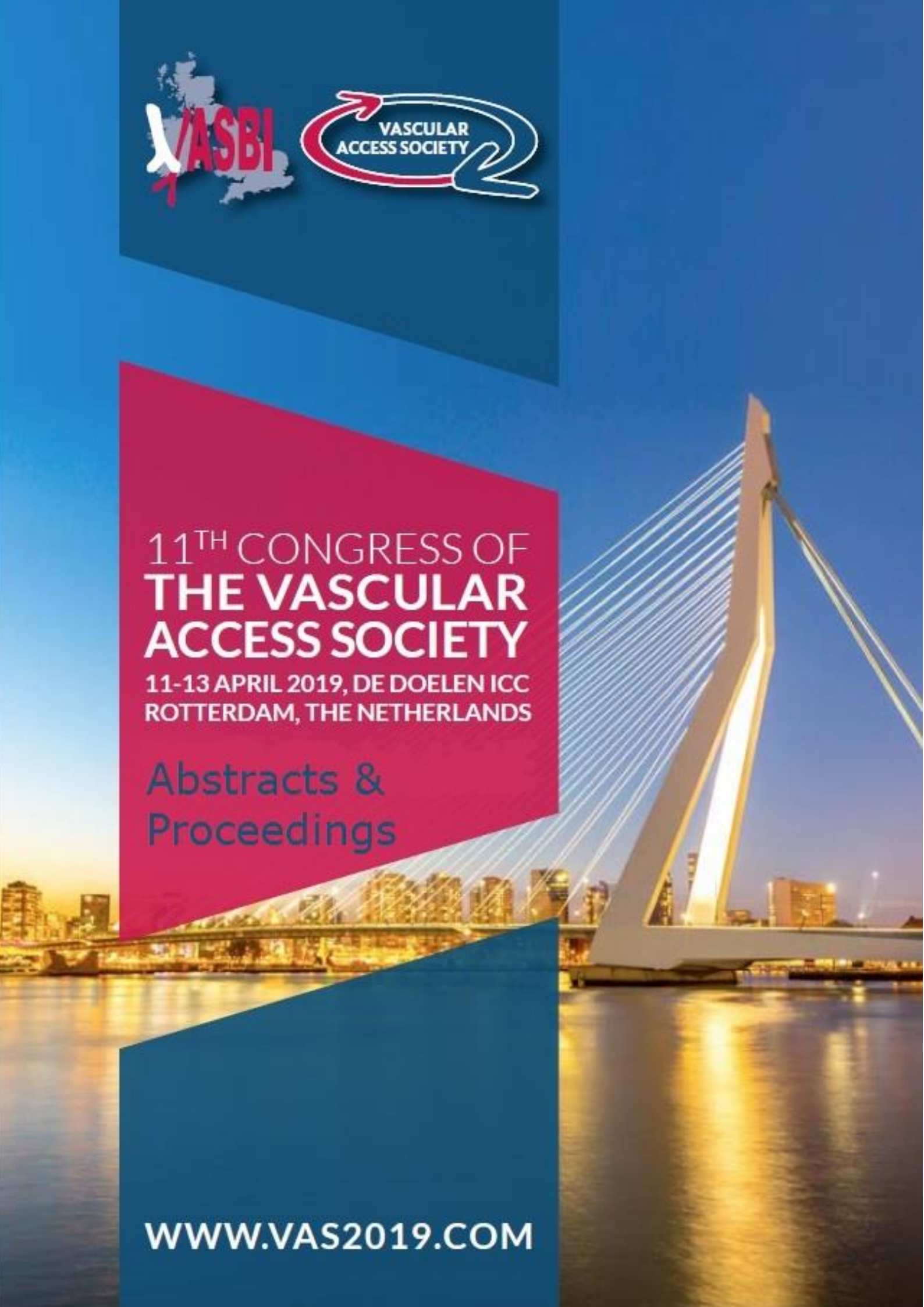

11TH CONGRESS OF THE VASCULAR ACCESS SOCIETY

11-13 APRIL 2019, DE DOELEN ICC ROTTERDAM, THE NETHERLANDS

Abstracts & Proceedings

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Index

Using radial approach in the treatment of early occlusion of distal accesses

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[2]CIPM, Paris, France

Introduction:
Post anastomotic early occlusion are a frequent cause of distal fistula maturation failure To redo the arteriovenous anastomosis higher up the forearm causes a loss in puncture zone. Creation of brachial accesses leads to a high risk of distal ischemia.

Methods and Results:
From Jannuary 2011 to September 2016, we performed percutaneous transluminal angioplasty (PTA) in the treatment of early occlusion in 60 patients with failing distal access maturation. We reported immediate results of the dilatation and retrospectively analyzed the outcome of the accesses after the procedure. Recanalization of early post anastomotic occlusion was achieved in all 60 patients. 2 main complications occurred: severe spasms of the feeding radial artery and rupture easily treated by prolonged low-pressure balloon inflation, no early thrombosis leading to access loss was noted.
Follow-up was available in 45 patients. PTA failed to restore a sufficient access flow in 4 patients. In the remaining 41 (91%), accesses started to be used for hemodialysis without difficulties. Primary patency access rates after PTA were 80% (range, 60%-93%) at 1 year. Secondary access patency rates were 80% (range, 64%-95%) at 1 and 2 years.
No severe vascular hemorrhagic complications were observed at post anastomotic radial artery level

Conclusion and Discussion:
When a distal access fails to mature because of early post anastomotic occlusion, PTA should be done and will salvage the fistula without risk
Radial artery approach is safe and effective in the treatment of distal access failure

Endovascular salvage of non-maturing autologous arteriovenous fistulas by using angioplasty and competitive vein embolization.

Lisette Nauta[1], Bram Voorzaat[2], Joris Rotmans[2], Elyas Ghariq[1], Thijs Urlings[1], Koen van der Bogt[1], Edwin van der Linden[1]

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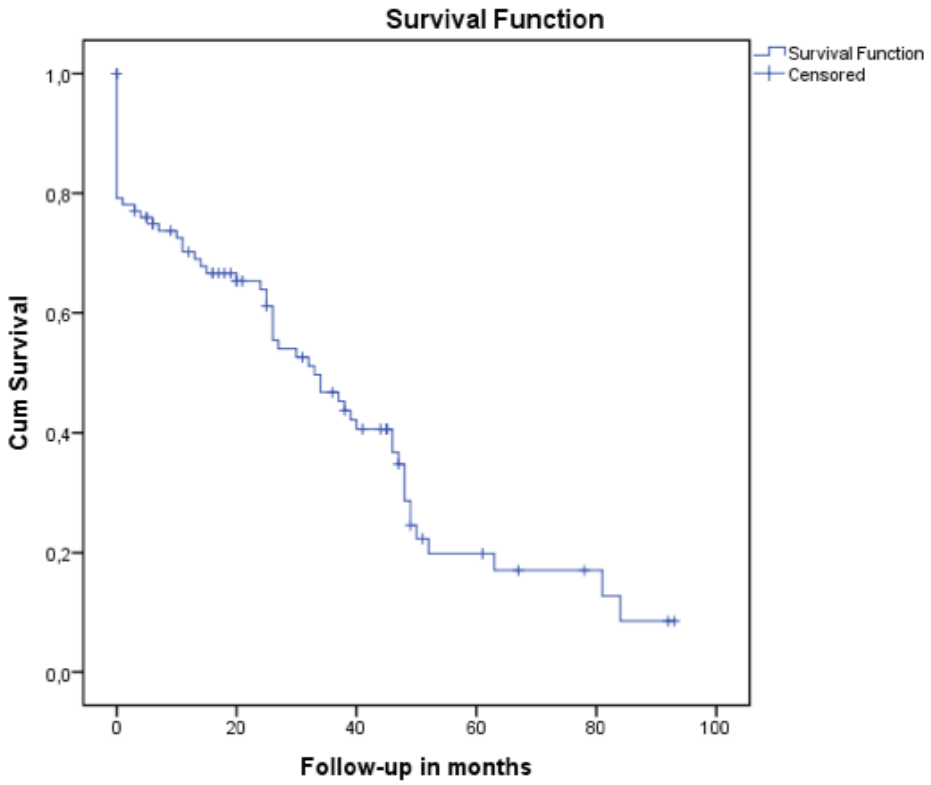
Introduction:
Autologous arteriovenous fistulas (AVFs) have high rates of primary failure because of non-maturation. The aim of this study is to evaluate theassisted patencyrates after endovascular treatment of non-maturing AVFs with percutaneous transluminal angioplasty (PTA), embolization of competitive veins or a combination of bothin a series of consecutive patients.

Methods and Results:
Patients with non-matured AVFs presented to our radiology department between January 2010 and February 2018 were evaluated retrospectively. Fistulography was performed in all patients to evaluate the presence of stenosis and competitive veins. Significant stenoses (>50%) were treated with balloon angioplasty and competitive veins (accessory and collateral veins) in the future cannulation zone were treated with coil embolization. Thirty brachial-cephalic (38%) and forty-eight (62%) radio-cephalic fistula were treated.

Angioplasty and coil embolization were performed in 73 and 51 patients, respectively.Technical success of PTA was achieved in 87%.No major complications occurred. In 65 out of 78 AVFs (83%) successful cannulation with two needles was possible after endovascular treatment. Sixty-three AVFs (81%) were used successfully for at least three months. Primary patency rates at 6 and 12 months were 54% and 37%, respectively. Secondary patency rates at 6 and 12 months were 78% and 65%, respectively.

Conclusion and Discussion:
Angioplasty and coil embolization are successful and safe treatments to save non-matured AVF's in more than 80 percent of patients. The assisted patency rates are similar to the patency rates of primary matured AVFs.

Picture 1:



Survival curve of AVFs after PTA and coil embolization by using Kaplan-Meier analysis.

Initial experience with the covera covered stent for the treatment of dysfunctional or thrombosed arterio-venous grafts. a retrospective analysis of 43 patients.

Panagiotis Kitrou, Panagiotis Papadimatos, Michail Theofanis, Spyros Papadoulas, Evaggelos Papchristou, Konstantinos Katsanos, Dimitrios Karnabatidis

Patras University Hospital, Patras, Greece

Introduction:
To retrospectively evaluate the safety and effectiveness of the Covera covered stent (CS) for the treatment of dysfunctional or thrombosed arterio-venous grafts (AVGs).

Methods and Results:
Within 21 months (February 2016 – November 2017), 61 patients underwent CS placement in our department for the treatments of their dysfunctional AVGs. Data were available for 43 patients, undergoing 43 procedures, using 43 devices. Mean follow-up was 214 days (20-524 days). Lesion characteristics were as follows: 33 cases with venous-

graft anastomosis (VGA) stenosis, 7 cases of puncture zone stenosis, 12 cases of in stent-graft (SG) stenosis, 5 cases of psuedoaneurysm treatment. Twenty-six patients presented with thrombosis while 26/43 case were restenotic lesions. Primary outcome measure was target lesion primary patency (TLPP) at six months, while secondary outcome measures included factors influencing primary outcome.
Technical success was 100%. TLPP was 60.64% at six months (median TLPP 264 days). During the whole follow-up period 17 AVGs were thrombosed and 11 cases required a redo procedure. There was no significant difference in terms of TLPP when de novo lesions were compared with restenotic, in SG restenosis vs. non in-SG stenosis, patients presented or not with thrombosis, or whether lesion was placed in the puncture zone or in VGA. A significant difference was observed between cases presented with thrombosis after treatment vs. those that were not thrombosed (133 vs. 285 days respectively. p=0.007).

Conclusion and Discussion:
Use of the Covera CS for AVG treatment is safe and effective in every case presented in this retrospective analysis.

De-novo and recurrent vascular access stenosis: timing and appropriate treatment

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Introduction:
We present our experience on drug eluting balloon (DCB) angioplasty of 'de novo' and recurrent vascular access stenosis.

Methods and Results:
Between January 2014 and October 2018 we performed 354 angioplasty in 262 patients (M:F=3:2, mean age 68±13 years). High pressure balloon (HPB) plus DCB (n = 145, 40.9%) or scoring balloon (SB: focal force balloon n = 147, 41.5%; cutting balloon n = 62, 17.5%) plus DCB angioplasty was adopted in 297 (83.9%) cases (re-stenosis n=176, 59.3%; de novo n=121, 40.7%). During follow-up (mean follow-up 26±9 months, range 2-48, follow-up index 0.84) stenosis recurrence was seen in 72 (24.2%) cases. After the re-treatment, in 18 (25.0%) cases multiple stenosis recurrence was documented, and additional treatment required. Univariate analysis with log-rank test shown high statistical correlation between stenosis recurrence and time spent between the identification of the lesion and its treatment (p=0.017). Multivariable analysis with COX regression shown a high statistical correlation between stenosis recurrence and history of previous angioplasty with plain or high-pressure balloon if compared to scoring plus DCB balloon angioplasty (HR: 3.86, 95% CI: 1.94 – 7.72, p<0.001).

Conclusion and Discussion:
These evidences stress the importance DCB over conventional angioplasty. In fact, conventional angioplasty would be related not only to a higher frequency of restenosis but also to a worse outcome of subsequent treatment, even if conducted with DCB. Moreover, partially in contrast with literature, the timeliness of the treatment would seem important. Finally, findings highlight the role of pre-dilatation especially with scoring balloon.

Stent-grafting as first intervention for venous stenosis impoves outcomes in incident arteriovenous grafts

Andrej Isaak[1], Karen S. Stevenson[2], Peter Thomson[2], Ram Kasthuri[2], David Kingsmore[2]

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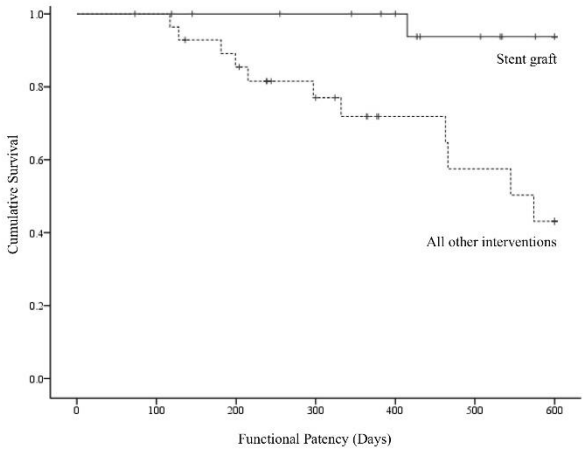
Introduction:
Management of significant venous stenosis to reduce re-intervention rate and increase long-term patency remain key challenges of contemporary vascular access surgery. In prevalent patients, although stent-grafting rather than angioplasty alone had better short-term patency, this did not translate into long-term benefit. The aim of this study was to determine if primary stent-grafting as the first intervention in incident grafts at surveillance improves outcomes.

Methods and Results:
A cohort of 103 consecutive patients with incident early-cannulation grafts (ecAVG) and a minimum follow- up of one year was investigated. Abstracted data of ecAVG outcomes and time to second intervention by first intervention (stent-graft, angioplasty or thrombectomy) when a significant venous stenosis was detected at surveillance were analyzed. The risk of thrombosis was significantly higher if angioplasty alone was performed rather than stent-grafting in patients who had a venous stenosis. The functional patency for patients with a venous stenosis if a stent-graft was placed primarily was 100% at one year, 90% at 18 months compared to 70% and 50% in patients in whom a stent-graft was not placed. The mean time to re- intervention was 252 days (± 25) if stent-grafting was the first intervention, for angioplasty and thrombectomy this time was 98 (± 30) and 103 days (± 20).

Conclusion and Discussion:
Stent-grafting as the primary intervention to treat venous stenosis in incident ecAVG at angiographic surveillance, rather than observation or angioplasty alone leads to less interventions, fewer thrombotic episodes and improved functional graft patency.
Picture 1:

Functional Patency By Intervention In Presence Of Significant Venous Stenosis.

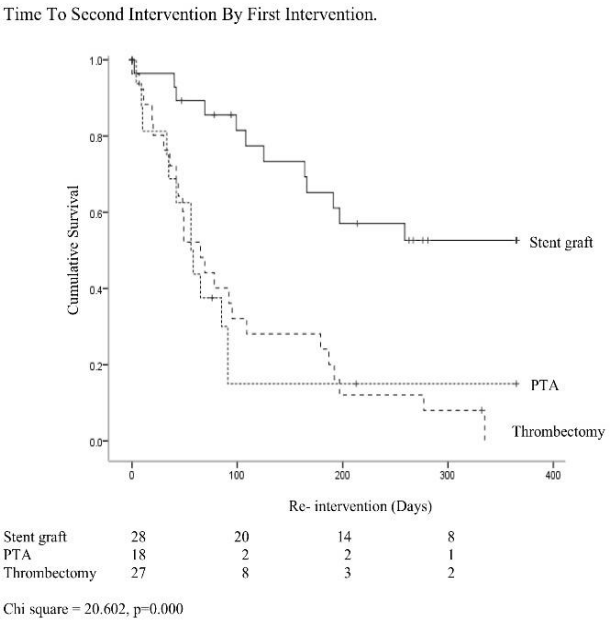


Stent graft	22	22	20	19	17	13	9
All other Interventions	29	28	23	17	10	8	6

Chi square = 9.320, p=0.002

Notes. Functional patency survival curve by intervention in presence of >50% venous outflow stenosis: stent graft group – insertion of Viabahn (Gore®) stent graft, and all other interventions group – PTA only, thrombectomy only or with PTA/ stent graft.

Picture 2:



Cardiovascular effects of hemodialysis access - 11 April 2019

Vascular access mamangement in patients with hearth failure

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Introduction:
To choose the adequate vascular access for patients with heart failure (HF) is a real challenge. HF entails a high risk for cardiovascular mortality in incident hemodialysis (HD) patients, especially during the arteriovenous access maturation period due to the great increase in blood flow that occurs.

Methods and Results:
When planning the best vascular access for each incident HF patient, the risk of HF worsening after arteriovenous access creation must be evaluated carefully along with the risk of catheter-related complications, but avoiding a non-selective 'catheter first' approach for all these patients. HF patients classified within the New York Heart Association (NYHA) Class I-II and the American College of Cardiology/American Heart Association (ACC/AHA) Stage A-B could initiate HD through a distal arm arteriovenous fistula; high-flow brachial artery-based fistula creation must be avoided because it presents the highest risk of worsening heart function. HF patients with significant reduction in systolic function (ejection fraction lower than 30%) or classified within the NYHA Class IV and the ACC/AHA Stage D, are candidates for tunneled central vein catheter placement to start HD treatment

Conclusion and Discussion:
It is necessary to validate models to predict, in the pre-dialysis stage, the blood flow rate that will have the arteriovenous access after its creation or, directly, to estimate its cardiac effects. These models can help us to choose the appropriate vascular access for each HF patient.

Vascular access blood flow suppression surgery improves brain perfusion

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Introduction:
Vascular access (VA) is necessary for patients to receive efficient dialysis. VA is a circulatory path that does not normally exist. Excessive flow through VA forces high cardiac output and diverts blood flow from other parts of the body. VA blood flow suppression surgery might improve this condition. We investigated blood flow status in the cervical artery before and after blood flow restriction surgery to test this hypothesis.

Methods and Results:
Ninety-four patients who had undergone blood flow suppression surgery and whose cervical artery blood flow was measured before and after the surgery at the Kanno Dialysis and Vascular Access Clinic from 2009 to 2018 were recruited for this study. VA and common bilateral carotid and vertebral artery blood flows were measured using Doppler ultrasound. VA flow decreased from 1513±438 ml/min to 702±230 ml/min after surgery. In the vertebral artery, blood flow on the access side, which was lower than that on the non-access side prior to surgery, significantly increased after the surgery. Blood flow in the common carotid artery tended to be higher prior to surgery. Blood flow in the common carotid and vertebral arteries on the non-access side was significantly increased after surgery.

Conclusion and Discussion:
Blood flow in the cervical artery on the high flow VA side was decreased compared to that on the opposite side. This finding suggests the diversion of flow from the brain due to excess VA. Blood flow suppression surgery could improve brain perfusion by reducing this diversion.

Early results using pro-b-type natriuretic peptide (pro-bnp) as a biomarker for the efficacy of secondary extension technique (set) in improving myocardial function in dialysis patients with high flow fistulas.

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Introduction:
The association of dialysis fistulas and heart failure is believed to be due to high cardiac output. N-terminal pro-B-Type Natriuretic Peptide (pro-BNP) which is secreted by the cardiac ventricles in response to excessive stretching of the myocytes has been used as a marker of heart failure with 90% sensitivity. We report our early experience using pro-BNP levels to test the efficacy of the novel 'secondary extension technique' (SET) in improving myocardial function by reducing fistula flow.

Methods and Results:
11 patients with high fistula flows (> 3L/m, all brachio-cephalic) and raised BNP underwent SET between 2011 and 2015. SET involves extending the anastomosis from brachial to either proximal radial or ulnar arteries. We measured BNP levels, fistula flow and clinical improvements both pre and post operatively. SET resulted in an average flow rate decrease of 57.1% which corresponded with a fall in pro-BNP of 76.8%. 63.6% of patients in the series pro-BNP level returned to a normal value at average follow-up of 3 months post SET.

Conclusion and Discussion:
Our small study shows that SET is an effective way of reducing fistula flow. It also shows that Pro-BNP may be a reliable biomarker in assessing the impact of the technique on cardiac function. These results warrant further investigation in the form of a definitive, multicentre study.

Echocardiographic changes in patients with high-flow arteriovenous fistula after flow reducing surgery

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Introduction:
More than 50% of patients in chronic hemodialysis program die of cardiovascular diseases. Changes of the structure and function of the heart could be detected by echocardiography. Pulmonary hypertension affects about 50% of patients with end stage renal disease (ESRD) and is associated with 2-fold increase in mortality. Another frequent finding is the diastolic dysfunction of the left ventricle. Hyperkinetic circulation is one of the possible etiologies. The aim of this study was to describe the effect of blood flow reduction in high-flow AVFs on echocardiographic parameters.

Methods and Results:
We included 24 patients with high-flow AVF who underwent surgical banding or other flow-reducing techniques. We performed an echocardiographic examination and ultrasonographic AVF blood flow volume (Qa) measurement before and 6 weeks after the surgery. The AVF banding led to a significant decrease of Qa (from 3000 to 1270 mL/min, p=0.000004) accompanied by decrease in cardiac output (from 8.4 to 6.3 L/min, p=0.003) and cardiac index (from 4.4 to 3.4 L/min/m^2, p=0.005). We observed a significant decrease of left atrium volume (from 48.5 to 43.3 mL/m^2, p=0.05), decrease of estimated pulmonary artery pressure (from 49.1 to 35.6 mmHg, p=0.0002) and improvement in left ventricle diastolic function (p=0.02).

Conclusion and Discussion:
Pulmonary hypertension and diastolic dysfunction are frequent in hemodialysis patients. One of the possible mechanisms could be hyperkinetic circulation caused by a high-flow AVF. AVF blood flow reduction improved diastolic function and reduced pulmonary hypertension in our patients. The debate about the safe Qa continues.

Tailoring vascular access - 11 April 2019

Vascular access cannulation and compression techniques

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Introduction:
The maintenance of the vascular access (VA) not only depends on the quality of the blood vessels and the surgical technique used, but also on the way in which the VA is cannulated. After creation of the initial VA, preferably an autogenous AVF, the correct needling technique has a favourable influence on fistula lifespan. VA is the lifeline of dialysis patients, but as the number of vessels that have been devastated, such as aging and diabetes cases increases, cases with puncture/compression hemostasis are increasing.

Methods and Results:
Puncture · Compressive hemostasis is also a great stress for the dialysis staff, requiring a stable procedure. Regarding the first puncture of VA creation, in the guideline, PTFE grafts should not routinely be used until 14 days after placement, and first puncture of 2- 4 weeks after creation of an AV access. Although early puncturable graft has been developed in recently, it is necessary to discuss the pros and cons of VA early puncture.
The Cannulation technique includes skin preparation, anesthesia, pre-cannulation examination, needle selection, and puncture technology, the mastering of standard techniques covering them is important. Ultrasound technique is mainly used for preoperative mapping and postoperative VA evaluation, ultrasound assisted cannulation is effective for difficult puncture cases, and education of this technique for dialysis staff is necessary.

Conclusion and Discussion:
Compression techniques require skill but Noninvasive compression adjuncts for Hemostasis for hemostasis has been developed. Chitosan-pad and Calcium / Sodium alginate sheets are frequently used for VA hemostasis, and effectiveness has been demonstrated with RCT.

Contemporary outcomes of alternative forearm cephalic vein fistulas (radar and jennings)

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[1]Brigham and Women's Heart and Vascular Center, Boston, United States of America

Introduction:
A small or absent cephalic vein or radial artery may preclude snuff-box and Cimino radial-cephalic arteriovenous fistula(AVF). Alternative forearm AVF configurations leverage forearm cephalic vein that does not fully extend to the wrist in the presence of radial artery of sufficient size at the wrist(Radial-Artery-Deviation-And-Reimplantation,RADAR) or is only suitable near the elbow(Jennings).[1-5] Here we examine the interplay of patient characteristics and short-term outcomes after alternative forearm cephalic AVF creation.

Methods and Results:
Consecutive patients undergoing RADAR or Jennings AVF creation by a single operator(2014-2018) were included in this institutional review board-approved study. Demographic,clinical,and anatomic patient data were retrospectively analyzed. Due to non-Gaussian distribution of data, non-parametric methods were used—Fisher exact test for discrete/ordinal data; Wilcoxon rank sum for continuous data.
35 patients underwent alternative forearm cephalic AVF creation. Eight were censored within 3 months due to unexpected death unrelated to dialysis access. Baseline characteristics are shown(Table 1). Primary patency was 44%,and secondary patency 93%. RADAR AVFs were associated with increased reintervention(83% vs 33%,p=0.01) and lower primary patency(17% vs 60%,p=0.002) compared to Jennings configurations . Patients on dialysis at the time of access creation had more short-term complications(22% vs 39%,p=0.04) and lower secondary patency(90% vs 100%,p=0.02). Patients with BMI>=30 underwent more reinterventions(3.7/patient vs 2.5/patient, p=0.045).

Conclusion and Discussion:
Obesity and active dialysis status associate with increased complications, reinterventions, and patency loss in patients with alternative forearm cephalic vein accesses. RADAR compared to Jennings configuration was associated with higher intervention rates, and lower primary but similar secondary patency. Adjuncts, such as periprocedural antithrombotic therapy may improve RADAR outcomes.

Picture 1:

Table 1. Baseline patient characteristics.

Variable		Value
Age, median years [IQR]		66 [53, 79.5]
Sex		
	Male (%)	9 (33.3%)
	Female (%)	18 (66.7%)
Race		
	White (%)	18 (66.7%)
	Latino (%)	2 (7.4%)
	African American (%)	5 (18.5%)
	Asian/Pacific Islander (%)	1 (3.7%)
	Other/Missing (%)	1 (3.7%)
Body mass index, median [IQR]		28.6 [24.9, 32.6]
Diabetes (%)		14 (51.9%)
Hypertension (%)		26 (96.3%)
Hyperlipidemia (%)		20 (74.1%)
Coronary artery disease (%)		10 (37.0%)
Peripheral arterial disease (%)		6 (22.2%)
Smoking		
	Current (%)	1 (3.7%)
	Former (%)	6 (22.2%)
	Never (%)	20 (74.1%)
Dialysis at time of access creation (%)		18 (66.7%)
AVF configuration		
	RADAR (%)	12 (44.4%)
	Jennings (%)	9 (33.3%)
	Jennings with transposed proximal radial artery inflow (%)	6 (22.2%)

Vascular access maturation - 11 April 2019

Clinical benefit of ultrasonography to monitor avf maturation

Jernej Pajek

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Introduction:
Besides clinical examination ultrasonography represents a key diagnostic tool to monitor arteriovenous fistulas for appropriate maturation. This has been popularly defined under the rule of 6 (appropriately matured fistula has a diameter of at least 6 mm, is less than 6 mm under the skin surface and provides at least 600 ml/min of blood flow). All of these crucial parameters (flow, vein diameter and depth) can be assessed during an ultrasonographic examination.

Methods and Results:
We give an overview of the suggested protocol for fistula ultrasonography examination whereby the whole upper arm circuit is comprehensively evaluated under the standardized sequence. Fistula non-maturation and failure continue to pose a widely prevalent problem since unassisted maturation of fistulas is reached in only up to 49% of cases in contemporary studies. Here we present some recent data on postoperative predictive factors for fistula maturation. Generally, much larger focus has been put on fistula non-maturation than high flow fistula development, which is also a significant risk after access construction, typically (but not exclusively) observed in fistulas with more proximal anastomoses. The remodeling of feeding artery and anastomosis, venous segment aneurysms and relative or absolute upstream stenosis with high-flow fistula maturation are typical features in these cases.

Conclusion and Discussion:
We conclude that ultrasonography examination in experienced hands should become a routine monitoring tool and it should be used for early diagnosis of impending both a non-maturation and high-flow arteriovenous fistula problems.

Pre-existing vascular pathology and avf maturation

Roberto Vazquez-Padron

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Introduction:
Our inability to prevent arteriovenous fistula (AVF) failure is, in part, due to an incomplete understanding of how preexisting venous and arterial conditions influence the function of the vascular access.

Methods and Results:
Herein, we will examine recent advances in our knowledge of how preexisting venous biology influences the outcomes of newly created AVFs. We will initially evaluate the relationship between the known "vascular pathologies" associated with chronic kidney disease (intimal hyperplasia, vascular calcification, and medial fibrosis) and hemodialysis access outcomes. We will then critically discuss whether in fact endothelial dysfunction, patients' sex, inflammation, and pre-existing vascularization play a role in AVF failure.

Conclusion and Discussion:
We will conclude there is no compelling evidence that preexisting vascular IH, medial fibrosis, or microcalcification has any adverse effects on AVF nonmaturation or primary unassisted patency of AVFs. We will finally highlight the imperative need to apply powerful and new high–throughput technologies for probing the transcriptome, proteome, and metabolome to increase our mechanistic understanding of the complex biology underlying AVF failure and vascular dysfunction.

Pre-operative duplex ultrasonography in arteriovenous fistula creation: intra- and inter-observer agreement

Niek Zonnebeld, Tommy Maas, Wouter Huberts, Magda van Loon, Tammo Delhaas, Jan Tordoir

Maastricht UMC+, Maastricht, Netherlands

Introduction:
Although clinical guidelines on arteriovenous fistula (AVF) creation advocate minimum luminal arterial and venous diameters, assessed by duplex ultrasonography (DUS), the clinical value of routine DUS examination is under debate. DUS might be an insufficiently repeatable and/or reproducible imaging modality because of its operator dependency. The

present study aimed to assess intra- and inter-observer agreement of preoperative DUS examination.

Methods and Results:
Ten ESRD patients were included. All measurements were performed by two trained and experienced vascular technicians, blinded to measurement readings. From the routine DUS protocol, representative measurements (venous diameters, and arterial diameters and volume flow in the upper arm and forearm) were selected. For intra-observer agreement the measurements were performed in triplicate, with the probe released from the skin between each. Intraclass correlation coefficients (ICCs) were calculated for intra- and inter-observer agreement, and Bland-Altman plots used to graphically display mean measurement differences and limits of agreement. Ten patients (6 male, 59.4±19.7 years) consented to participate, and all predefined measurements were obtained. IICCs for intra-observer agreement of diameter measurements were at least 0.90 (95% CI 0.74–0.97; radial artery). Inter-observer agreement was at least 0.83 (0.46–0.96; lateral diameter upper arm cephalic vein). The Bland-Altman plots showed acceptable mean measurement differences and limits of agreement.

Conclusion and Discussion:
In experienced hands, excellent intra- and inter-observer agreement can be reached for the discrete pre-operative DUS measurements advocated in clinical guidelines. DUS is therefore a reliable imaging modality to support AVF surgery planning. The content of DUS protocols, however, needs further standardisation.

Vascular Acces Training – 11 April 2019

Online dialysis access training

Ingemar Davidson[1], Nick Inston[2], Gerald Beathard, John Ross[3]

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[2]Queen Elizabeth Hospital, Birmingham, United Kingdom
[3]Regional Medical Center Orangeburg, Orangeburg, United States of America

Introduction:
End state renal disease (ESRD) treatment, specifically dialysis access, is a complicated disease state treated by a variety of medical specialties. Access to reliable and applicable training is limited and disparity exists between medical specialties and also geographically among professionals globally. The population of patients needing treatment is growing and training for medical professionals is paramount to improve patient outcomes.

Methods and Results:
Kidney Academy is a non-profit entity dedicated to quality ACCME accredited education to a global audience on topics related to dialysis access. It is translated into 7 languages reaching a global audience of physicians and adjunct health care professionals. The best way to understand what Kidney Academy offers is to visit the website at *www.kidneyacademy.com*. An introductory video explains the content and the registration process. When complete in mid-2019 there will be 15 modules: 1. Introduction to Dialysis Access; 2. Physical Examination; 3. Dialysis Access Algorithms; 4. Native AV fistula 5. Grafts; 6. Peritoneal Dialysis; 7. Thoracic Central Vein Obstruction; 8. Hand Ischemia: Dialysis Access Steal Syndrome; 9. Radiation Safety; 10. Vascular Access Aneurysms; 11. Complex Dialysis Access Case Reports; 12. ICD-10 coding; 13. Dialysis Access Catheters; 14. Cannulation and Dialysis Delivery; 15. Ultrasound in Dialysis Access.

Conclusion and Discussion:
Kidney Academy offers an opportunity to learn state of the art techniques in dialysis access.

Pretreatment with a phosphodiesterase type 5a inhibitor improves adaptive wall remodeling in rat arteriovenous fistula.

Maheshika Somarathna, Tatyana Isayeva-Waldrop, Kevin Ingle, Huashi Li, Lingling Guo, Timmy Lee

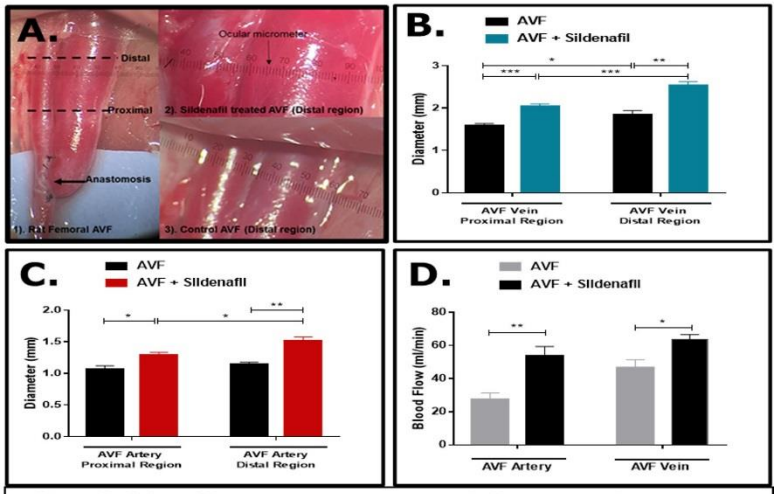
University of Alabama at Birmingham, Birmingham, United States of America

Introduction:
Inadequate adaptive wall remodeling in response to increased blood flow following arteriovenous fistula (AVF) creation is a major contributing factor of AVF maturation failure. We hypothesize that pretreatment with a selective phosphodiesterase type 5A (PDE5A) inhibitor, sildenafil, can be used to improve vascular adaptive remodeling.

Methods and Results:
Sildenafil was administered to 12-16 weeks old Sprague-Dawley rats two weeks prior to AVF creation and continued until sacrifice at 7 days. At the time of sacrifice, AVF vessels blood flow (perivascular flow probe) and the diameters were measured. Neointimal hyperplasia (NH) development was assessed by morphometric analysis of the AVF vein. When compared to control group, a significant increase in venous and arterial diameter was observed in the sildenafil treated group in proximal and distal regions, at 7days after AVF creation. Furthermore, increased AVF vessels blood flow was also observed in sildenafil treated AVFs. However, no significant difference in the NH development was observed between the two groups.

Conclusion and Discussion:
Sildenafil administered before and after AVF creation, improves venous blood flow and the outward expansion in AVF vessels without affecting the level of NH at 7 days. These observations suggest that, outward expansion of venous limb of the AVF can preserve the luminal caliber and allow proper maturation of AVF, in the presence of NH formation. These results suggest a beneficial therapeutic effect of pretreatment with PDE5A inhibitor. Therefore, mechanisms that enhance outward vascular remodeling could be a potential therapeutic approach for treating AVF maturation failure.

Picture 1:



Effect of Sildenafil treatment on AVF vessel diameter and AVF venous blood flow, 7 days following AVF creation in rats.
A) Representative regions of interest for the measurement of the diameter of AVF vessels. Note the significant increase in venous diameter at the distal region of the sildenafil treated AVF, compared to the control. Average diameter of vein (B) and artery (C) in sildenafil treated rats (n=6) compared to control rats (n=4). (D) Comparison of average venous blood flow in Sildenafil treated rats (n=6) and control rats (n=3). *P<0.05, **P<0.001 and ***P<0.0001.

Towards the identification of the major hemodynamic determinant in inducing endothelial cell quiescence in arteriovenous fistulae

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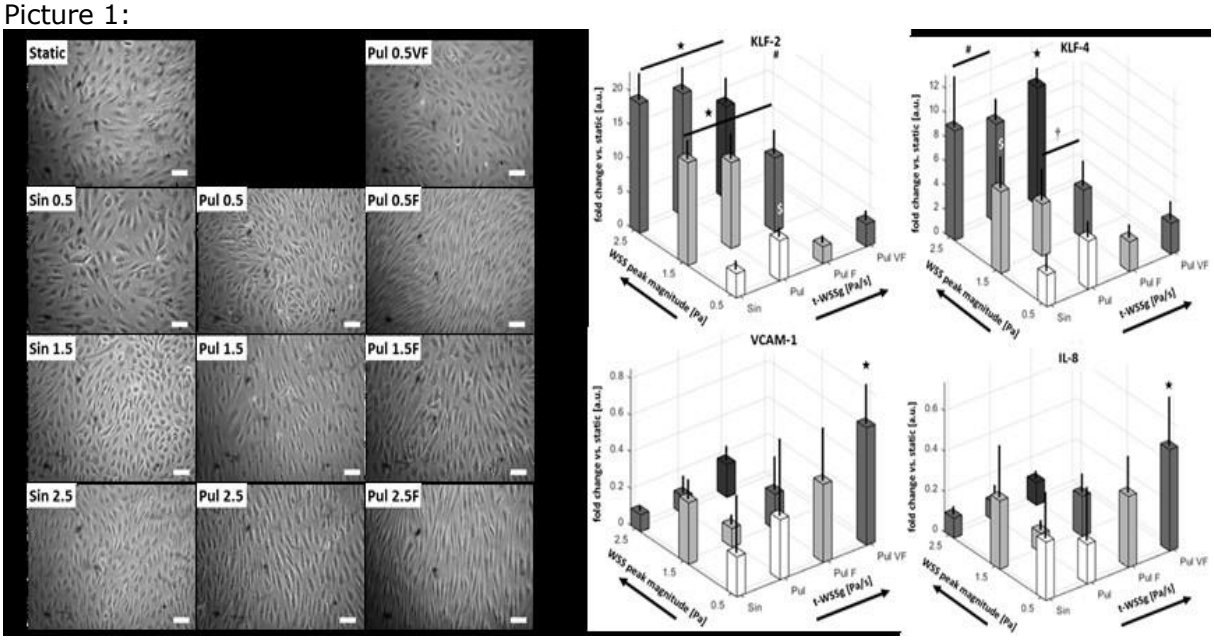
Introduction:
Wall shear stress (WSS) is involved in the maturation and failure of arteriovenous fistulas (AVF). The anastomotic region of the AVF experiences highly unsteady, reciprocating flow characterised by complex fluid-dynamic features such as time-averaged WSS, maximum WSS (maxWSS), WSS temporal gradient (t-WSSG) and reverse phases. To understand the effects of any single feature on AVF maturation, we decomposed these complex patterns and investigated their effects on endothelial cells in an in-vitro setting.

Methods and Results:
Human umbilical vein endothelial cells (HUVECs) are exposed to ten different WSS waveforms for 24 hrs. WSS waveforms have WSS average values ranging from 0 to 0.8 Pa, maxWSS from 0.5 to 2.5 Pa, t-WSSG from 2 to 20 Pa/s and from 0 to 0.5 of oscillatory shear index (OSI) value. Cellular responses were analysed in terms of morphology, organisation and in terms of the gene (RT-PCR) and protein (WB) expression involved in cell quiescence or activation. Our results demonstrated that within the flow waveforms examined, the maxWSS is the main flow parameter that induces cell elongation and alignment and is also correlated to the increase of quiescence markers (KLF-2 and KLF-4) and the downregulation of inflammatory markers (VCAM-1, IL-8).

Conclusion and Discussion:
Current theories suggest the average WSS and OSI values as possible predictors of the risk of AVF failure. However, in agreement with a previous longitudinal study on AVF maturation in-vivo, we demonstrated that maxWSS in the flow waveforms examined is the most important feature in inducing cell quiescence and possibly promoting AVF maturation.

Picture 1:



On the left, HUVECs exposed to 24 hrs of different WSS, scale bar 50μm. On the right, flow induced gene expression versus static controls.

Outcomes of translumbar and transhepatic dialysis catheters: a single center experience

Ammar Almehmi[1], Souheil Saddekni[1], Vinay Narasimha Krishna[1], Andrew Gunn, Ahmed Kamel

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Introduction:
Translumbar (TLC) and transhepatic (THC) dialysis catheters are temporary dialysis access that are used in patients who have exhausted traditional accesses. We sought to report the outcomes of these catheters in our center.

Methods and Results:
We retrospectively reviewed the medical records of all patients who received TLCs and THCs between January 2000 to January 2016 at our center. Primary catheter interval was defined as the number of catheter days from insertion until failure or removal, patient death, or conclusion of the study with a functional catheter. Secondary catheter interval was defined as the catheter interval that started after exchange or salvage, without abandonment of the access site. Total catheter interval was defined as the sum of all catheter intervals irrespective of the access site. This study included 12 translumbar and 10 transhepatic catheters were inserted in 10 patients. Mean age of the patients was 52.7 years; 60% had diabetes; and 30% were males. The primary catheter patency at 3 months for TLC and THC was 50% and 75%, respectively. At 6 and 12-month intervals, neither translumbar nor transhepatic primary catheters were patent. The main complications were poor blood flow (31.8%) and catheter related infection (18.2%). There was no difference in survival between the translumbar and transhepatic catheter cohorts (p=0.31).

Conclusion and Discussion:
Conclusion: The current report suggests that both TLCs and THCs are viable options for those who have exhausted conventional access. However, the long term use of these catheters is associated with frequent exchanges, infections and poor blood flow.

Dialysis catheter insertion with substernal ultrasound guidance

Krzysztof Letachowicz, Tomasz Golebiowski, Waldemar Letachowicz, Mariusz Kusztal, Anna Szymczak, Slawomir Zmonarski, Maciej Kanafa, Magdalena Krajewska

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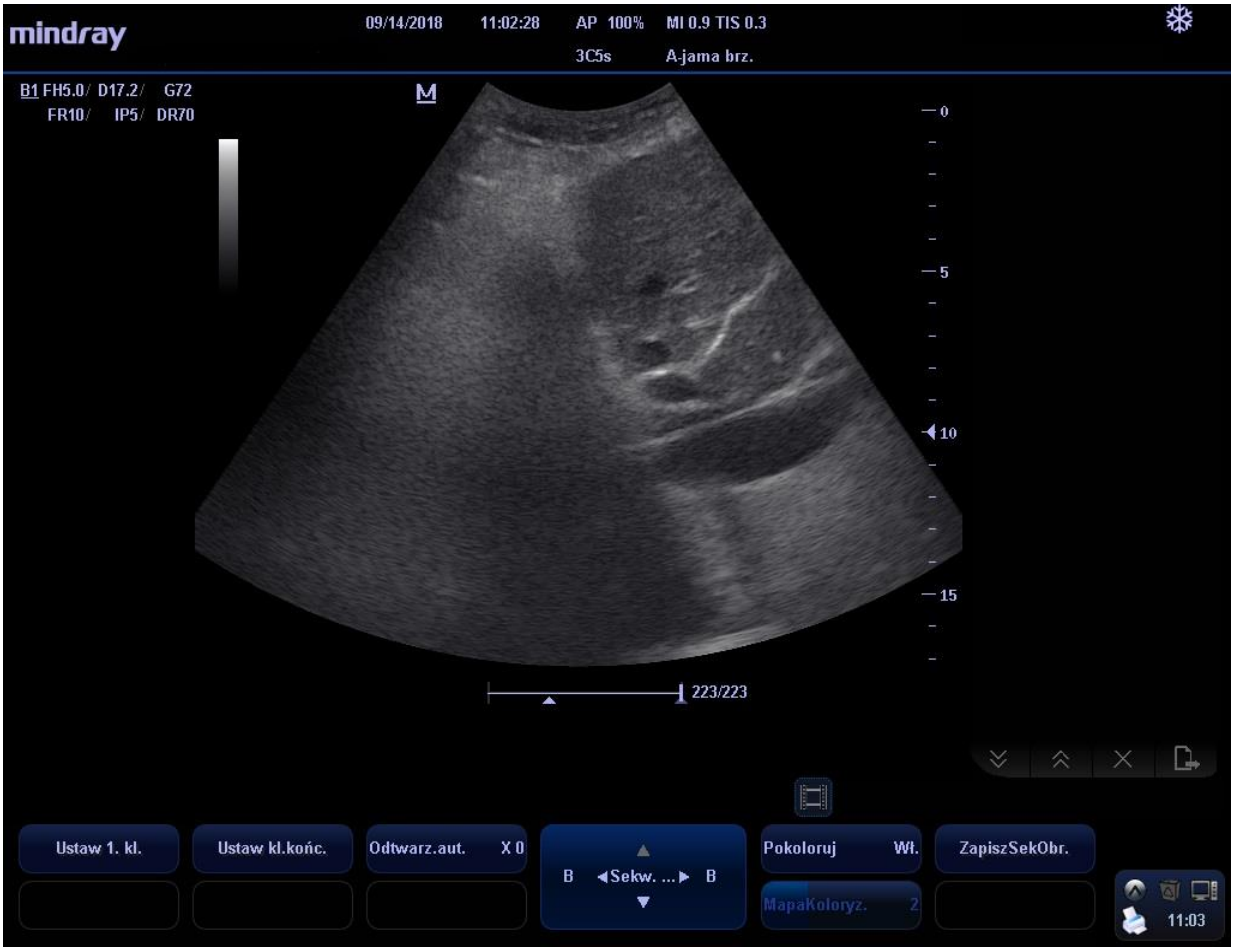
Introduction:
A right supraclavicular fossa ultrasound improved the accuracy of central venous catheter tip positioning. We have evaluated the feasibility of substernal ultrasound to confirm guidewire position.

Methods and Results:
The study was approved by local ethics committee and registered (NCT03727581). Data of 24 patients are presented. Jugular veins were punctured with ultrasound guidance by nephrologist and guidewire wire was introduced. Second physician tried to visualize the guidewire in the inferior vena cava (IVC) or right atrium (RA) using a substernal transhepatic window. In 15 (62.5%) patients IVC view was excellent, in 8 (33.3%) was fair and in one patient we failed to visualize IVC. In one patient procedure was stopped due to problems with introduction of the guidewire.
We identified guidewires in IVC in 18 (78.3%) patients, in 7 (30.4%) after withdrawing and advancing guidewire, and in RA in 3 (13%) patients. In one (4.3%) patient we could

not distinguish it from pacemaker's wires. Catheters were successfully placed in 23 (95.8%) patients with tips located in RA in 20 (86.9%) cases.

Conclusion and Discussion:
Detection of the guide-wire confirms correct course of the procedure. The described technique increases the safety of catheter insertion without fluoroscopy. Procedure could be expanded by agitated saline bubble-enhanced transthoracic echocardiography, accurate method for position controls of central venous catheters. Use of ultrasound for puncture, guide-wire detection and catheter tip confirmation could be cost-effective alternative for fluoroscopy guided catheter insertion and should be verified in randomized trial.

Picture 1:



Guidewire in the inferior vena cava

Reasons for dialysis catheter insertion - real-time data from reducction project

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Introduction:
More than half of Australian patients initiate maintenance haemodialysis with a dialysis catheter, however catheter use for patients with acute kidney injury (AKI) is not measured at a national level. We aimed to use data collected as part of a prospective national project (REDUCCTION - Reducing the burden of dialysis catheter complications) to understand the reasons for dialysis catheter insertion across Australian and New Zealand renal units.

Methods and Results:
Data was collected using a web-based data collection tool on all patients who had a dialysis catheter inserted between 20/12/2016 and 06/11/2018 (censored) at any of the 42 participating REDUCCTION units (37 Australian; 5 NZ). Study data collection continues. The reasons for insertions were grouped into AKI, commencement of maintenance dialysis, arteriovenous fistula/graft (AVF/AVG) dysfunction, transition from Peritoneal Dialysis (PD) without permanent vascular access and other as reported by study site.
Data on 5806 (3962 patients) dialysis catheters were captured, representing 593,996 catheter days. Of these, 1975 (34%; 59% Tunnelled) catheters were inserted for AKI, 1802 (31%; 85% Tunnelled) for commencement of maintenance dialysis, 774 (13%) for AVF/AVG dysfunction, 662 (11%) for transition from PD and 590 catheters (10%) for other reasons. At the censor date, 1409 catheters remained in situ while 4420 catheters were removed after a median of 23 days (IQR 7-99 days).

Conclusion and Discussion:
The data suggest opportunities to reduce catheter usage by understanding patients with AKI requiring dialysis better, identifying those requiring chronic HD and timely referral for access creation and improving the transition from PD.

Central venous catheters - long term experiences of a major vascular access center

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Introduction:
Central venous catheters (CVC) are only third choice of vascular access (VA) for hemodialysis. But once inserted CVCs provide an easy to use access and patients as well as nephrologists seem to be reluctant to have them removed.

Methods and Results:
Between 2006 and 2016 all 1846 CVCs implanted were prospectively followed. Main indication for CVC was first dialysis (41,7%), classical bridging of a failed access in 24,3%. Problems with existing CVC (malfunction or infection) made up 33,7%. Catheters were inserted via the Internal Jugular Vein whenever possible (95,9%), alternative routes were Subclavian Vein (2%) and Femoral Vein (2,1%). Almost half of the catheters (49,8%) could be removed electively, 30,8% had to be removed early for malfunctioning or infection, 10,4% of patients died, 7,9% are still in use. Subset analysis showed that 69,6% of CVC were removed within 6 months, but 10,7% were still in use after 1 year. CVC implanted to replace a malfunctioning or infected catheter had to be explanted prematurely for infection (13,6%) or malfunction (28,9%) more frequently (12,2/9,6%, 10,2/17,5% respectively) and earlier than those implanted for onset of dialysis or bridging. Femoral and Subclavian catheters had to be removed for malfunction more often than Jugular (30,3/25,8% vs 17,8%) and more patients died with catheter (18,2/16,1% vs 10,1%).

Conclusion and Discussion:
CVCs provide a reliable VA but carry a 30% risk of premature loss due to infection or malfunction. However, dwell times are usually long enough to create a definite access and all efforts should be made to do so.

Outcome of mrsa catheter-related bacteraemia (crb)-can we solve the problem ?

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Introduction:
The incidence of invasive MRSA infection among patients(pts) undergoing chronic dialysis is >100 times higher than in the general population. Increased risk of MRSA infections in dialysis patients is related to repeated vascular access for hemodialysis patients through central venous catheters (CVCs).

Methods and Results:
We collected epidemiological and laboratory data on all cases of MRSA bacteremia at pts on hemodialysis with CVC , from December 31, 2010 to December 31, 2017. Demographic data, medical comorbidities (diabetes),duration of CVC, duration of hospitalization and antibiotic therapy, function and complications were recorded

Conclusion and Discussion:
We identified 52 episodes of MRSA bacteremia from 46 patients (24 males, 22 females, aged 57 years).Thirthy nine pts had temporary CVC, and 7 permanent CVC. More than a half of the patients have diabetes, and one third of the pts were on Chronic Hemodialysis Program more than 3 years. There were no differences in age, gender or severity of bacteraemia and comorbidities In logistic regression analysis, variables were duration time of CVC, type of previous venous access, previous use of antimicrobials, and previous hospitalization related to CRB. Previous hospitalization increased the chance of developing CRB, 6.6-fold (CI 95%: 1.9–23.09) All CVC were removed and new ones were inserted. Only one patient died, and two had complications- Spondylodiscites. Vancomycin was most frequently administered antibiotic. All MRSA catheter-related bacteraemia were successfully resolved by changing CVC and appropriate antibiotic therapy. Therefore, prevention activities should focus on improving CVC maintenance.Infection prevention measures for bloodstream infections related to central venous catheter use should be intensified.

Precurved non-tunnelled catheters for haemodialysis are comparable in terms of infections and malfunction as compared to tunnelled catheters - a retrospective cohort study.

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Introduction:
The main limitations of central venous catheters (CVCs) for haemodialysis access are infections and catheter malfunction. Our objective was to assess if precurved non-tunnelled CVCs (NTCVCs) are comparable to tunnelled CVCs (TCVCs) in terms of infection and catheter malfunction and to assess whether precurved NTCVCs are superior to straight CVCs.

Methods and Results:
In this retrospective, observational cohort study, adult patients in whom a CVC for haemodialysis was inserted between 2012-2016 were included. The primary endpoint was a combined endpoint consisting of the first occurrence of either an infection or catheter malfunction. The secondary endpoint was a combined endpoint of the removal of the CVC

due to either an infection or catheter malfunction. Using multivariable analysis, cause-specific hazard ratios for endpoints were calculated for TCVC versus precurved NTCVC, TCVC versus NTCVC and precurved versus straight NTCVC. A total of 1603 patients were included. No difference in reaching the primary endpoint was seen between TCVCs, compared to precurved NTCVCs (HR 0.91, 95% CI 0.70-1.19, *P*=0.48). TCVCs were removed less often, compared to precurved NTCVCs (HR 0.65, 95% CI 0.46-0.93, *P*=0.02). A trend was seen for less infections and catheter malfunctions when precurved jugular NTCVCs were compared to straight NTCVCs (HR 0.60, 95% CI 0.24–1.50, *P*=0.28), and were removed less often (HR 0.41, 95% CI 0.18–0.93, *P*=0.03).

Conclusion and Discussion:
Conclusions: TCVC and precurved NTCVCs showed no difference in reaching the combined endpoint of catheter-related infections and catheter malfunction. TCVCs get removed less often because of infection/malfunction than precurved NTCVCs.

Late-breaking clinical trials – 12 April 2019

Vonapanitase to increase fistula use for hemodialysis and secondary patency - pivotal trial results

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[7]Wake Forest School of Medicine, Winston-salem, United States of America
[8]Loma Linda University School of Medicine, Loma linda, United States of America
[9]University of California Irvine Medical Center, Orange, United States of America
[10]Arizona Kidney Disease and Hypertension, Phoenix, United States of America

Introduction:
Vonapanitase, investigational recombinant human chymotrypsin-like elastase family member 1 (CELA1), is applied for 10 minutes to the external surface of a fistula immediately after surgical creation. In previous clinical trials, vonapanitase was associated with increased fistula use for hemodialysis and secondary patency (Bleyer 2018).

Methods and Results:
The PATENCY-2 trial, a "Multicenter, Double-Blind, Placebo-controlled Study of Vonapanitase (PRT-201) Administered Immediately after Radiocephalic Fistula Creation in Patients with Chronic Kidney Disease" is a being conducted at 39 centers in the US and Canada to assess the safety and efficacy of vonapanitase (NCT02414841). Key inclusion criteria were age ≥18, diagnosis of chronic kidney disease, and planned creation of a radiocephalic fistula. A total of 613 patients enrolled and 603 were treated with vonapanitase or placebo in a 2:1 randomization stratified by hemodialysis status. Patients are followed for 12 months. The co-primary endpoints are use for hemodialysis (≥90 days of use or ≥30 days of use and in use at the final study visit) and secondary patency (survival of the fistula without abandonment). Additional endpoints are unassisted fistula use, primary patency, maturation by ultrasound, and rate of procedures to the fistula. Patients whose fistulas are not abandoned enter a registry for an additional 2 years of follow-up. The last patient enrolled was treated in March 2017. Baseline characteristics were: white/black/other 68%, 24%, 8%; male/female 76%, 24%; age 57±13 years; kidney disease DM/HTN/other 46%, 24%, 30%; and on hemodialysis yes/no 45%, 55%.

Conclusion and Discussion:
Final study results will be presented at the meeting.

Preoperative patient-specific flow predictions to improve hemodialysis arteriovenous fistula maturation (shunt simulation study): a randomized controlled trial

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Introduction:
An arteriovenous fistula (AVF) needs to mature before it becomes usable for hemodialysis. AVF maturation importantly depends on the postoperative flow increase. Unfortunately, 20–40% of created AVFs fail to mature (FTM). A patient-specific computational model that predicts immediate postoperative flow was previously developed, and it was hypothesized that having this additional information available during surgical planning can reduce FTM rates.

Methods and Results:
A multicenter randomized controlled trial in nine Dutch hospitals was conducted in which (pre)hemodialysis patients that were referred for AVF creation were recruited. Patients were randomly assigned (1:1) for the control or simulation group. Both groups underwent an extensive work-up, including duplex ultrasonography (DUS) examination. In the simulation group the data from the DUS examination were used for model simulations and based on the immediate postoperative flow prediction the ideal AVF configuration was recommended. Primary endpoint was FTM defined as an AVF flow <500 ml/min and/or diameter <4mm at six weeks postoperatively. Secondary endpoint was model performance (i.e. comparisons measured and predicted flows and multivariate regression analysis for maturation likelihood with accompanying area undee the receiver operator characteristic curve [AUC]) 236 patients were randomly assigned (116 in the control group and 120 in the simulation group), of which 205 (100 respectively 105) were analyzed for the primary endpoint. There was no difference in FTM rates between both groups (i.e. 29 respectively 32%). Immediate postoperative flow prediction had an OR of 1.15 (1.06–1.26; p<0.001) per 100 mL/min for maturation, and the accompanying AUC was 0.67 (0.59–0.75).

Conclusion and Discussion:
Patient-specific immediate postoperative flow predictions are predictive for AVF maturation. Having this additional information available during surgical planning, however, does not (yet) result in reduced FTM rates.

The lutonix® global av registry. final 6-month results and subgroup analysis

Panagiotis Kitrou

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Introduction:
The Lutonix® Global AV Registry is a multi-center, single-arm registry investigating the real-world clinical use, safety and efficacy of the Lutonix Drug Coated Balloon PTA Catheter for the treatment of dysfunctional arterio-venous fistulas (AVF) and grafts (AVG).

Methods and Results:
Registry enrolled 324 subjects of a heterogeneous patient population from 25 international clinical sites, in real world clinical practice. Target lesions included restenotic lesions, central venous stenosis, in-stent restenosis in both AVGs and AVFs. Patients were treated

per standard of care when using the Lutonix® DCB while procedure was performed as per instructions for use. Follow-up visits, through 12 months, were also done per standard of care. Primary endpoints are: Safety: Freedom from any serious adverse event(s) involving the AV access circuit through 30 days. Efficacy*:* Target Lesion Primary Patency (TLPP) through 6 months.
Final 6-month and interim 12-month results will be presented. Subgroup results will also be presented. Endpoint data for this treatment group will be available in January 2019.

Conclusion and Discussion:
The Lutonix Global AV registry is the first large multi-center real-world registry of DCB in dysfunctional grafts and fistulae. Final 6-month results, interim 12-month results and interim sub-group analysis including central veins, in-stent restenosis, and AVGs will also be presented to determine treatment effect.

Isometric exercise and arteriovenous fistula for haemodialysis: the impact on maturation process

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Introduction:
Arteriovenous fistula (AVF) is the gold standard vascular access (VA) for end-stage chronic kidney disease(CKD).Postoperative exercises may help to improve maturation. Nevertheless, scarce scientific evidence has been reported about their utility. To assess the effect of a postoperative isometric exercises program on native VA maturation in 5-5D CKD

Methods and Results:
24months prospective study.Patients were randomized to isometric exercise group(EG) or control group(CG)postoperatively.Isometric exercises protocolled program was performed in EG. CO received usual care. Muscle strength (handgrip(HG)), Doppler ultrasound(DUS)measurements; outflow vein (OV)diameter and humeral artery blood flow rate(BFR), clinical and DUS maturation and medical or surgical VA complications were assessed at 4 and 8 weeks postoperatively.
60patients.30EG,30CO.71,7%men.68,6±13,1years.60%Radiocephalic AVF. Both groups were similar at baseline.A significant increase in HG was observed only in EG at the end of study(20,7±8,1vs25,1±10,3Kg,p=0,001).DUS measurements statistically increased for both groups(OV diameter: EG3,2 ± 0.8vs.6.2 ± 1.5 mm; CG 2.9 ± 0.7 vs. 5.6 ± 6.2 mm; humeral artery BFR:EG 142.7± 35.2vs.1536.2 ± 679.2 ml/min; CG 134.6± 36,6vs.1170.4 ± 537.1ml/min) at the end of study.EG group obtained highest clinical maturation at 4(CG 33.3%vsEG 70%;p=0,009) and 8 weeks(CG33% vs EG76,7%;p=0,002). Similarly, DUS maturation was better in EG at 4(CG40%vsEG80%;p=0,003)and 8weeks respectively(CG43.3%vsEG83.3%;p=0,003).These results were also observed in EG both distal and proximal territories for all these periods.There were not differences in VA complications

Conclusion and Discussion:
The isometric exercises protocolled program improve clinical and DUS maturation in our patients.This effectiveness was observed in both distal and proximal territories.Further studies are required to support the benefits of postoperative isometric exercises in VA maturation process

Liposomal prednisolone to improve radiocephalic fistula maturation: results from the lipmat study - a randomized controlled trial

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Introduction:
Non-maturation is an important limitation of radiocephalic arteriovenous fistulas (RCAVF) that occurs in 30-50% of patients. Inflammation is proposed as a limiting factor in AVF maturation. Liposomal prednisolone (LP) is a potent inhibitor of inflammation, which after intravenous infusion has a long circulation half-life and localizes at sites of inflammation by passing leaky endothelium. In a murine model, intravenously administered liposomal prednisolone localized in the inflamed AVF wall. Compared to placebo, treated mice had significantly improved AVF diameter and luminal area. The LIPMAT study investigated if liposomal prednisolone improves RCAVF maturation in end-stage renal disease patients.

Methods and Results:
The LIPMAT study was an investigator-initiated, multicenter, double-blinded, placebo-controlled randomized controlled trial with 1:1 randomization to liposomal prednisolone or placebo. Subjects (n=29, mean age 67 years) were treated by intravenous infusion at 1 and 15 days after RCAVF creation. The primary outcome was the juxta-anastomotic cephalic vein diameter at 6 weeks after surgery. The diameter at 3 months and AVF flow at 6 weeks and 3 months were secondary outcomes. Sixteen subjects received liposomal prednisolone and 13 subjects received placebo.
We observed no significant differences for the primary outcome, the cephalic diameter at 6 weeks (placebo 3.9 mm, LP 3.7mm, p=0.88) or secondary outcome, the AVF flow at 6 weeks (placebo 456 ml/min, LP 406 ml/min, p=0.81). No significant differences were observed at the 3-month time-point. The safety profile was favorable in this population.

Conclusion and Discussion:
Liposomal prednisolone treatment is safe in dialysis patients but does not improve RCAVF maturation in this randomized controlled trial.

Av fistula outcomes using an intra-operative perivascular sirolimus eluting collagen implant

Sriram Iyer

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Introduction:
In the United States, 39% of arteriovenous fistulae (AVF) fail to mature; for the remainder, median time to "first use" is 108 days. On average, only 25% of AVF are functional by day 90 and 50% at later time points (Range: 38%-65%).
Uncontrolled cellular proliferation causing a flow limiting juxta-anastomotic segment (JAS) stenosis is an important cause of AVF maturation failure. Sirolimus delivered locally to the vascular wall is a clinically proven anti-proliferative. Vascular Therapies (Cresskill, NJ, USA) is studying AVF outcomes following intra-operative, perivascular delivery of sirolimus using the Sirolimus-eluting Collagen Implant (SeCI). This report presents outcomes from a single-arm Phase 2 trial and the open-label (OL) cohort from an ongoing US Phase 3 randomized trial (NCT02513303).

Methods and Results:
Following successful AVF creation, SeCI dosage units were implanted perivascularly around JAS and anastomosis in 30 Phase 2 and 26 OL Phase 3 subjects (OL = first subject enrolled by a participating surgeon; definitely receives the SeCI). Maturation success was similar for both groups (87%); overall 69% of AVF were used on or before day 90. Approximately 75% of the Phase 2 subjects had functionally useful AV fistulae at 6 and 12 months (treatment durability). Key metrics are tabulated.

Conclusion and Discussion:
Based on actual AVF cannulation data (i.e. no ultrasound surrogates), in comparison to historical, standard of care controls, sirolimus treated AVF signal a shortened time to first clinical use and a clinically meaningful improvement in suitability for dialysis that appears durable. Enrollment is continuing in the randomized US Phase 3 trial.

Picture 1: Key Metrics

Phase N	Mean Age, y (range)	Male	Diabetes	Dialysis Dependent	RCF	Early Thrombosis[a]	TTFD[b] (Median Days)[c]	Fistula Maturation Success (%)
2 30	51 (25-77)	60%	20%	100%	73%	13%	42	87% (26/30)
3 (OL) 26	61.4 (30-91)	77%	69%	96%	58%	12.5%	76	87.5% (21/24)[d]

a. Within 6 weeks of surgery
b. TTFD = Time to first of 3 consecutive dialysis sessions using the index fistula with 2 needles
c. Excludes AVF that thrombosed early
d. Currently, 24/26 patients are eligible for analysis

Endo AVF and last resort options – 12 April 2019

The ellipsys endovascular avf creation

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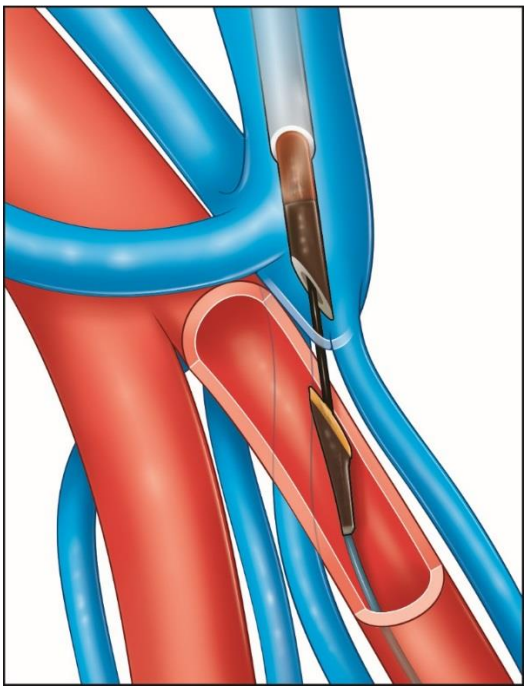
Introduction:
The Ellipsys Vascular Access is a system for percutaneous creation of arteriovenous fistula (pAVF), using tissue fusion to create an anastomosis between the proximal radial artery (PRA) and the deep communicating vein (DCV) in the proximal forearm. The procedure is completed with an immediate angioplasty of the anastomosis. We herein report our extended experience and follow-up.

Methods and Results:
We retrospectively reviewed all patients who underwent a PRA-pAVF procedure, between May 2017 and December 2018. Data collected included functional patency rates, flow rates, time to initial cannulation, complications, demographic data and other information. 175 patients are included in this study. Mean age was 62 years and 63% were male. A PRA-pAVF was created in 173 patients yielding a technical success rate of 99%. Primary and cumulative patency rates were 71 and 97%, respectively. Mean brachial artery flow rates at the latest follow up (mean: 8.5 months, range: 1-19 months) was 860 ml/min (range = 645-1228 ml/min). Functional dialysis access was established within 4.6 weeks for all patients with a patent access. No major complications were encountered related to the pAVFs.

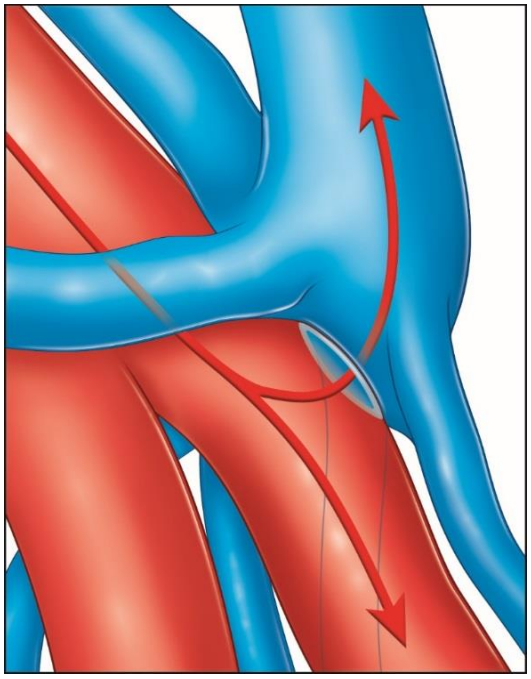
Conclusion and Discussion:
We found percutaneous arteriovenous fistula creation using the proximal radial artery for inflow offers prompt maturation times, excellent technical success and patency rates with a very high safety profile. Surgical procedures and associated wound healing, inflammation and discomfort were avoided.

Picture 1:



Ellipsys catheter positioned open before activation

Picture 2:



pAVF after creation

Current status of last resort haemodialysis access

António Norton de Matos

Vasular Access Center - GEV, Porto, Portugal

Introduction:
The capacity of the haemodialysis treatment team: nephrologists and nurses to identify the malfunction and the complications of vascular access and refer the patient to the surgical team in due time is very important in that process.

Methods and Results:
The technical advances on the field of surgical and endovascular procedures of creation and maintenance of vascular access for haemodialysis are continuously evolving and progressing. After exhaustion of superficial veins, deep veins are a rich source of opportunities for an autologous access. Basilic, brachial and femoral vein transpositions are the routine procedures in our daily practice.
In order to substitute the damaged or unsuitable conduits, translocations of segments of healthy veins from different areas of an arm or even from one limb to the other, can be successfully engaged with long-lasting and very satisfactory results.
The lack of outflow drainage of radio cephalic fistulas also has various surgical solutions which we are applying with great success. Also, the frequent stenosis of the cephalic arch in a brachial cephalic fistula that has been routinely dealt with endovascular balloon dilatation has an efficient surgical alternative when these endovascular procedures become too frequent (more than four a year) and unsatisfactory in their result: the technically demanding but very effective cephalic arch turn down to the axillary.

Conclusion and Discussion:
Recently, we have given one more step in extending the duration of the brachial cephalic fistula performing the rotation of the external jugular vein to the cephalic

Risk of iodinated contrast use in predialysis patients undergoing percutaneous endovascular arteriovenous fistula formation

Aurang Zaib Khawaja, Karen Tullett, Nicholas Inston, Robert Jones

Queen elisabeth hospital, Birmiingham, United Kingdom

Introduction:
Additional consideration needs to be given to predialysis chronic kidney disease stage patients(CKD4-5) undergoing angiography with iodinated-contrast due to risk of contrast-induced nephropathy(CIN)[1]. Current evidence &guidelines advocate isotonic volume expansion around time of exposure[2]. Percutaneous endovascular arteriovenous fistula (endoAVF) formation using the WavelinQ™ system(Becton Dickinson Medical,NJ,US) requires contrast for guidance and can potentially expose this cohort to CIN.

Methods and Results:
Since December 2016 prospectively collated observational data was collated on 31 patients who underwent endoAVF formation. Bassline demographics, procedural data, baseline renal function(eGFR, serum creatinine, rate of eGFR decline per month over preceding 12 months &KFRE[3] risk of progression to end stage) was compared to post-procedure. All patients received peri-procedural oral &intravenous hydration only. Non-ionic, low osmolar, iodinated contrast(Visipaque320,GE Healthcare,IL,US) was used &diluted at discretion of operator. Median age was 65 years(range 22-79,IQR 7),female:male ratio 1:7.5 &median contrast volume 50 ml(IQR 20). Median pre-procedural renal function: eGFR 12(range 7-16,IQR 2),creatinine 424(range 296-771,IQR 172),median rate of decline eGFR0.67/month and 2 year &5 year risk of progression was 62.5%(IQR 18) and 97.5%(IQR 5). Post-procedural results at one month were: eGFR 12(range 7-16, IQR 3),creatinine 465(range 315-778, IQR 136),rate of decline eGFR 1/month while KFRE was 68%(IQR 10) &99%(IQR 2) at 5 years. There was no significant difference in the pre and post procedural eGFR or in monthly rate of decline(Wilcoxon Signed-Rank p=>0.05).

Conclusion and Discussion:
Percutaneous endovascular AVF formation using iodinated contrast and peri-procedural hydration in predialysis patients is safe and does not significantly increase risk of progression or rate of decline towards end stage renal failure.

Single centre analysis of arteriovenous grafts in the lower limb

Tarique Sabah, Micaela Antonius, Usman Khalid, Elaine Saunders, Sarah Mcmillan, Mohammed Adel Ilham, Michael Stephens, Laszlo Szano

University Hospital of Wales, Cardiff, United Kingdom

Introduction:
The aim of this study was to analyse the outcomes of AV grafts of the lower limb in a series of complex vascular access patients at a Tertiary UK Hospital.

Methods and Results:
Data on AV grafts in haemodialysis patients was collected and analysed retrospectively at the University Hospital of Wales, Cardiff. Any AV grafts inserted into the lower limb between November 2010 and April 2018 were included. Demographics, primary patency rates, secondary patency rates and complications were analysed.
A total of 14 patients underwent AV graft insertion procedures of the lower limb. The Median age was 54 (33 to 89) years, of which 5 (36 %) were male. Of the cohort: 5 (36%) were Diabetic, 2 (14%) had Peripheral Vascular Disease and 5 (36%) had Ischaemic Heart Disease. Five patients required radiological Thrombectomy. One patient received two thrombectomies and one fistuloplasty. There was one recorded incidence of infection, the graft did not require removal. The median primary patency rate was 191 +/- 297 days (95% CI 0 - 774). The median secondary patency rate was 1227 +/- 786 days (95% CI 0 - 2768).

Conclusion and Discussion:
In our centre lower limb grafts provided long patency, low infection rate and less intervention was needed to keep them patent. These promising results suggest that lower limb AV grafts can provide equal or superior outcomes compared to upper limb grafts and lower limb is a safe alternative to upper limbs for graft insertion and should be used more often.

Screening and suitability for the endovascular creation of an ulno-ulnar arteriovenous fistula

Aurang Zaib Khawaja, Karen Tullett, Robert Jones, Nicholas Inston

Queen elisabeth hospital, Birmiingham, United Kingdom

Introduction:
Presence of suitable anatomy can dictate whether patients can undergo endovascular creation of arteriovenous fistula (AVF) for dialysis access. As these have a shared outflow, appropriate preoperative assessment can aide in identifying potential flow patterns and multiple target cannulation veins. We report our experience of screening for this as part on an ongoing clinical trial using the WavelinQ endoAVF system (BD Medical,NJ).

Methods and Results:
All patients referred for dialysis access formation underwent full ultrasound mapping by a single operator to assess presence of a median cephalic vein (MCV), its feeding perforator and their communication with deep and superficial systems. Pre and postoperative assessment of brachial artery and venous outflow configuration with flow volume was also carried out. Over a 16 month period 189 patients were referred for their first assessment and 159(84%) anatomically suitable and had trial inclusion/exclusion applied. At 1 month mean brachial artery flow was 889mls/min (95%CI 722-1056). Cephalic vein diameter increased from a mean 4.9mm (+/-2.4 SD) to 7(+/-1.1 SD p=0.02) with flow volume of 355mls/min (95%CI 226-484) while basilic increased from 3.8(+/-1.3SD) to 5.4(+/-2.1SD), flow volume of 284mls/min (95%CI 78-490). Patients were achieving mean pump speeds of 370(95%CI 347-397), 6 using cephalic vein for cannulation and 4 using MCV, basilic and cephalic. Two flow diversion procedures were required post creation.

Conclusion and Discussion:
In keeping with previous literature, endo-AVFs have acceptable outcomes. Ultrasound assessment is essential for mapping of the shared flow fistula and can aide in identifying multiple target cannulation sites.

Management of VA related complications – 12 April 2019

Management of cephalic arch obstruction

Takashi Sato[1], Kanyu Miyamoto[2], Naofumi Miwa[3], Hiroshi Sakurai[3], Takeshi Onogi[3], Masato Tsuboi[3]

[1]Kaikoukai healthcare corporation Meiko kyoritsu clinic, Nagoya, Japan
[2]Kizawa Memorial Hospital, Gifu, Japan
[3]Nagoya Kyoritsu Hospital, Vascular Access Treatment Center, Nagoya, Japan

Introduction:
Vascular access (VA) is required for both hemodialysis maintenance and improved dialysis patient prognosis. In Japan, more than 97% of approximately 330,000 chronic dialysis patients in Japan are managed by hemodialysis or hemodiafiltration, VA management is

essential. Although the cephalic arch is prone to stenosis, frequently leading to obstruction, effective treatments have not been identified. Moreover, multiple interventions are required to maintain VA due to vulnerability to restenosis. We analyzed our treatment program to identify VA access problems.

Methods and Results:
This retrospective observational analysis of 2,313 cases of access failure during 2013-2016 found that 4.9% (113/2,313) had cephalic arch stenosis (CAS); of these, 23% (26/113) had cephalic arch obstruction (CAO). Endovascular therapy (EVT) and surgical therapy (ST) for CAO had a 100% technical success rate, with 45.5% of ST cases requiring a change of access route. Average patency durations with EVT and ST were 140.03 and 119.3 days, respectively, without a significant difference (P=0.65).

Conclusion and Discussion:
There is no consensus on optimal treatment for thrombotic occlusion (surgical thrombectomy, percutaneous thrombolysis or percutaneous aspiration thrombectomy) in Japan. Controlling CAS is essential for CAO prevention. CAO is treated with EVT or ST. Since ST sometimes requires a change of access route, EVT is preferred according to culprit lesion location. As combined use of thrombus aspiration and thrombolysis/angioplasty using Multi Flash (Infusion PTA balloon catheter; JMS Co. LTD) showed relatively good therapeutic effect, we will describe our methodology.

Surgical management of high-flow access

Hideki Kawanishi, Sadanori Shintaku

Tsuchiya General Hospital, Hiroshima, Japan

Introduction:
The complications of high-flow access are the induction of heart failure and the steel syndrome- Distal hypoperfusion ischemic syndrome (DHIS)- of the whole/peripheral blood vessel. The definition of high-flow access considering heart failure is VA-flow(Qa)> 2.0 L / min or Qa / CO> 20-30-35%. However, in cases with some cardiac disorder, symptoms of heart failure occur even at Qa lower than this. Therefore, cardiac function (by doppler ultrasound, DUS) of dialysis patients should be evaluated before VA creation and periodically after dialysis initiation. Brachial artery flow volume using DUS is useful for the quantitative evaluation of VA-flow.

Methods and Results:
Two factors must be considered for surgical interventions.
In the cases of high flow VA/ischemic syndrome without stenosis of feeding artery, the surgical flow redaction of banding/narrowing/reduction of anastomosis diameter, graft interproton, revision using distal inflow (RUDI), distal revascularization with interval ligation (DRIL) and prefinalization of artery flow (PAF, PAVA) are selected. Miller banding procedure used by intervention technic is effective for simple flow redaction.
In the cases of ischemic syndrome with proximal stenosis of feeding artery, the final option of occlusion VA and the selections of superficialization of artery, CVC, A-A Jump Graft, and direct puncture of artery/vein are considered.

Conclusion and Discussion:
The important in VA management is evaluated the quantitative functional of VA and maintained the optimum state.

Reconstruction of giant aneurysms: the multicenter experience

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[1]Moscow Regional Research and Clinical Institute, Moscow, Russian Federation
[2]Hospital for war veterans ? 2, Moscow, Russian Federation

Introduction:
Aneurysm of the fistula vein is one of the frequent complications and significantly increases the risk of thrombosis and loss of vascular access. We evaluated the results of preventive reconstruction of the fistula vein aneurysms.

Methods and Results:
128 patients were included in the study. In 87 of them preventive correction was performed, in 41 patients the correction was not performed for various reasons. The follow-up period was 4.9 [IQR 3.1; 5.7] years. In 29 patients the aneurysm was combined with proximal vein stenosis, 31 patients had high-flow AVF (Qa>1.5 l or cardiopulmonary recirculation > 25%). All patients of the study group underwent reconstruction: aneurysm resection, vein modeling on a silicon tube. After that, the vein was placed in a new subcutaneous canal. If required, we performed the stenosis plasty using the wall of the aneurysm. If necessary, we reduced the blood flow through the AVF to optimal values. The two-year survival rate in the study group was 93% [95% CI 85%; 97%], in the control group – 71% [95% CI 56%; 67%], log-rank test p=0.01. Reconstructions were performed in such a way as to preserve the segment for punctures. The incidence of central venous catheter implantation in study group was 0.41 per 100 patient-months, in control group – 1.162 per 100 patient-months, incidence rate ratio 0.353 [95%CI 0.191; 0.639], p=0.0006.

Conclusion and Discussion:
Preventive reconstruction is a necessary procedure in case of fistula vein aneurysms. Aneurysms are often accompanied by stenosis or high-flow AVF. An comprehensive approach is needed.

Picture 1:

Long-term outcomes of the 'primary extension technique' for the prevention of dialysis access steal syndrome (dass)

Haytham al-Khaffaf, Ravi Goel, Natasha Charlwood

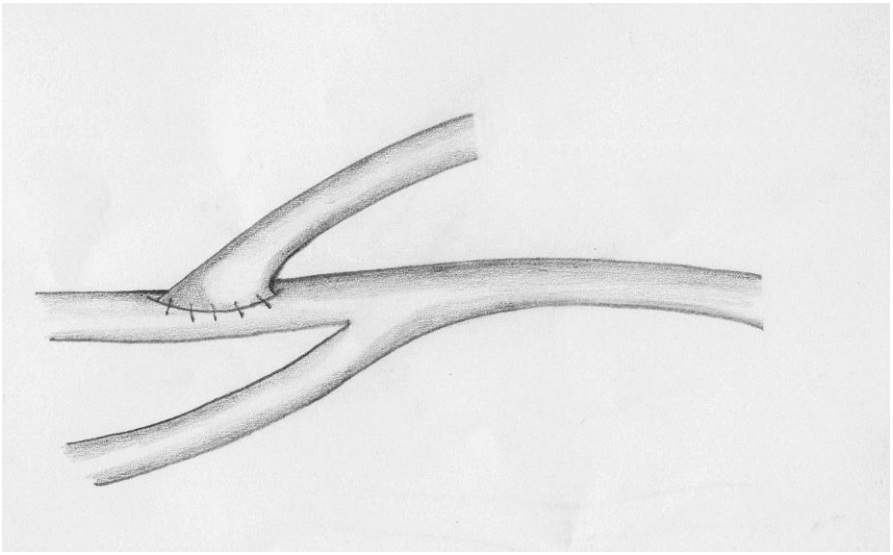
Cumbria and Lancashire Vascular and Endovascular Centre, Blackburn, United Kingdom

Introduction:
To report long term results of our experience with the 'Primary Extension Technique' (PET) fistula formation for the prevention of dialysis associated steel syndrome (DASS) by reporting the use and follow-up of this technique over 16 years.

Methods and Results:
All diabetic patients undergoing upper arm fistula formation using the PET 2001- 2017 at a single centre. Patients were evaluated for patency, adequacy of needling, and steal symptoms. In PET the fistula is formed by anastomosing the median vein with the proximal radial or ulnar artery just below the brachial artery bifurcation. This preserves part of the blood supply to the hand, and prevents DASS.
64 fistulas in 64 patients. Follow-up 23- 84 months. All patients were diabetic. 9 patients (14%) developed cephalic vein thrombosis but the patent basilic vein was successfully transposed to the existing fistula. In 8 patients (12.5%) the cephalic vein was too deep and required superficialisation. In 3 patients the flow was preferentially into the basilic vein with poor maturation of cephalic vein due to stenosis. 1 patient developed DASS due to technical error. Symptoms improved with revision of the fistula.

Conclusion and Discussion:
Our 13 year experience demonstrates that the PET is a safe and effective procedure for fistula formation with patency rates comparable to brachio-cephalic and brachio-basilic fistulas as well as effective prevention of DASS. It also has the added benefit of maturation of both the basilic and cephalic veins.

Picture 1:



Principle of the PET technique

Outcomes of percutaneous peritoneal catheters: elective versus urgent start dialysis

Ammar Almehmi[1], Nathan Ertel, Rachel Oser, Andrew Gunn, Souheil Saddekni, Ahmed Kamel

[1]University of Alabama at Birmingham, Birmingham, United States of America

Introduction:
Percutaneous insertion of peritoneal dialysis catheter (PDC) using flouroscopic and ultrasound guidance has been utilized for urgent and elective-start peritoneal dialysis (PD). However, limited data are available that compare the PDC outcomes between urgent and elective PD. Hence, the objective of this study was to compare the outcomes of PDC used for urgent versus elective-start peritoneal dialysis.

Methods and Results:
We retrospectively reviewed the medical records of patients who had peritoneal dialysis catheter placed between 2005 and 2015. The cohort was divided into two groups: elective start PD [ESPD] and urgent start PD [USPD]. The primary endpoint was complication-free catheter survival at 365 days. The study included 50 patients: ESPD (n=32) and USPD (n=18); 21 females (42%); median age was 56.4years. There was no significant difference in the baseline characteristics between the two groups. The 90 and 365 days complication-free catheter survival were not different between the two groups (66% and 53% for ESPD versus 61% and 39% for USPD, p=0.74, and p=0.33, respectively). Catheter leak was significantly lower in ESPD (3.3%) compared to USPD (22%) (p=0.05). The overall catheter survival at 365 days was significantly higher for ESPD compared to USPD (64% and 33%, respectively; p=0.04), with the median days until removal being 532 and 168 days (p= 0.07), respectively.

Conclusion and Discussion:
Apart from catheter leak, there was no significant difference in the complication-free PDC survival placed for elective versus urgent-start PD. The 365-day overall catheter survival was significantly better for elective PDC and catheter removals occurred earlier in the urgent-start PDC.

Percutaneous image-guided peritoneal dialysis catheter placement by interventional radiologist - our units experience

Debbie Knagge, Kerrie Wheeler, Leone Wood, Christine King, Albert Goh

Royal North Shore Hospital, Sydney, Australia

Introduction:
Insertion techniques for peritoneal dialysis (PD) catheters include an open surgical approach, laparoscopic and percutaneous. Our aim was to evaluate our experience following the introduction of the percutaneous technique including the use of urgent and rapid start PD. The primary outcomes measured include successful initiation of PD and complications leading to loss of catheter.

Methods and Results:
Percutaneous PD catheter insertion began in September 2017 by interventional radiologist (IR) under full anaesthetic. Patient selection for this technique included non-contrast abdominal CT. Anaesthetic review and abdominal marking for PD catheter by PD nursing staff is routine for both techniques. Procedure dates are determined by urgency and arranged by the renal access coordinator.
Fifty peritoneal dialysis catheters were captured in the renal access database for 48

patients. Of these 20 were placed in radiology by an IR and 30 in theatre by upper gastrointestinal surgeons (UGI). Both private and public health services are used with most patients treated as day of surgery admissions (DOSA).
Five catheters have been used for urgent start peritoneal dialysis (UGI -3, IR - 2) and 3 were used for rapid start dialysis (UGI -1, IR - 2). Complications for 7 IR placed catheters are discussed with one patient requiring a haemodialysis catheter and peritoneal dialysis abandoned.

Conclusion and Discussion:
Peritoneal dialysis has several advantages over haemodialysis including its simplicity of use, lower mortality in the first year after starting peritoneal dialysis and maintaining residual renal function. While our IR PD catheter insertion program is still young, there have been improvements with experience.

Devices to promote dialysis access function - 12 April 2019

A computational fluid dynamics (cfd) approach to optimize autogenous arterial-venous access (avf) anastomotic hemodynamics with an external support device (vasq™)

Dirk Hentschel[1], Yair Bergner[2]

[1]C/o Laminate Medical Technologies, Tel-aviv, Israel
[2]Laminate Medical Technologies, Tel aviv, Israel

Introduction:
The complex AVF geometry induces hemodynamic changes in the juxta-anastomotic region (JAR). Multidirectional flow and oscillating wall shear stress (WSS) along the venous wall invoke inward remodeling through development of neointimal hyperplasia. A CFD model was utilized to study the effect of geometric parameters on hemodynamic profiles to inform optimal design of an external support device.

Methods and Results:
A fully developed 3D end-to-side AVF CFD model was evaluated through a range of artery and vein diameters (2.9-8mm) and flow volumes (40–1100 ml/min) assuming Newtonian flow. 2D velocity streamline patterns were analyzed. Geometric parameters controllable by an external scaffold were optimized for minimizing multidirectional flow along the venous wall (A1) and maximizing its distance from anastomosis (P1) to achieve a small A1/P1 ratio (λ) associated with a desirable flow pattern. Parameters included anastomotic angle (20°-60°), Proximal Vein (PV)/Distal Vein (DV) diameter ratio (conical shape) (1.2-2) and conical segment length (CSL) (15-25mm). Each parameter was analyzed by fixing all model values excluding the tested one. The desirable flow patterns were observed for anastomotic angle between 40°-50° (λ=0.92±0.2) compared to 20°-30° (λ=2.3±1.7) and 60° (λ=1.74±1.3). Optimal conical ratio PV/DV was 1.5 (λ=0.23±0.07) compared to higher or lower ratios. CSL of 25mm (λ=0.2±0.8) was better than 20mm (λ=0.27±0.05) and 15mm (λ=0.35±0.06).

Conclusion and Discussion:
Minimized multidirectional flow more distant from the anastomosis in the JAR were observed for anastomotic angle between 40°-50°, conical vein shape with 1.5 PV/DV and CSL of 25mm in multiple configurations. These findings were the basis for designing the VasQ™ external support device.

Picture 1:

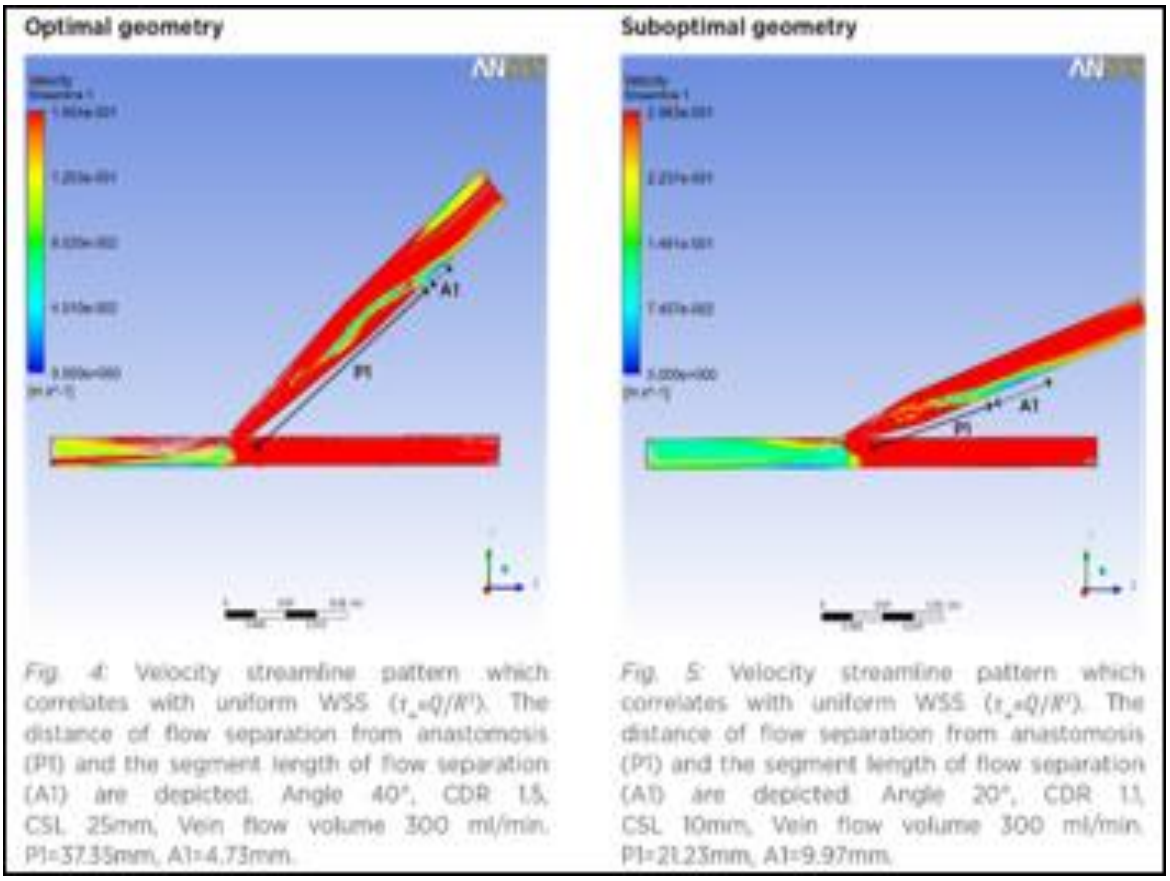


Fig. 4: Velocity streamline pattern which correlates with uniform WSS ($\tau_w = Q/R^3$). The distance of flow separation from anastomosis (P1) and the segment length of flow separation (A1) are depicted. Angle 40°, CDR 1:5, CSL 25mm, Vein flow volume 300 ml/min. P1=37.35mm, A1=4.73mm.

Fig. 5: Velocity streamline pattern which correlates with uniform WSS ($\tau_w = Q/R^3$). The distance of flow separation from anastomosis (P1) and the segment length of flow separation (A1) are depicted. Angle 20°, CDR 1:1, CSL 10mm, Vein flow volume 300 ml/min. P1=21.23mm, A1=9.97mm.

Velocity streamline patterns optimal vs suboptimal anastomotic geometry

Long-term outcomes of flixene and standard eptfe arteriovenous grafts for hemodialysis

Letty van Vliet, Niek Zonnebeld, Magda van Loon, Jan Tordoir, Maarten Snoeijs

Maastricht UMC+, Maastricht, Netherlands

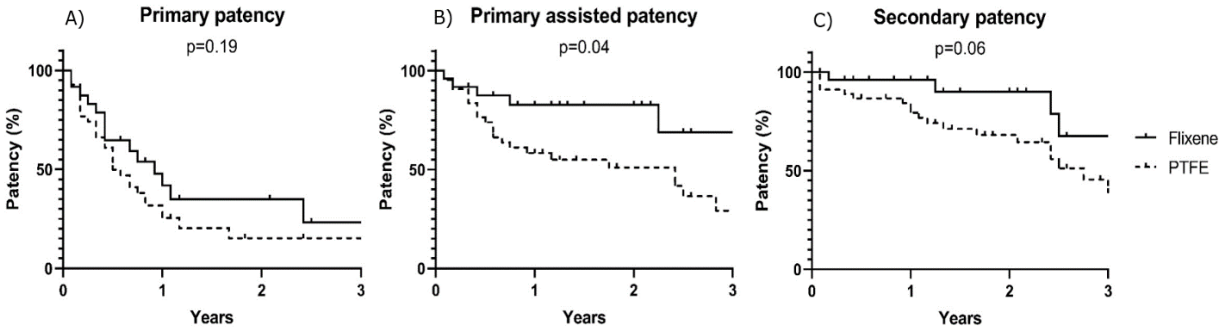
Introduction:
The Flixene arteriovenous graft has been developed to allow cannulation for hemodialysis treatment within 24 to 72 hours after implantation[1]. Little is known about the long-term outcome of these grafts[2]. Therefore, we compared the outcomes of Flixene early cannulation grafts to standard expanded polytetrafluoroethylene (ePTFE) grafts.

Methods and Results:
An observational cohort study was performed on patients receiving arteriovenous grafts between January 2007 and December 2016 at Maastricht University Medical Center. All patients on maintenance hemodialysis treatment in our center were followed up and included. Patency rates, time to first cannulation, and time to catheter removal were evaluated using Kaplan-Meier survival analysis with log-rank tests. Some 27 Flixene grafts and 54 standard ePTFE grafts were implanted. Baseline characteristics of the study groups were similar, except that all patients receiving Flixene grafts were already on hemodialysis treatment compared to 82% of patients receiving standard ePTFE grafts (P=0.03). As expected, patients receiving Flixene grafts were cannulated earlier and had earlier catheter removal compared to standard ePTFE grafts (P<0.01). At 36 months, primary patency was 21% for Flixene grafts and 13% for standard ePTFE grafts (P=0.19); primary assisted patency was 64% and 27% (P=0.04), and secondary patency was 65% and 42% (P=0.06), respectively.

Conclusion and Discussion:
Our findings confirm the results of previous studies showing short-term advantages of the Flixene arteriovenous graft in allowing safe early cannulation and fast catheter removal. In the long term, our study now shows that Flixene grafts are durable and may have better patency than standard ePTFE grafts.

Picture 1:

FIGURE
Kaplan-Meier survival curves of primary (A), primary assisted (B), and secondary patency (C).



Kaplan-Meier survival curves of primary (A), primary assisted (B), and secondary patency (C).

Results from a single center experience with the vasq™ device for radiocephalic arteriovenous fistulae

Robert Shahverdyan

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Introduction:
The Radiocephalic arterio-venous fistulae (RCAVF), recommended as the first choice for hemodialysis (HD) access, suffer from high incidence of primary failure and reduced primary and cumulative patency. An external support device (VasQ™, Laminate medical), which optimizes juxta-anastomotic geometry and hemodynamics, demonstrated improved outcomes in Brachiocephalic AV fistulae. We report for the first time our single-center results in RCAVF created with VasQ™ Forearm models.

Methods and Results:
15 RCAVF were created with VasQ™ Devvice between June and November 2018 (no exclusions). Patients' charts were reviewed retrospectively for AVF outcomes (follow-up time 19-162 days, median 100 days). 100% (15/15) primary patency was achieved, of which 86.6% (13/15) matured. 2-needle cannulation was successful in 87.5% (7/8) of patients requiring HD with 35 ± 6.86 days mean time to first-time cannulation.

Conclusion and Discussion:
High incidence of early failures for RCAVF are reported to range between 5%-46% (mean 25%), which poses a major challenge in achieving a functioning distal AVF. In 15 RCAVF created with VasQ™ we observed no early failures, perfect patency and satisfactory short postoperative time-period to a successful first cannulation in patients requiring HD.

Picture 1:

Distal RCAVF created using VasQ-Device

A new technique to repair high flow arteriovenous fistula using a novel external support device

Vladimir Matoussevitch[1], Robert Shahverdyan[2], Egan Kalmykov[1], Jan Brunkwall[1]

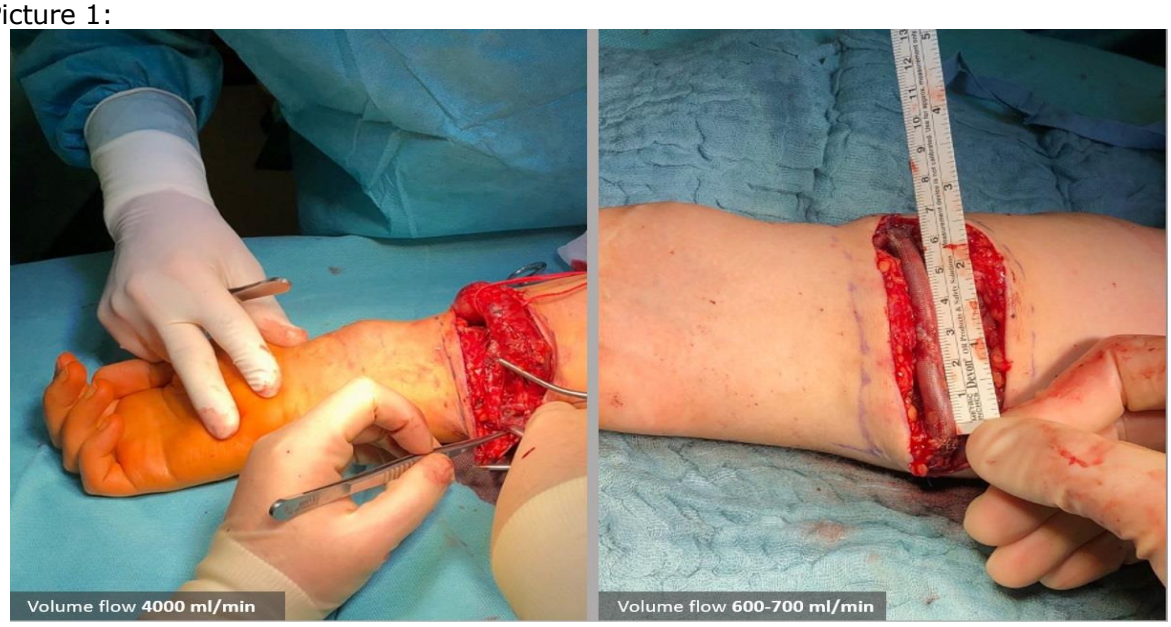
[1]University of Cologne, Cologne, Germany
[2]Asklepios Clinic Barmbek, Hamburg, Germany

Introduction:
High flow arteriovenous fistula (AVF) remains one of the most challenging complications in hemodialysis patients. We describe a new technique of flow reduction using novel external support device. The objective of this study was to evaluate the safety and the early efficacy of the new technique.

Methods and Results:
16 patients with high flow AVF underwent fistula reconstruction stabilized with an external support, between June 2018 and November 2018 in two centers. The dilated vein segment was resected, underwent volume reduction and was externally stabilized using a braided cobalt chromium scaffold of 6mm in diameter and 2.5-4.5cm in length, which was threaded over the entire reconstructed vein segment (figure 1). Flow measurements and clinical evaluation were performed preoperatively, 1 and 6 months postoperatively, if possible. Interim data on 16 patients (mean age 57, 68% males) with radio-cephalic (42%), brachiocephalic (25%) and Gracz (33%) AV fistulas was collected with mean follow up time of 2.63 ± 1.23 months. Technical success of the procedure using the external support was 100%. Mean flow rates pre and post operatively were 2600.8±810ml/min (range 1000-6000) and 810±275 (range 410-1300) respectively. Interim follow up data was available for 10 patients at 1 month. All patients had patent fistulas and 90% maintained low and stable flow rates.

Conclusion and Discussion:
Flow reduction using a braided cobalt chromium external support is feasible, safe and effective for flow reduction in high flow AVF patients. Our study suggests that this technique may provide durable solution for patients with high-flow AVF.

Picture 1:



Venous segment of the arteriovenous fistula before (left) and after (right) reconstruction with external support

Video session on access techniques – 12 April 2019

Deduplication of arm veins: a new surgical procedure for the treatment of non-maturing dialysis av-fistulas

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Ziekenhuis Oost-Limburg, Genk, Belgium

Introduction:
Non-maturation of AV-fistulas is a frequent problem after access creation, especially in the forearm. Accessory veins can play an important role in the non-maturing fistula. Different surgical and endovascular techniques are described to deal with this problem.

Methods and Results:
We describe a new surgical technique in which we perform a deduplication of the efferent veins to create a single run-off vessel with sufficient diameter and flow for hemodialysis.

Conclusion and Discussion:
The deduplication procedure is a possible alternative to rescue non-maturing fistulas due to important side branches or accessory veins.

Endoscopic superficialisation of arteriovenous fistulae

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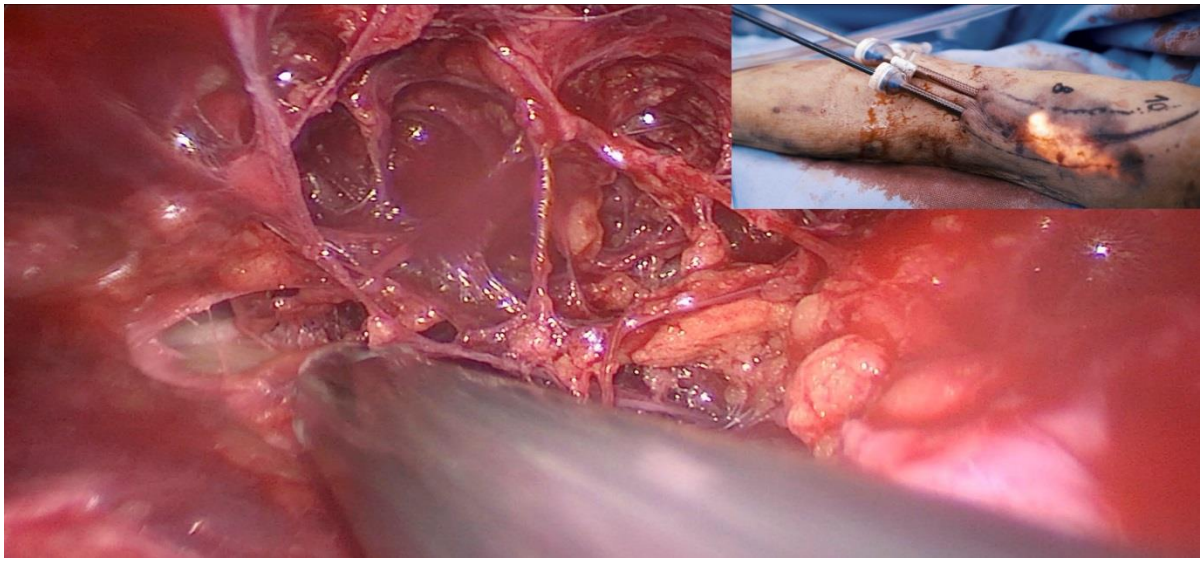
[1]University Hospital Basel, Basel, Switzerland
[2]Clinica Luganese Moncucco, Lugano, Switzerland

Introduction:
In obese patients superficial veins often are covered by overlying subcutaneous fat tissue and are well protected from routine punctures. After arteriovenous fistula creation and subsequent dilatation of these arterialized veins to satisfy the diameter criteria, the deep location may complicate or preclude cannulation.

Methods and Results:
We present an endoscopic approach (video presentation) to superficialise deep lying upper arm and forearm arteriovenous fistulae using 5 mm endoscopic devices. Endoscopic superficialisation is performed as a second stage procedure. Using two 5 mm incisions on either side of the vein at the distal end of the deep lying AVF segment, an endoscopic video camera and a suction device are introduced through trocars in order to aspirate the subcutaneous fat tissue under visual control. Optionally, tributaries can be closed during the procedure applying endoscopic clips.

Conclusion and Discussion:
Endoscopic superficialisation is safe as it reduces the risk of vein injury and does not prolong the procedure. This minimally invasive technique also avoids long skin scars associated with common superficialisation techniques.

Picture 1:



Pilot study: bone-anchored port for hemodialysis

Matthias Widmer[1], Andreas Arnold[2], Dominik Uehlinger[3], Ursula Dietrich[3], Marco Caversaccio[2]

[1]University Hospital (Inselspital) Bern, Department of Cardiovascular Surgery, Bern, Switzerland
[2]University Hospital (Inselspital) Bern, Department ORL; Head and Neck Surgery, Bern, Switzerland
[3]University Hospital (Inselspital) Bern, Department of Nephrology, Bern, Switzerland

Introduction:
This new designed bone-anchored port (BAP) connected to a conventional hemodialysis catheter is currently under evaluation for safety and functionality.

Methods and Results:
Starting in 2010, physicians and engineers have developed this bone anchored port which was implanted in April 2016 for the first time in man.Until October 1st, 2018 the bone-anchored port was implanted into 6 patients. During the first 30 days one patient needed a skin flap to cover a skin defect. Dialysis started on average on day 7 (range 1-15). By 30.11.2018 we oversee 1944 patient days (average 324, days, range 45-479). One patient died unrelated to the device after 14 month. A problem with the inner valve resulted in a technical change after the first patient.

Conclusion and Discussion:
An interdisciplinary team is needed to implant the device, which can be implanted in a safe manner and is appreciated by patients and nurses due to its simple handling.In the future the easy and safe handling of this system may be helpful in patients with a portable dialysis device.

Best selected oral abstracts – 13 April 2019

Repair of aneurysmal arteriovenous access fistulae: a systematic review and meta-analysis

Peter Balaz[1], Slavomir Rokosny[1], Jan Bafrnec[1], Adam Whitley[1], Stephen O´Neill[2]

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[2]HPB/Transplant Unit, Royal Infirmary of Edinburgh, Edinburgh, United Kingdom

Introduction:
Aneurysms arising from arteriovenous fistulae are a common finding among dialysed patients and pose a risk of acute bleeding. The aim of this study was to perform a systematic review and meta-analysis evaluating the surgical options for aneurysmal arteriovenous fistulae.

Methods and Results:
A systematic review and meta-analysis of articles published between January 1, 1995 and January 21, 2017 describing the surgical treatment of arteriovenous fistulae aneurysms. A total of 625 records were identified. After duplicate and low-quality studies were removed 68 full text articles were reviewed and from these 7 were included in the meta-analysis. The total number of patients was 192. Aneurysms were located in the forearm in 152 cases (81%) and the smallest diameter of a treated aneurysm was 15mm. The most frequent indication for treatment was bleeding prevention (108 cases, 60%). Aneurysmorrhaphy was the surgical method of choice in all 7 studies. The pooled primary patency rate at 12 months was 80% (95% CI 70% to 87%, 6 studies I^2=13%, p=0.33). There was no significant difference between studies using external prosthesis (85%, 95% CI 71% to 93%, 2 studies, I^2=0%, p=0.33) and not using external prosthesis (78%, 95% CI 63% to 88%, 4 studies, I^2=17%, p=0.31).

Conclusion and Discussion:
Symptomatic aneurysmal arteriovenous fistulae should be surgically treated with aneurysmorrhaphy to prevent fatal bleeding.

Impact of arterio-venous fistula flow on ventricular contractility in hemodialysis patients - a cardiac magnetic resonance study

Sheena Bhagirath[1], Anita de Vette[1], Carl Siegert[1], Giorgos Karas[1], Harold Suliman[1], Maurits van der Graaf[2], Marcel Weijmer[1], Pranav Bhagirath[2]

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Introduction:
The arterio-venous fistula (AVF) in hemodialysis patients often leads to a substantial increase in cardiac output. The resulting high-output state can have detrimental effects in the long term. In this study the relation between AVF flow and ventricular contractility parameters was investigated using cardiac magnetic resonance imaging (CMR).

Methods and Results:
CMR was performed prior to and after hemodialysis in 22 hemodialysis patients and 22 age-matched controls. AVF flow was used to subdivide the patients in Group 1 (low flow, <1000ml/min) and Group 2 (high flow, >1000ml/min). Short- and long-axis cine images were used for calculating global longitudinal strain (GLS), global circumferential strain (GCS) and global radial strain (GRS) with the tissue-tracking module of Circle Cardiovascular Imaging. There were no significant differences in the contractility parameters between the three groups prior to dialysis. Following dialysis, no significant changes in contractility were observed between Group 1 (n=7) and the control group (n=22). Left ventricle: compared to the control group, patients in group 2 (n=15) had a significantly lower GLS (-14.2±2.3% vs. -20.4±3.3%, P<0.05), GCS (-13.5±1.6% vs. -22.3±2.1%, P<0.05) and GRS (23.3±4.7% vs. 45.0±8.4%, P<0.05) post-dialysis. Right ventricle: compared to the control group, patients in Group 2 had a significantly lower GLS (-16.5±3.0% vs. -28.1±4.4%, P<0.05) and GRS (31.0±8.5% vs. 71.7±23.7%, P<0.05) post-dialysis.

Conclusion and Discussion:
These findings suggest that patients with high AVF flow are at an increased risk for developing ventricular dysfunction. Tissue-tracking analysis can be used to detect subtle early changes in contractility and could improve the diagnosis and prognosis of this patient group.

Vascular access and survival rates in older adults: peculiarities of the cause-effect relation.

Alexey Zulkarnaev, Natalia Fominikh

Moscow Regional Research and Clinical Institute, Moscow, Russian Federation

Introduction:
The use of a central venous catheter (CVC) as a permanent vascular access point is associated with reduced survival rates compared to AVF. At the same time, the question of polarity of the cause-effect relation is not straightforward

Methods and Results:
We have analysed the results of 604 older adults with CKD 5D. 391 patients started and continued HD using AVF, 129 – started HD via CVC and then changed to AVF (CVC-AVF group), 84 – received HD via CVC only. Survival rate in the AVF group differed from that in CVC, but not from CVC-AVF. Post adjustment in the multifactorial analysis, mortality was found to be associated with diabetes, systemic disease and co-morbidities (CIRS-G scale), but not with the type of vascular access. Therefore, CVC patients initially had a higher CIRS-G (p<0,001) and a higher risk of death. This compromises CVC and may lead to re-evaluation of its effect on mortality.

Conclusion and Discussion:
Conversion from AVF to CVC in some patients may be justifiable: progressive systolic and diastolic heart dysfunction, pulmonary hypertension, but not in the case of diabetes mellitus (DM). The five-year survival rate of patients with DM in CVC group was 21% versus 59% in AVF and CVC-AVF groups, log rank p=0,01. DM increases mortality in patients even with adjustment for comorbidities. In other diseases, conversion may be justified and in most cases, leads to improvement in cardiac and pulmonary haemodynamics in the short term. The effect on long term survival rates remains uncertain, there is a need for more researches.

An autologous cellularized in vivo engineered vascular graft capable of remodeling to a non-thrombogenic blood vessel upon arteriovenous grafting in adult goats

Wouter Jan Geelhoed, Koen van der Bogt, Tonia Rothuizen, F.F.R. Damanik, J.F. Hamming, C.D. Mota, M.S. van Agen, H.C. de Boer, M. Tobón Restrepo, B. Hinz, A. Kislaya, C. Poelma, A.J. van Zonneveld, Ton Rabelink, L. Moroni, Joris Rotmans.

LUMC, Leiden, Netherlands

Introduction:
Due to the increasing prevalence of cardiovascular diseases, there is an ever increasing need for suitable vascular substitutes. We aim to validate the remodeling capacity our cellularized *in vivo* tissue engineered blood vessels (TEBVs), and evaluate their patency compared to ePTFE.

Methods and Results:
Polymeric rods were implanted subcutaneously in goats for 1 month, resulting in the formation of fibrocellular tissue capsules (TCs) with sufficient pressurised bursting pressure (2382 ± 129 mmHg), and suture retention strength (SRS: 1.97 ± 0.49 N). One month after implantation, the polymeric rod is extracted whereupon TCs were grafted as arteriovenous conduit between the carotid artery and jugular vein of the same goats. The arteriovenous grafting model was used as it is a rigorous model for the evaluation of vascular prosthetics. After 1 or 2 months in the vasculature the grafts were harvested. Whole blood *ex vivo* perfusion revealed that the vascular grafts (at this stage called TEBVs) were less thrombogenic than the initial TC's, and expanded polytetrafluoroethylene (ePTFE) grafts. the TEBV's were composed of vascular smooth muscle cells-like cells, with confirmed contractility. At 2 months, complete endothelialisation, and abundant elastin was observed, while patency was comparable to ePTFE.

Conclusion and Discussion:
Here, we demonstrate the remodelling capacity of cellularized *in vivo* TEBVs, and their potential as replacements for prosthetic vascular grafts. Based on these data, a clinical trial is initiated to assess the performance of our TEBVs in a clinical setting.

Picture 1:

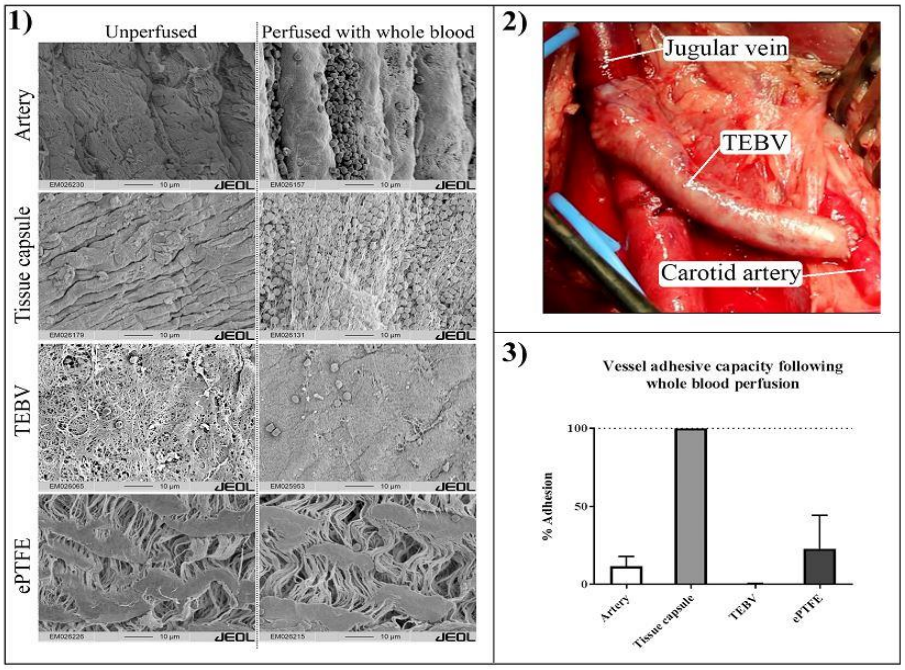

Figure 1: ***1)*** *An overview of SEM images captured of the various tissues before (left column), and after (right column) laminar whole blood perfusion of whole tissue samples at 20 dyn/cm². **2)** A tissue capsule implanted as TEBV, as arterviovenous conduit **3)** Quantification of adhesion of samples before and after flow. Notably is the drastic decrease in adhesive capacity from tissue capsule to TEBV, following only 1 month of implantation in the vasculature.*

Nitric oxide releasing bionanomatrix gel to promote arteriovenous fistula maturation

Maheshika Somarathna[1], Patrick Hwang[2], Tatyana Isayeva-Waldrop[1], Grant Alexander[1], Lingling Guo[1], Ho-Wook Jun[1], Timmy Lee[1]

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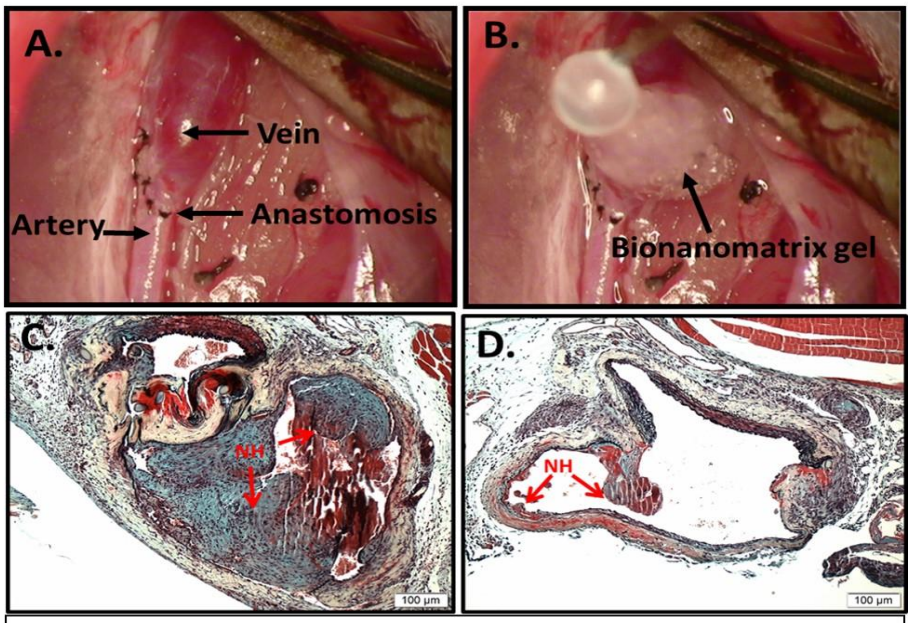
[2]Endomimetics, LLC3, Birmingham, United States of America

Introduction:
An arteriovenous fistula (AVF) is the preferred type of vascular access in hemodialysis patients. However, nearly 60% of AVFs created develop AVF maturation failure due to early venous neointimal hyperplasia (NH) formation and poor vascular remodeling. We hypothesize that local nitric oxide (NO) delivery at the time of AVF creation can enhance AVF maturation by inhibiting venous NH, reducing local inflammation and enhancing smooth muscle cell relaxation.

Methods and Results:
After AVF creation, NO-releasing gel (NO gel) or the control gel (without NO) was applied on the AVF anastomosis in 12-16 week old Sprague-Dawley rats. Rats were sacrificed at 7 days to investigate the changes in: 1) NH development 2) expression levels of inflammatory biomarkers such as MCP-1, IL-1β, IL-6 and TNF-α and 3) cyclic guanosine monophosphate (cGMP) levels in AVF veins (n=4). The NO-releasing gel treatment group showed a significant reduction in NH development ($P < 0.0091$, 70%) at 7 days after AVF creation compared to the control group. We observed a significant reduction in MCP-1 levels ($P < 0.0006$) in NO gel treated group and a similar trend was observed for the other inflammatory markers. NO treatment resulted in a significant elevation of AVF vein cGMP levels ($P < 0.0032$).

Conclusion and Discussion:
NO-releasing gel therapy applied locally on the AVF has great potential to promote AVF maturation by reducing NH, enhancing venous cGMP bioavailability and mitigating local inflammation following AVF creation at 7 days. Therefore, local delivery of NO at AVF creation could be a potential therapeutic approach to promote AVF maturation.

Picture 1:



Effect of nitric oxide treatment on venous NH formation, 7 days following AVF creation in rats. A) Rat femoral (end) vein to artery (side) arteriovenous fistula model. B) Application of NO gel immediately after AVF creation. C) Representative micrographs of venous NH development following 7 day post-AVF creation with control gel therapy and D) NO gel therapy.

Outcome of vascular access 13 April 2019

Clinical outcomes for hemodialysis access by using flixene vascular graft

Bulang He[1], Duxxa Tailor, Shaun Samuelson, Sanjay Nadkarni, Matt van Wyk, John Ferguson, Jonathan Tibballs, Doris Chan

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Introduction:
Creation of a native arterial-venous fistula (AVF) for hemodialysis can be challenging in some patients. As such various types of vascular grafts have been used. Flixene graft has a composite trilaminate structure that offers exceptional strength and durability allowing early needling. The aim of this study is to review the outcomes of Flixene graft in our cohort of patients.

Methods and Results:
This is a single centre retrospective study of all patients who had an AVF created using a Flixene vascular graft from March 2011 to October 2017. The demographic data and primary kidney disease were recorded. The graft configuration was from brachial artery to the axillary vein in the majority of patients. The primary outcomes were primary and secondary patency rate and secondary outcome was the complication. During study period, 50 grafts in 48 patients were placed. The median age was 66 years (29-88 years). The cause of renal failure in majority of patients (54%) was diabetes. Median follow up was 3 years. Two grafts were needled earlier within 72 hours after surgery. The 1-year primary and secondary patency rate was 30% and 100% respectively. Two grafts required segmental replacement due to pseudoaneurysm. The requirement for fistulogram ranged from 1-16 times, median 4 times during follow up.

Conclusion and Discussion:
Flixene vascular graft is an option for creation of hemodialysis access with satisfactory results. The nature of Flixene graft allows early use for dialysis. The regular surveillance is mandatory as the occurrence of venous site stenosis.

The uk vascular access graft registry - 3 years of data collection

James Gilbert

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Introduction:
The UK Vascular Access Graft Registry was developed and launched in 2015. Its purpose is to provide clinicians with a platform in which to collect data relating to the placement of dialysis grafts in order to understand how they perform over time. This paper reports the registry data collected over the last 3 years

Methods and Results:
A retrospective analysis was undertaken of all registry cases. Analysis looked at graft type, anatomical site and configuration. 14-day patency, infection and death rates were reviewed. All follow up episodes were analysed for infection, patency and death rates. 354 grafts have been placed in 321 patients. Male:Female ratio was 167:154. 228 grafts were placed on the left. 341 grafts were PTFE. The Venaflo (99) and Flixene (97) were most commonly used and most grafts (221) were placed in an upper arm straight configuration. 14/354 grafts (3.9%) become infected within 14 days. 2/14 were removed. There was a 5% thrombosis rate (18/354) at 14 days and 9/18 were not salvaged. 2 Patients died in the first 14 days. 988 follow-up events have been recorded in 232 patients. There have been 154 thrombotic episodes in 82 patients with 128 successfully

salvaged. 12 grafts have been removed for infection and 45 patients have been reported as died.

Conclusion and Discussion:
The UK Vascular Access Graft Registry is the first of its kind with over 350 graft insertions registered. 14-day infection rates are 3.9% with secondary patency of 97.4%. The longer term censored infection and secondary patency rates are 7.5% and 79.9% respectively.

Preliminary results of physicalfav trial.

Ines Aragoncillo Sauco[1], Jose Manuel Ligero Ramos[1], Covadonga Hevia Ojanguren[2], Silvia Caldes Ruisanchez[2], Yesika Amezquita[2], Almudena Vega Martinez[1], Soraya Abad Estebanez[1], Nicolas Macias Carmona[1], Yolanda Hernandez Hernandez[2], Jose Luño Fernandez[1]

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[2]HOSPITAL INFANTA SOFIA, Madrid, Spain

Introduction:
Hemodialysis with an autologous arteriovenous fistula (AVF) is associated with higher survival, lower health care costs, and fewer complications. Although distal forearm AVF is the best option, not all patients are good candidates for this approach, and the primary failure rate ranges from 20% to 50%. The optimal AVF depends mainly on the anatomical and hemodynamic characteristics of the artery and the vein chosen for the anastomosis. These characteristics can be modified by performing physical exercise.

Methods and Results:
The PHYSICALFAV trial (NCT03213756) is an open-label, multicenter, prospective, controlled, randomized trial designed to evaluate the usefulness of preoperative isometric exercise (PIE) in pre-dialysis or prevalent hemodialysis patients who are candidates for a new AVF. Patients are randomized 1:1 to the PIE group (isometric exercises combining hand grip and elastic band for 8 weeks) or the control group (no exercise).
Results.- During the first year of the trial, 73 patients have been recruited. After 8 weeks of preoperative isometric exercise we have found significant differences on vein diameter ($p<0,001$), arterial diameter ($p=0,007$) and maximum strength ($p<0,001$) on PIE group patients (figure 1). We have been able to perform 82,6% of distal AVF in PIE group compared to 51,8% in the control group ($p=0,022$). Global primary failure rate was very low in both groups (4,8% PIE group vs 8,3% control group, $p=0,632$) and intervention free rate at three months was 89% PIE group vs 77,8% in control group ($p=0,370$).

Conclusion and Discussion:
Isometric preoperative exercise can improve vascular calipers and increase the possibility of performing distal AVF.

Picture 1:

	Visit one	After 8 weeks of exercise	p
Vein diameter (mm)	2,79	3,51	<0,001
Artery diameter (mm)	2,56	2,71	0,007
PSV (cm/sg)	71	74,9	0,288
Maximun strength(kg)	29,2	33,44	<0,001

Incidence and survival of arteriovenous fistulae through 38 years. a national danish cohort study.

Kristine Lindhard[1], Ditte Hansen[1], Henrik Post-Hansen[1], Marianne Rix[2], Brian Lindegaard-Pedersen[2], James Heaf[3]

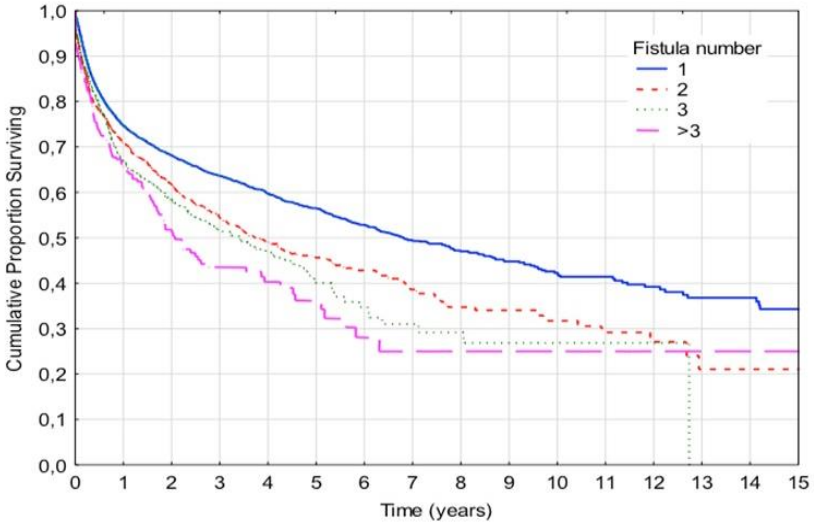
[1]Herlev Hospital, Herlev, Denmark
[2]Rigshospitalet, Copenhagen ø, Denmark
[3]Roskilde Hospital, Roskilde, Denmark

Introduction:
The age and comorbidities of the dialysis population has increased over time. This may influence the incidence and survival of the arteriovenous fistula (AVF). The present study explored the incidence and patency of AVF throughout 38 years. Factors affecting patient selection and access survival were evaluated.

Methods and Results:
The study was a retrospective cohort study based on national Danish registries. Incident haemodialysis patients in the period 1977-2015 were included. The incidence of AVF and factors for receiving an AVF was described. AVF survival and risk factors was explored by Kaplan Meier and Cox proportional hazard analysis. The total number of AVFs was 10187 AVFs (71 %) and 4201 catheters. No significant difference in the proportion of AVF through the 38 years was seen. Age and renal diagnosis did not influence the proportion of AVFs. Patients with CVCs had a significantly higher prevalence of comorbidities (p<0,01). The first AVF had the best survival (35% still functioning after 15 years). For subsequent AVFs the prognosis got successively worse. Factors such as brachialis vein fistula, female sex and diabetic nephropathy increased the risk of AVF failure (OR:2,45(2,28-2,64), OR:1,16(1,09-1,24), OR:1,20(1,12-1,3)). AVF survival remained stable during the 38 years.

Conclusion and Discussion:
Despite an older dialysis population, the proportion of AVFs in the Danish dialysis population has not changed, probably due to increased awareness of AVF as the first choice of vascular access. The AVF patency remained stable despite the older population. This may be due to better AVF surveillance, surgery and repair.

Picture 1:



Relationship of fistula number to fistula survival. P<0,001

Long-term outcomes of hemodialysis vascular access in the dutch vascular access study

Bram Voorzaat, Cynthia Janmaat, Koen van der Bogt, Friedo Dekker, Joris Rotmans

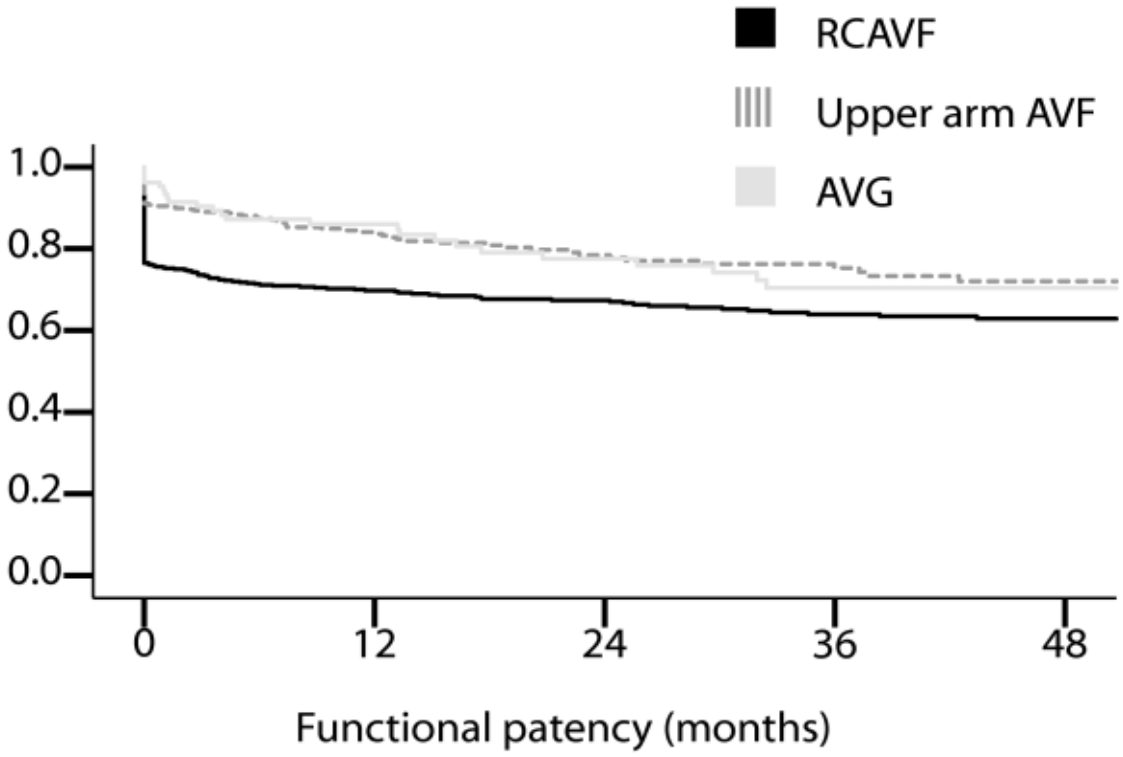
Leiden University Medical Center, Leiden, Netherlands

Introduction:
Arteriovenous fistulas (AVFs) for hemodialysis (HD) are often associated with better outcomes than arteriovenous grafts (AVG). We aimed to investigate vascular access (VA) outcomes in the Netherlands and assess if AVF nonmaturation outweighs long-term complications of AVGs.

Methods and Results:
1041 patients in the Dutch Vascular Access Study cohort were analyzed. One- and three-year primary, primary assisted, secondary and functional patency were calculated using Kaplan Meier analysis and the incidence of adverse events and procedures was assessed. Functional patency of upper arm AVFs and AVGs were compared using Cox analyses.
Of VAs that matured, one-year functional patency approximated 90% for all VA configurations. Including VAs that failed to mature, one-year functional patency was worse for RCAVFs at 67 ± 2.0% compared to upper arm AVFs (83 ± 2.0%) and AVGs (85 ± 3.5%). Functional patency of upper arm AVFs and AVGs was very similar adjusted HR 1.00 (0.64 – 1.59). AVGs required more procedures per year (3.3/year) of functional patency when compared to upper arm AVFs (1.8/year) and experienced more stenosis, thrombosis and infections.

Conclusion and Discussion:
The functional patency of matured AVFs and AVGs is comparable, although AVGs required more interventions to maintain usability for hemodialysis. The choice of VA is a trade-off between short-term advantages, favoring AVGs and long-term advantages, favoring AVFs. Which VA is most appropriate depends on the patient's prognosis and preferences.

Picture 1:



Functional patency of VAs in the Dutch Vascular Access Study

Arteriovenous fistula in diabetic patients

Laszlo Szabo, Lorna Murray, Adel Ilham, Tarique Sabah, Michael Stephens

University Hospital of Wales, Cardiff, United Kingdom

Introduction:
High quality vascular access in patients with end stage renal failure (ESRF) is paramount to enabling successful long term haemodialysis. Vascular access for haemodialysis is best achieved via an arteriovenous fistula (AVF), although this can be challanging in diabetic patients. The primary aim of the study was to assess the impact of diabetes on early patency rates of AVFs.

Methods and Results:
From 2011 to 2017 1,677 braciochephalic (BC) or radiocephalic (RC) AV fistulas were created in our centre. Patency was checked two weeks post op and the patency rates were analyzed. There were no significant differences in early patency rates between diabetic patients and not diabetic patients in for all types of fistula (73% vs 71% p=0.83). There was also no significant difference between patients with diabetic nephropathy (DN) and patients who did not have DN as their cause of end stage renal failure (ESRF) (79% vs 73% p=0.44). There was no significant difference between the percentage of RC/BC fistula within each group.

Conclusion and Discussion:
In our centre we managed to create successfully AVFs in diabetic patients. There was no differences in rates of early patency between diabetic and non diabetic patients or in patients with DN and patients who don't have DN in both RC and BC fistulas. There was no bias between types of fistula attempted on each group therefore this was not a confounding factor.

Poster session A – 11 April 2019

Basic research / Miscellaneous

1 Preexisting venous medial matrix metalloproteinase (mmp)-2 and arteriovenous fistula (avf) maturation: findings from the hemodialysis fistula maturation (hfm) consortium study

Yan-Ting Shiu[1], Ha Le[1], Michael Allon[2], Michelle Robbin[2], Kelly Hudkins[3], Charles Alpers[3], Tom Greene[1], Alfred Cheung[1]

[1]University of Utah, Salt lake city, United States of America
[2]University of Alabama at Birmingham, Birmingham, United States of America
[3]University of Washington, Seattle, United States of America

Introduction:
AVF maturation requires adequate outward remodeling (luminal expansion) and limited inward remodeling (neointimal hyperplasia) to facilitate increases in AVF diameter and blood flow. Inhibition of MMP-2 and MMP-9 reduces neointimal hyperplasia following vascular injury or graft implantation in animals with normal renal function. However, the clinical relevance of MMP-2 and MMP-9 in AVF diameter (a net result of luminal expansion and neointimal hyperplasia) and blood flow remains unclear.

Methods and Results:
We prepared histological slides of venous samples from 100 randomly selected patients in the HFM Study at the time of AVF creation. The protein levels of MMP-2 and MMP-9 were quantified by immunohistochemistry and ImageJ, and reported as a percentage of the total medial area. We then investigated the statistical associations of MMP-2 or MMP-9 levels with AVF diameter and blood flow assessed using duplex ultrasound at 6 weeks after AVF creation. Venous medial MMP-2 (Fig. 1) and MMP-9 expression varied widely among patients. We found a negative association of venous medial MMP-2 with the 6-week AVF diameter (change in diameter = −0.23 mm; 95% CI, −0.44 to −0.02; p=0.029) and a trend for AVF blood flow (change in flow = −39 ml/min; 95% CI, −106 to −29; p=0.26), per 10% increase in MMP-2. No significant association was found for MMP-9.

Conclusion and Discussion:
Preexisting venous medial MMP-2 expression was associated with impaired AVF maturation in this subset of HFM patients. More rigorous validation of this observation using a larger cohort is necessary.

Picture 1:

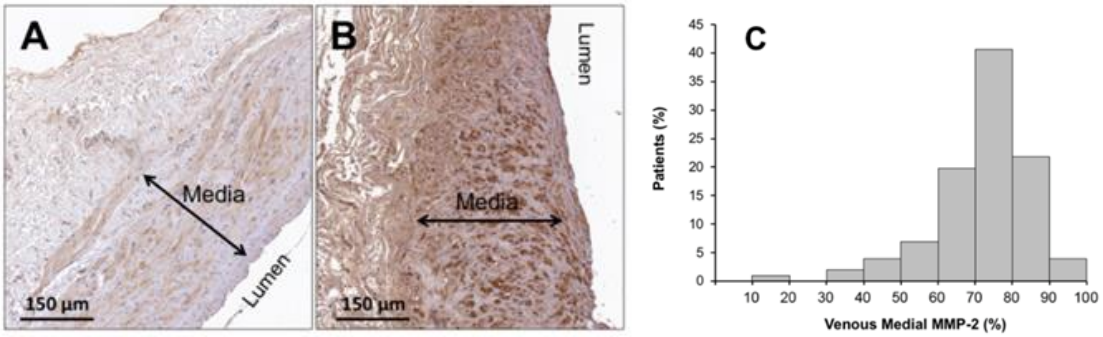


Fig. 1. Representative immunohistochemistry images of MMP-2 (rust color) show **(A)** a patient whose venous medial layer had low MMP-2 quantity (50% of area stained positive of MMP-2), and **(B)** a different patient whose venous medial layer had substantially more MMP-2 (93%). **(C)** Distribution of MMP-2 in 100 patients.

2 Roles of matrix metalloproteinase-2 and -9 in arteriovenous fistula development in rodent models

Yan-Ting Shiu[1], Ha Le[1], Yuxia He[1], Jason Tey[1], Isabelle Falzon[1], Yanhang Zhang[2], Michael Allon[3], Timmy Lee[3], Scott Berceli[4], Karl Nath[5], Edgar Jaimes[6], Alfred Cheung[1]

[1]University of Utah, Salt lake city, United States of America
[2]Boston University, Boston, United States of America
[3]University of Alabama at Birmingham, Birmingham, United States of America
[4]University of Florida, Gainesville, United States of America
[5]Mayo Clinic, Rochester, United States of America
[6]Memorial Sloan-Kettering Cancer Center, New york city, United States of America

Introduction:
Matrix metalloproteinase (MMP)-2 and MMP-9 are key regulators of vascular remodeling. They can stimulate the proliferation of vascular endothelial cells (ECs) and smooth muscle cells (SMCs) and disrupt the extracellular matrix, which suggests that they may negatively affect the remodeling process of arteriovenous fistulas (AVFs) in chronic kidney disease (CKD) patients. Yet their exact role in AVF maturation remains controversial. Clinical studies have reported positive and negative associations between their pre-operative baseline levels and post-operative AVF maturation. We investigated how their expression levels are affected by CKD and their causal relationship with AVF development using mechanistic cell and animal studies, respectively.

Methods and Results:
Human vascular ECs and SMCs (N≥3) were cultured in serum obtained from CKD patients or non-CKD controls. CKD serum enhanced MMP-2 (1.3-fold) and MMP-9 (20-fold) protein expression in ECs. Similar trends were found for SMCs. Carotid-jugular AVFs were created in global MMP-2 or MMP-9 knockout (KO) mice and wild-type (WT) C57BL/6 mice (N≥3 per strain). The percent open AVF lumen area at 1 week after creation was larger in the MMP-2 (39% ± 6%) and MMP-9 (47% ± 3%) KO mice vs. the WT mice (11% ± 2%). Baseline compliance of the carotid artery was higher in MMP-2 and MMP-9 KO mice compared to WT mice.

Conclusion and Discussion:
Gene ablation of MMP-2 and MMP-9 improves AVF development, which may be mediated by improved compliance. Therapeutically inhibiting these molecules may enhance AVF maturation in CKD patients.

3 Inhibition of microrna-92a enhances arteriovenous fistula development in rodent models

Yan-Ting Shiu[1], Jason Tey[1], Yuxia He[1], Isabelle Falzon[1], Ha Le[1], Zhen Chen[2], Yun Fang[3], Lisa Lesniewski[1], Alfred Cheung[1]

[1]University of Utah, Salt lake city, United States of America
[2]Beckman Research Institute, City of Hope, Duarte, United States of America
[3]University of Chicago, Chicago, United States of America

Introduction:
MicroRNA-92a (miR-92a) causes endothelial dysfunction, which in turn has been shown to impair development of arteriovenous fistulas (AVFs) in patients with chronic kidney disease (CKD). We recently reported that CKD patients had higher serum miR-92a levels than non-CKD controls, and that serum miR-92a was likely derived from the endothelium. Here we investigated the role of miR-92a in AVF development in animal models.

Methods and Results:
In male Wistar rats with normal kidney function or adenine diet-induced CKD, we assessed femoral AVF lumen diameter and tissue miR-92a levels at 4 weeks after creation. Compared to non-CKD rats, CKD rats had increased miR-92a expression (3-fold, $p<0.05$) and smaller AVF lumen diameter (1.0 ± 0.51 in CKD vs. 1.55 ± 0.65 mm in non-CKD, $p<0.05$). In a mouse carotid-jugular AVF model, miR-92a was inhibited using whole-body knockout (miR-92a$^{-/-}$) or nanoparticles (NPs) that encapsulate miR-92a inhibitors (8 mg/kg body weight) and target inflamed endothelium, given 1 day after AVF creation. C57BL/6 mice, unencapsulated inhibitors, and saline served as wild-type (WT), no-NP, and no-treatment controls, respectively. One week after creation, percent open AVF lumen area was larger in miR-92a$^{-/-}$ (72%) than in WT mice (12%). Both NP-encapsulated (41%) and un-encapsulated (23%) miR-92a inhibitors had larger open lumen area than saline control (5%); the effect of encapsulated inhibitors was more pronounced.

Conclusion and Discussion:
CKD increased AVF tissue miR-92a levels and decreased AVF lumen diameter. Inhibiting miR-92a improved AVF development. Nanomedicine may be a novel and effective therapy to enhance AVF maturation in dialysis patients.

4 Fluid shear stress mediates the expression of monocyte chemotactic protein-1 by vascular endothelial cells and its signaling pathway

Zhe Wang, Aili Jiang, Fang Wei, Lan Jia

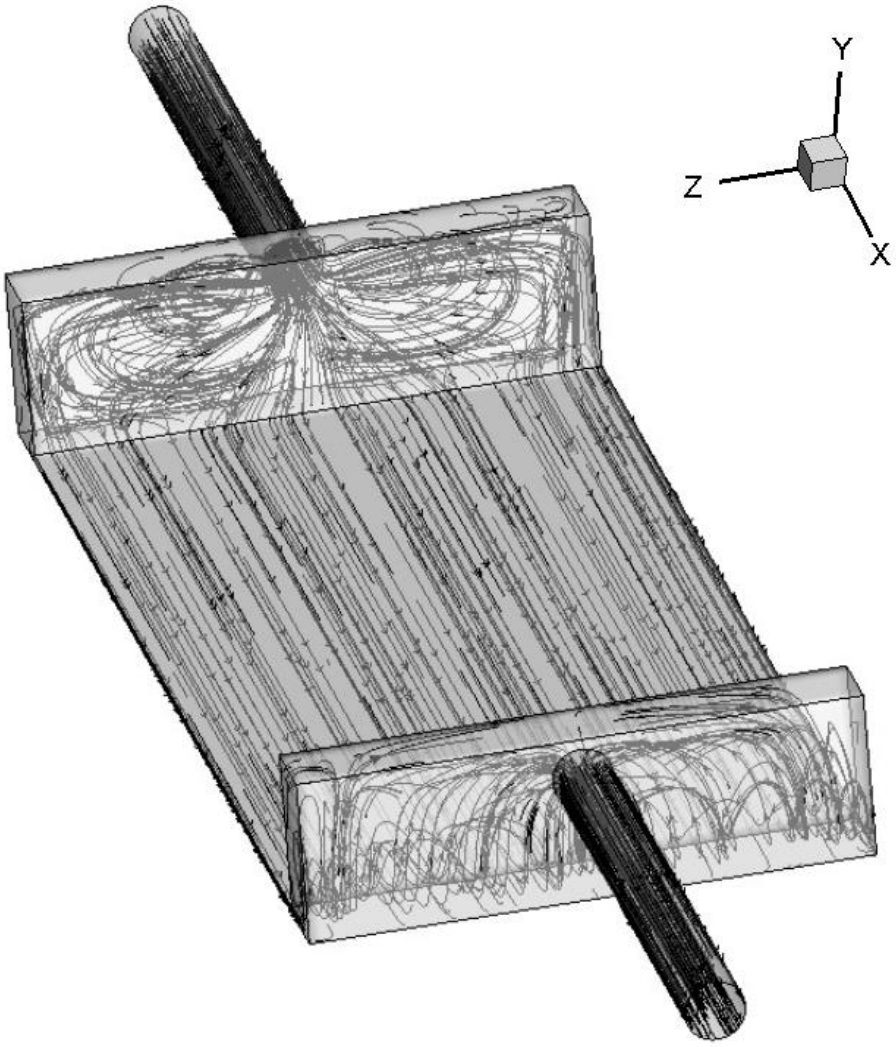
The Second Hospital of Tianjin Medical University, Tianjin, China

Introduction:
The study investigated the mechanism of fluid shear stress on intimal hyperplasia, and provided evidences for improving maturation and patency rate of AVF.

Methods and Results:
(1) We established the parallel plate flow chamber, computational fluid dynamics (CFD) models was used to compute fluid shear stress and map its spatial distribution in the chamber. Human umbilical vein endothelial cells (HUVECs) in the chamber were exposed to low shear stress (4dyn/cm^2), physiological shear stress (12dyn/cm^2), high shear stress (20dyn/cm^2), or oscillatory shear stress (0±5dyn/cm^2). We analyzed the expression of MCP-1, CCR2, Cav-1, ERK1/2 and NF-κB. (2) We added the uremic serum to culture medium to simulate uremic environment, repeated the above steps and analyzed these proteins. (1) The expression of MCP-1, CCR2, ERK1/2 and NF-κB increased, and Cav-1 decreased in HUVECs exposed to low laminar shear stress or oscillating shear stress. The expression of MCP-1, CCR2, ERK1/2 and NF-κB decreased, and Cav-1 increased in HUVECs exposed to high laminar shear stress. (2) In uremic environment, the changes of above proteins were more significant than those in physiological environment.

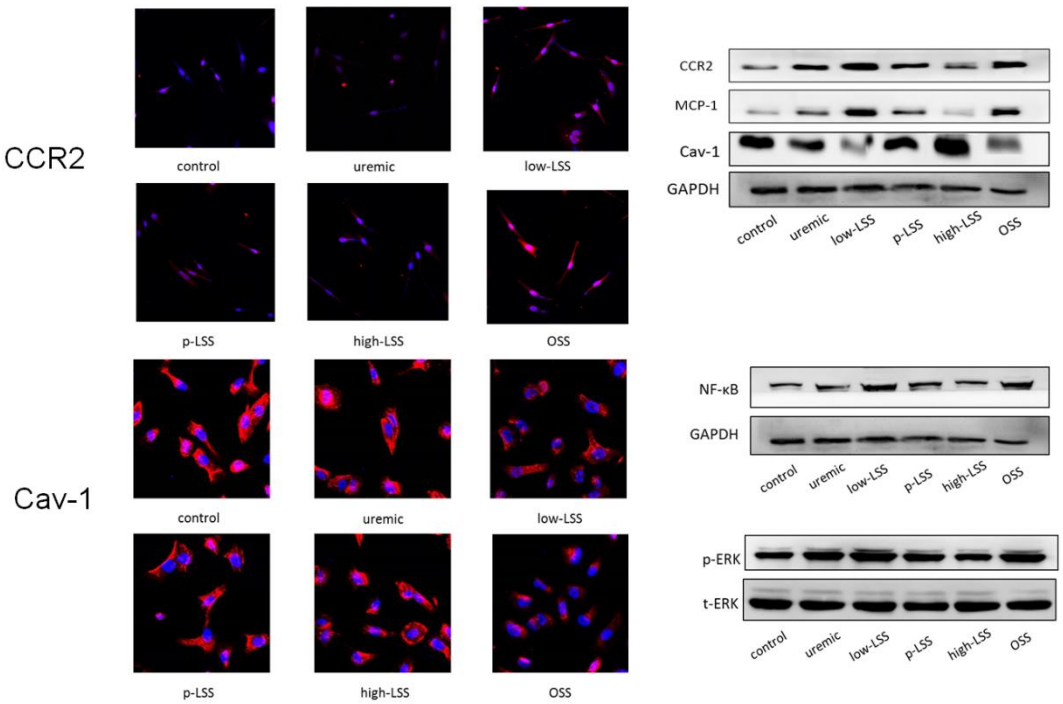
Conclusion and Discussion:
Low laminar shear stress or oscillating shear stress reduced the expression of Cav-1, activated ERK pathway, and increased the level of MCP-1 and CCR2. High laminar shear stress leaded to opposite direction. The expression of MCP-1, CCR2, ERK1/2, and NF-κB increased, and Cav-1 decrease with time-dependent. Low laminar shear stress or oscillating shear stress may influence intimal hyperplasia by Cav-1/MCP-1-CCR2/ERK pathway.

Picture 1:



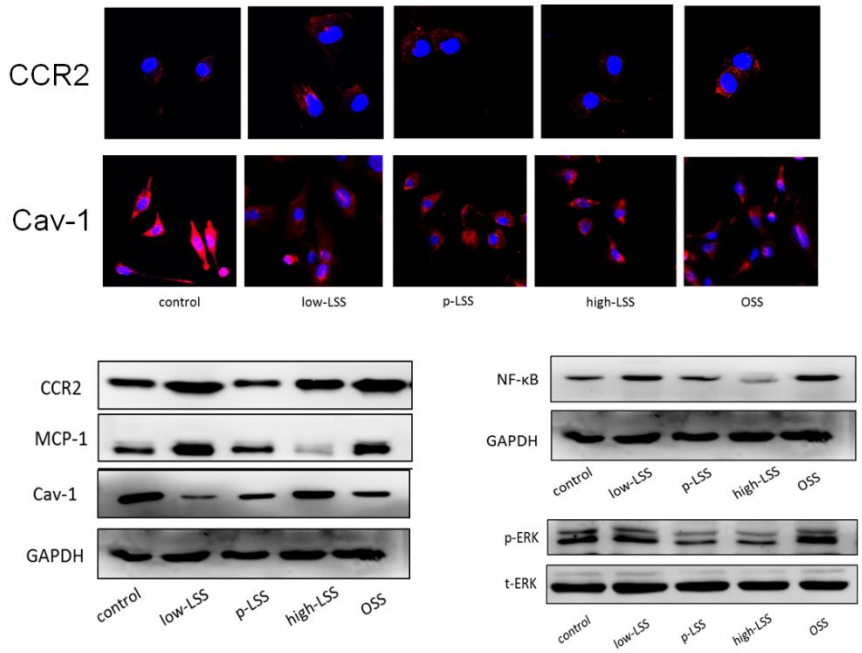
Distribution of the flow in parallel-plate flow chamber

Picture 2:



Distribution and expression of proteins in HUVECs in uremic environment

Picture 3:



Distribution and expression of proteins in HUVECs in physiological environment

Picture 4:

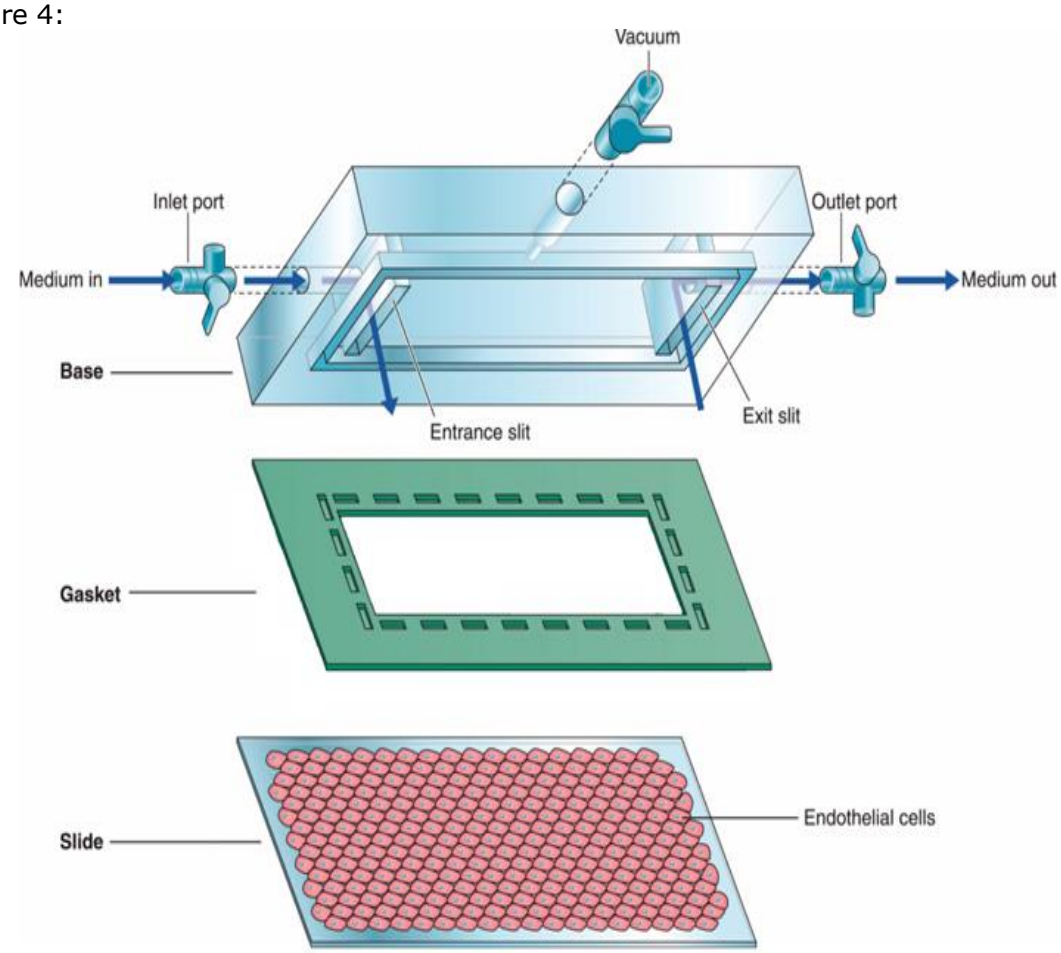


Diagram showing the parallel-plate flow chamber (From Chiu JJ, et al)

5 Contribution of bone marrow-derived cells to in situ engineered tissue capsules in a rat model of chronic kidney disease for generation of in vivo tissue engineered blood vessels

Taisiya Bezhaeva[1], Wouter Geelhoed[1], Dong Wang[2], Haoyong Yuan[2], Eric van der Veer[1], Carla van Alem[1], Febriyani Damanik[3], Xuefeng Qiu[2], Anton-Jan van Zonneveld[1], Lorenzo Moroni[3], Song Li[2], Joris Rotmans[1]

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[2]University of California, Los Angeles, Los angeles, United States of America
[3]Maastricht University, Maastricht, Netherlands

Introduction:

Tissue engineered blood vessels (TEBVs) hold great promise for patients with ESRD requiring vascular access for hemodialysis. Recently, we developed a method to generate TEBVs by utilizing foreign body response (FBR) directed towards subcutaneously implanted polymeric rods that culminates in the formation of tissue capsules (TCs). The FBR predominantly involves bone-marrow (BM) derived cells and ESRD coincide with impaired function of BM. In the present study we assessed the generation of TEBVs in conditions of renal failure.

Methods and Results:
Rods were implanted in the subcutis of Sprague Dawley (SD) rats after BM-transplantation with GFP-labeled BM-cells in a model of chronic kidney disease (CKD). Renal function was monitored and efficacy of the BM transplant was assessed by FACS. SD rats with BM-transplantation, but without CKD was used as a control. TCs were harvested at 1 and 3 weeks post-implantation and their cellular composition was analyzed.
3 weeks post-implantation, rods were encapsulated by TCs composed of collagen, myofibroblasts and macrophages. 14% of $CD68^+$ macrophages were GFP^+, indicating BM origin. Macrophage-to-myofibroblasts differentiation played an important role in TC formation as 26% of SMA^+/GFP^+ myofibroblasts co-expressed macrophage marker CD68 (fig.1a). At 3 weeks, the cellular response changed towards tissue repair, characterized by 40% increase in $CD68^+/CD163^+$ repair-associated macrophages and 95% increase in TGFβ and IL10 gene expression (fig.1b).

Conclusion and Discussion:
Both BM derived and tissue resident cells, contribute to TC formation. Macrophages serve as precursors of myofibroblasts in mature TCs. CKD did not significantly alter the process of TC formation, which supports our approach for future clinical use.

Picture 1:

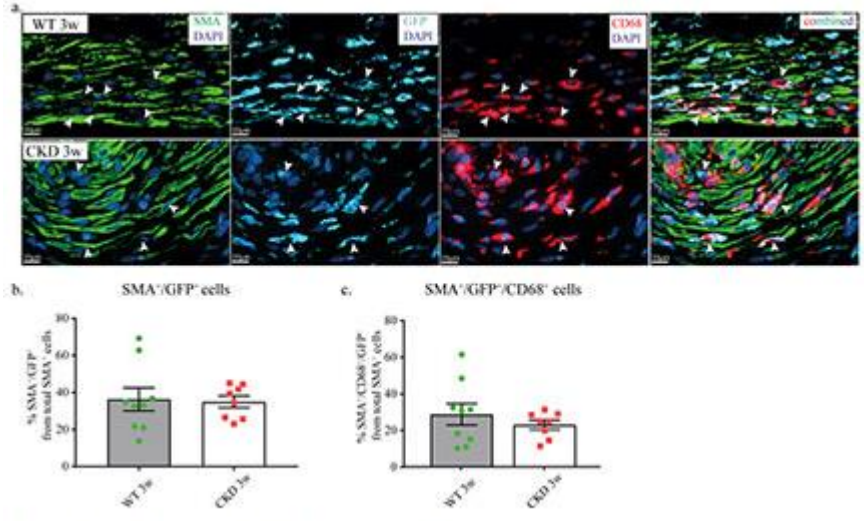


Figure 1a: Macrophage-to-myofibroblast differentiation

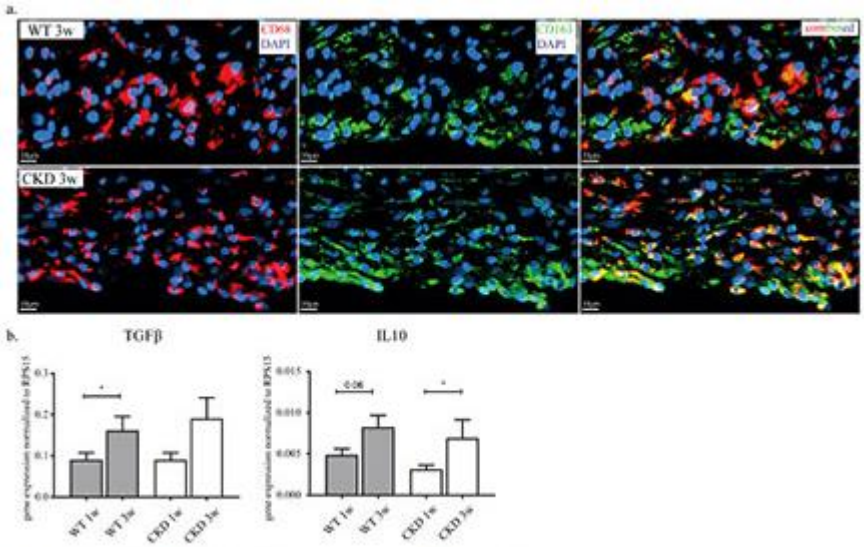


Figure 1b: Tissue resident macrophages in tissue capsule formation.

6 Shear stress modulates endothelium-dependent vascular smooth muscle cell migration in a coculture system

Lan Jia

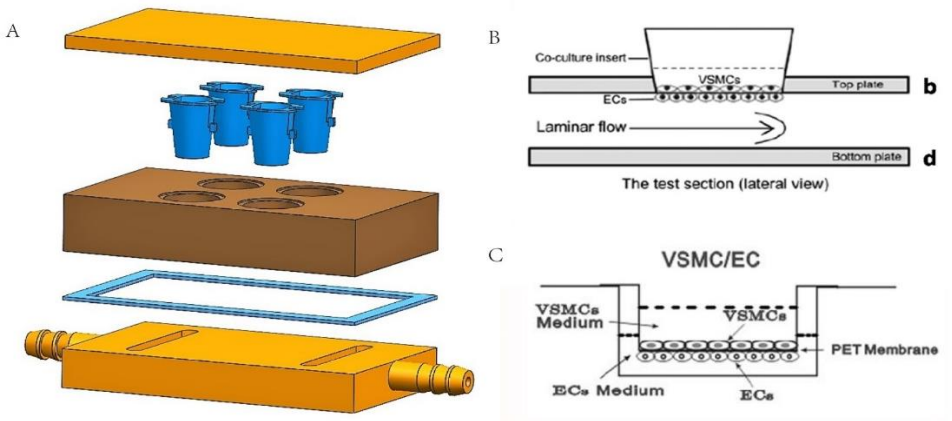
The second Hospital of Tianjin Medical University, Tianjin, China

Introduction:
The non-uniform distribution of neointimal hyperplasia within the arteriovenous fistulae has been attributed to proatherogenic influences of low and oscillatory wall shear stress (WSS) on endothelial cells (ECs) and vascular smooth muscle cells(VSMCs). In the present study, we investigate how WSS influences ECs and the role they play in VSMCs migration.

Methods and Results:
By using an EC/VSMC cocultured parallel-plate flow chamber system (**Fig.1**), in which ECs and VSMCs are grown on the opposite sides of a porous membrane and different WSS is applied to the ECs side. Three kinds of forces were involved, including low WSS ($4dyn/cm^2$), physiological WSS ($12dyn/cm^2$), high WSS ($20dyn/cm^2$), and oscillatory WSS ($0\pm4dyn/cm^2$). Then the velocity and WSS distribution in the parallel plate flow chamber could be simulated with computational fluid dynamics software. The expression of VEGF-A, PDGF-BB and FGF-4 were detected by Western blotting. VSMCs migration was then assessed with a Transwell assay. We found that low and oscillatory WSS up-regulated migration of VSMCs. The expression of VEGF-A, PDGF-BB and FGF-4 increased in ECs exposed to low and oscillatory WSS, compared to physiological and high WSS.

Conclusion and Discussion:
These results indicate that physiological and high WSS protects against endothelial regulation of VSMCs migration, which may be an atheroprotective function on the vessel wall. Low and oscillatory WSS was a pathological inducer for neointimal hyperplasia by up-regulated migration VSMCs, which increased the productions of VEGF-A, PDGF-BB and FGF-4 from ECs. In summary, shear stress–modulated VSMCs migration is an endothelium-dependent process.

Picture 1:



EC/VSMC cocultured parallel-plate flow chamber system.

7 Remodelling of vascular allograft after long-term preservation in large animal pig experiment

Bulang He[1], Gabrielle Musk, Zi Ng, Helen Kershaw, Rajalingam Sinniah, Jeffrey Hamdorf

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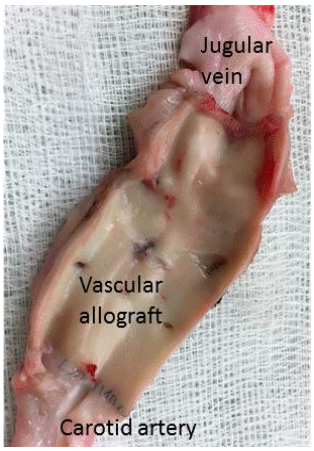
Introduction:
Recent studies have shown that biological vascular grafts achieve better patency and are resistant to infection. The ideal method for preservation of the vascular allograft should be capable of retaining its structure and eliminating immunogenicity. The aim of this study was to investigate a method by which the vascular allografts can be preserved for longer periods of time and readily available for surgery. The remodelling of the allografts was also examined.

Methods and Results:
The study was approved by the animal ethics committee. The aorta, vena cava and iliac arteries and veins were harvested and stored in 75% ethanol at 4 ºC for 6 months after processing. Eight large pigs were allocated into 2 groups for arterial and venous allograft respectively. Each pig underwent the procedures of creation of arterial-venous graft (AVG) fistula in the neck and implantation of allograft as a bypass graft in the leg. The pigs were observed for 8 weeks and the allografts were harvested and examined
All pigs were observed for 8 weeks except two which required early euthanasia. There was no claudication on the leg with bypass allograft. The majority of the bypass grafts were patent, whereas most of the AVG was fibrotic. Histopathology showed fibromuscular hypertrophy and elastin replication in the vein allograft and regeneration of the endothelium and some calcification over the wall of arterial allograft.

Conclusion and Discussion:
Vascular allografts can be preserved by this method for 6 months and retain function. Further study will be needed for monitoring the allograft for a longer period of time.

Picture 1:



8 The effect of endothelial nitric oxide synthase on hemodynamic profiles and vascular wall deformation in murine arteriovenous fistulas

D Pike[1], Yt Shiu[2], Yf Cho[2], H Le[2], Jd Symons[3], Cg Kevil[4], M Somarathna[5], L Guo[5], T Isayeva[5], J Totenhagen[6], T Lee[5]

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[2]Division of Nephrology and Hypertension, U of UT, Salt lake city, United States of America
[3]Department of Nutrition and Integrative Physiology, U of UT, Salt lake city, United States of America
[4]Department of Pathology, LSU Health Shreveport, Shreveport, United States of America
[5]Department of Medicine and Division of Nephrology, UAB, Birmingham, United States of America
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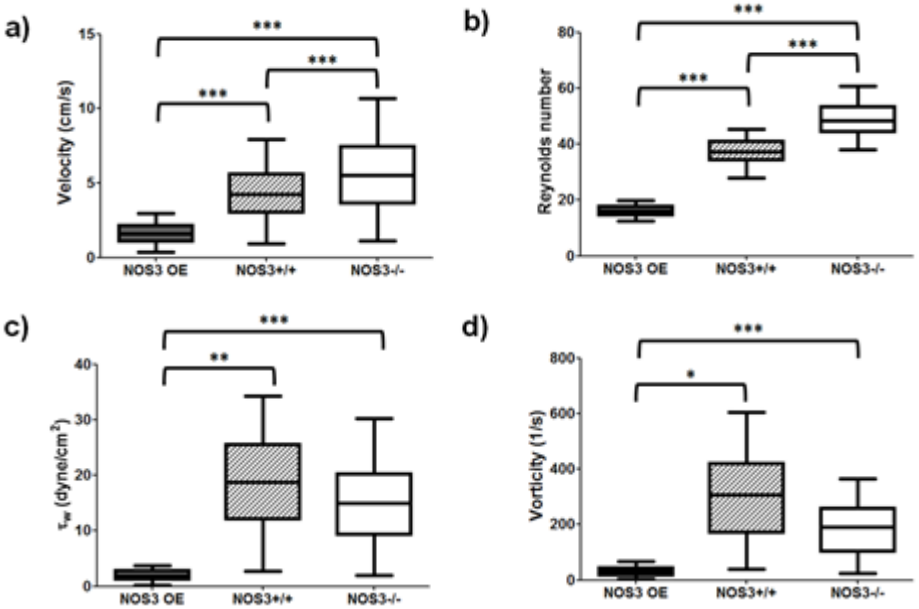
Introduction:
Creation of a hemodialysis arteriovenous fistula (AVF) causes aberrant hemodynamics and wall mechanics at and near the AVF anastomosis. When inadequately regulated, these aberrant mechanical factors may impede AVF lumen expansion to cause AVF maturation failure, which is a significant clinical problem with no effective treatments. The endothelial nitric oxide synthase (NOS3) is crucial for vascular health and function, but its effect on AVF maturation has not been fully characterized. We hypothesize that following AVF creation, NOS3 promotes AVF maturation by regulating local vascular mechanics.

Methods and Results:
Here we report the first MRI-based fluid-structure interaction (FSI) study in a murine AVF model using three mouse strains: NOS3 overexpression (NOS3 OE) and knockout (NOS3-/-) on C57BL/6 background, with C57BL/6 as the wild-type control (NOS3+/+). When compared to NOS3+/+ and NOS3-/-, AVFs in the NOS3 OE mice had larger lumen area (i.e., the desirable AVF remodeling outcome), which was concomitant with smoother blood flow streamlines, as well as lower fluid-wall shear stress (τ_W), vorticity, inner wall circumferential stretch, and radial wall thinning (Figure).

Conclusion and Discussion:
Our results demonstrate that overexpression of NOS3 resulted in distinct hemodynamic and wall deformation profiles associated with favorable AVF remodeling. Enhancing NOS3 expression may be a potential therapeutic approach for promoting AVF maturation.

Picture 1:



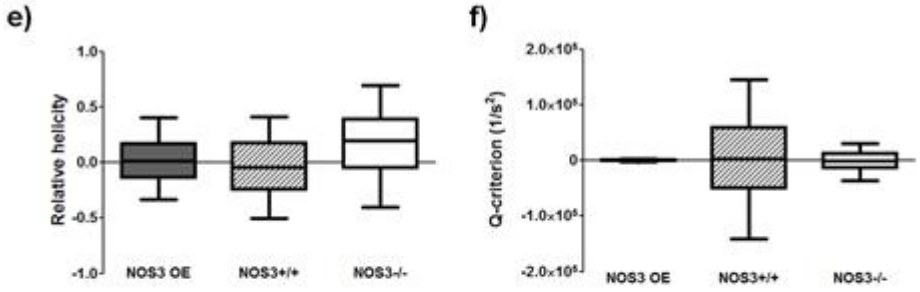


Figure. AVF hemodynamics and wall mechanics as 21 days after creation. Box plots of (a) velocity, (b) Reynolds number, (c) fluid-wall shear stress (i.e., τ_w), (d) vorticity, (e) maximum inner wall circumferential stretch, and (f) maximum radial wall thinning were averaged over both a cardiac cycle and the first 7 mm of the proximal AVF vein starting from the anastomosis. Box plots show 25th to 75th percentile, with whiskers of 5% and 95% of data range. *: $p<0.05$; **: $p<0.01$; ***: $p<0.001$. Baseline (i.e., pre-surgery jugular vein in NOS3+/+ mice) values were: velocity = 0.04 ± 0.02 cm/s; Reynolds number = 0.2 ± 0.1; τ_w = 1.0 ± 0.3 dyne/cm^2; vorticity = 20.4 ± 10.3 1/s; maximum inner wall circumferential stretch = 0.02 ± 0.004 %; maximum radial wall thinning = 0.01 ± 0.003 µm.

AVF hemodynamics and wall mechanics as 21 days after creation.

9 Serial analysis of lumen size and hemodynamics in murine arteriovenous fistulas

D Pike[1], Yt Shiu[2], Id Falzon[1], H Le[2], Jd Symons[3], M Somarathna[4], T Isayeva[4], L Guo[4], J Totenhagen[5], T Lee[4]

[1]Department of Biomedical Engineering, U of UT, Salt lake city, United States of America
[2]Division of Nephrology and Hypertension, U of UT, Salt lake city, United States of America
[3]Department of Nutrition and Integrative Physiology, U of UT, Salt lake city, United States of America
[4]Department of Medicine and Division of Nephrology, UAB, Birmingham, United States of America
[5]Department of Radiology, UAB, Birmingham, United States of America

Introduction:
Fluid-wall shear stress (FWSS) has long been proposed as critical in determining the outcome of arteriovenous fistula (AVF) remodeling, but little information exists on how FWSS or other hemodynamic parameters may affect AVF lumen size over time. Endothelial nitric oxide synthase (NOS3) is crucial for vasodilation. This study aims to investigate the association between hemodynamics parameters and subsequent AVF lumen size change and whether NOS3 affects this relationship.

Methods and Results:
Carotid-jugular AVFs were created in NOS3 overexpression (NOS3 OE) and knockout (NOS3-/-) mice on C57BL/6 background, with C57BL/6 as the wild-type control (NOS3+/+). MRI-based computational fluid dynamics (CFD) simulations were performed on AVFs at Day 7 and Day 21 after creation, as well as on presurgical blood vessels. CFD results were used to calculate FWSS and Q-criterion. Among the three strains, NOS3 OE had the largest AVF venous area and the smoothest velocity streamlines in the AVF vein at both Day 7 and Day 21 (Figure). Each of these strains had positive associations between (1) FWSS at Day 7 and the cross-sectional area change in the AVF vein from Day 7 to Day 21 ($P<0.05$), and (2) Q-criterion at Day 7 and the cross-sectional area change in the AVF vein from Day 7 to Day 21 ($P<0.05$). NOS3 OE had the smallest correlation coefficient for both associations.

Conclusion and Discussion:
Lumen size change is significantly associated with both FWSS and Q-criterion. NOS3 expression level affected this association, suggesting that NOS3 and hemodynamics may interact to affect AVF remodeling.

Picture 1:

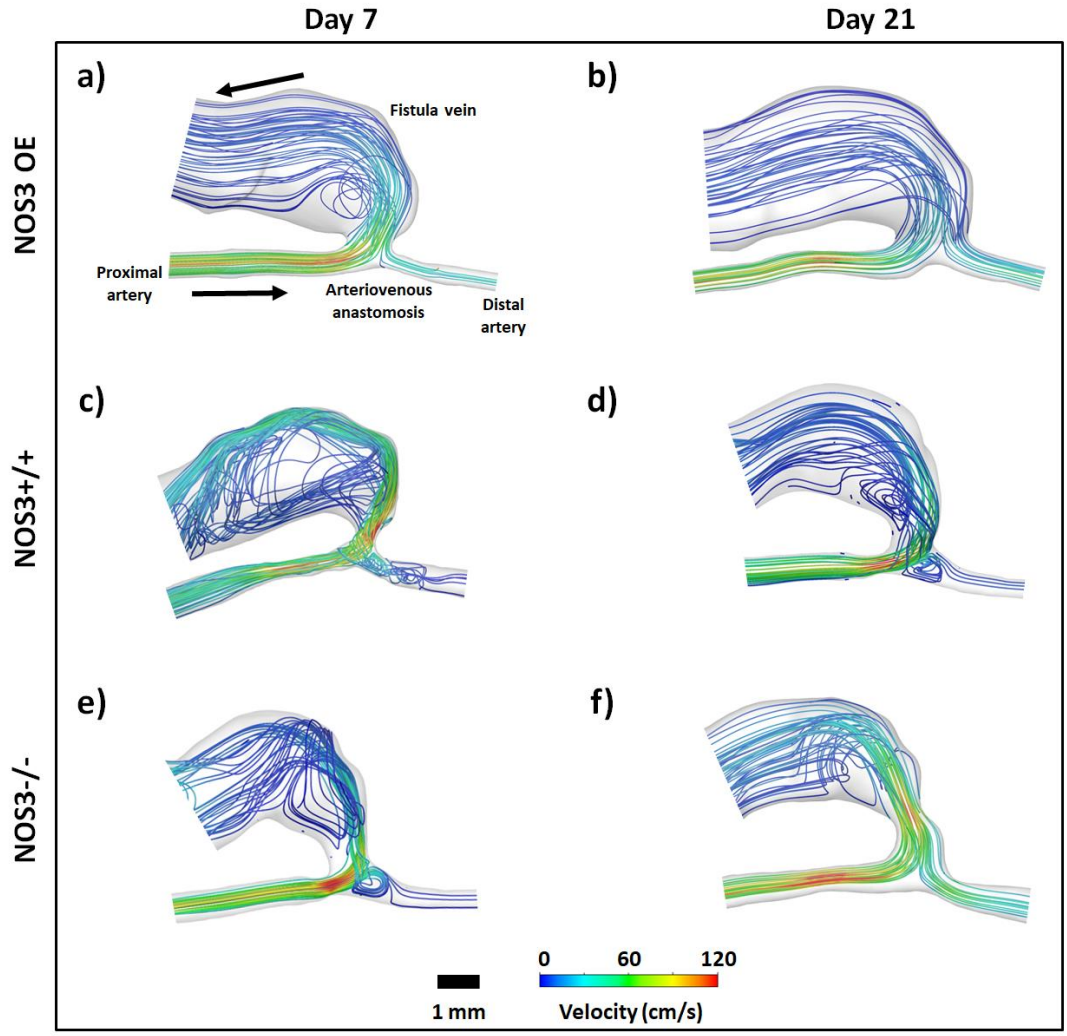


Figure. AVF velocity streamlines at 7 and 21 days after creation.
Streamlines at systole for NOS3 OE Day 7 (a), NOS3 OE Day 21 (b), NOS3+/+ Day 7 (c), NOS3+/+ Day 21 (d), NOS3-/- Day 7 (e), NOS3-/- Day 21 (f). Velocity scale bar in (a)-(b) applies to (a)-(f).

AVF velocity streamlines at 7 and 21 days after creation.

10 A novel rat model of balloon angioplasty for the understanding of accelerated restenosis in avf

Maheshika Somarathna, Tatyana Isayeva-Waldrop, Kevin Ingle, Huashi Li, Lingling Guo, Timmy Lee

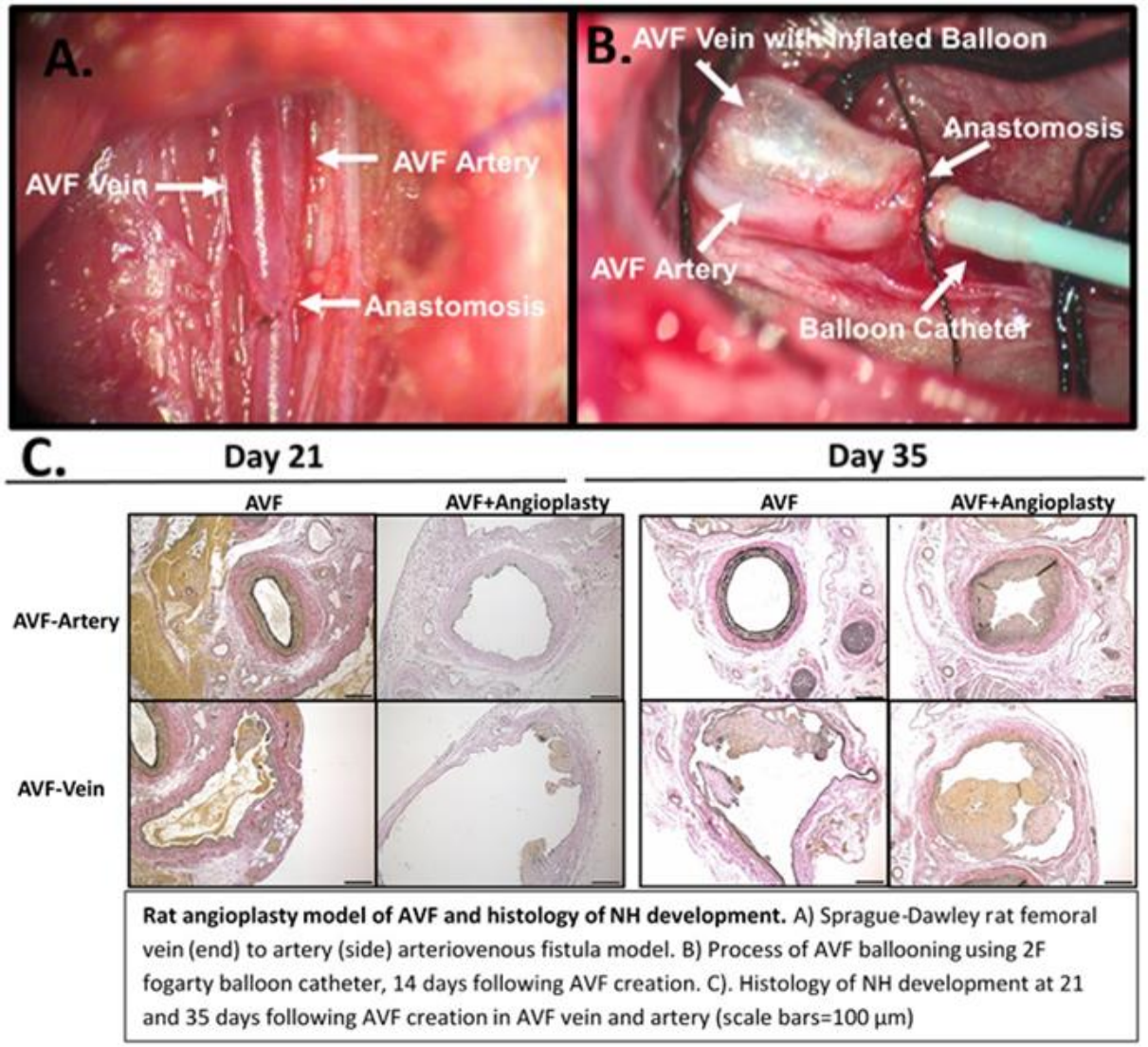
University of Alabama at Birmingham, Birmingham, United States of America

Introduction:
Accelerated restenosis following balloon angioplasty (BA) in arteriovenous fistula (AVF) remains a important clinical problem. The lack of an animal model limits the understanding of pathophysiological factors that contributes to the restenosis. The aim of this study is to establish a BA injury model in rat AVF.

Methods and Results:
AVFs were created in 12-16 weeks old rats, followed by ballooning the AV anastomosis at 14 days, and sacrificed at 21 and 35 days post AVF creation. Extent of balloon injury and histological features were characterized by changes in 1) medial thickness 2) neointimal hyperplasia (NH) formation and 3) expression of eNOS3 and MCP1. We observed a significant reduction in medial thickness in AVF vein ($P < 0.05$) and artery ($P < 0.01$) in the BA group compared to the control group without BA. The rate of NH formation was significantly higher at both time points in ballooned AVF artery ($P < 0.05$) and a similar trend was also observed for the ballooned AVF vein. There was a significant reduction in eNOS protein expression in AVF vessels at 21 days in BA group and it remained decreased at 35 days in the venous segment ($P < 0.05$). In the BA group, MCP-1 was increased at 21 days following AVF creation, which was more prominent in the venous segment ($P < 0.01$).

Conclusion and Discussion:
Angioplasty following AVF creation resulted in reduced medial thickness and decreased eNOS protein levels, signifying angioplasty-induced vessel and endothelial damage. Vascular injury induced inflammatory response may result in accelerated NH formation.

Picture 1:



Rat angioplasty model of AVF and histology of NH development. A) Sprague-Dawley rat femoral vein (end) to artery (side) arteriovenous fistula model. B) Process of AVF ballooning using 2F fogarty balloon catheter, 14 days following AVF creation. C). Histology of NH development at 21 and 35 days following AVF creation in AVF vein and artery (scale bars=100 μm)

11 Autophagy response in the setting of shear stress and arteriovenous fistula maturation.

Tatyana Isayeva Waldrop, Miles Grigorian, Jeonga Kim, Maheshika Somarathna, Lingling Guo, Kevin Ingle, Timmy Lee

University of Alabama at Birmingham, Birmingham, United States of America

Introduction:
Venous neointimal hyperplasia is an important cause of dialysis arteriovenous fistula (AVF) failure. Mechanical wall stress, plays an important role in AVF remodeling. Autophagy signaling may play a key role in maintaining cell survival under disturbed flow conditions, such as seen in arteriovenous fistulas. The goal of this study is to evaluate the role of macroautophagy in the setting of laminar shear stress and disturbed flow as seen in AVF development.

Methods and Results:
Our in vitro studies using customized perfusion system using HUVEC cells demonstrated an significant increase in autophagy signaling (ATG3, ATG7, and LC3) in 1 hour after exposure to the laminar shear stress (LSS) 20 dyne/cm2 vs static conditions($p<0.015$). We also characterized autophagy in murine and rat AVFs to evaluate the role of autophagy in disturbed flow settings. In our murine AVF model, the venous intima/media ratio and p62/SQSTM1 positive cells were significantly higher ($p<0.004$ and $p<0.012$ respectively) in the endothelial cells-specific *ATG7* knock-out (EC-ATG7$^{-/-}$) mice AVF tissues versus ATG7 wild type mice (ATG WT) (Figure 1). Western blot staining of rat AVFs revealed significant expression of p62/SQSTM1 protein in 1 hour and 7 days following AVF creation, suggesting an impaired autophagic flux.

Conclusion and Discussion:
Disturbed autophagy may play an important role in the setting of shear stress and disturbed flow and during the early events of AVF creation and neointima hyperplasia formation. Further elucidation of mediators of that regulate autophagic response in the setting of AVF creation and therapies that modulate autophagy may enhance AVF development.

Picture 1:

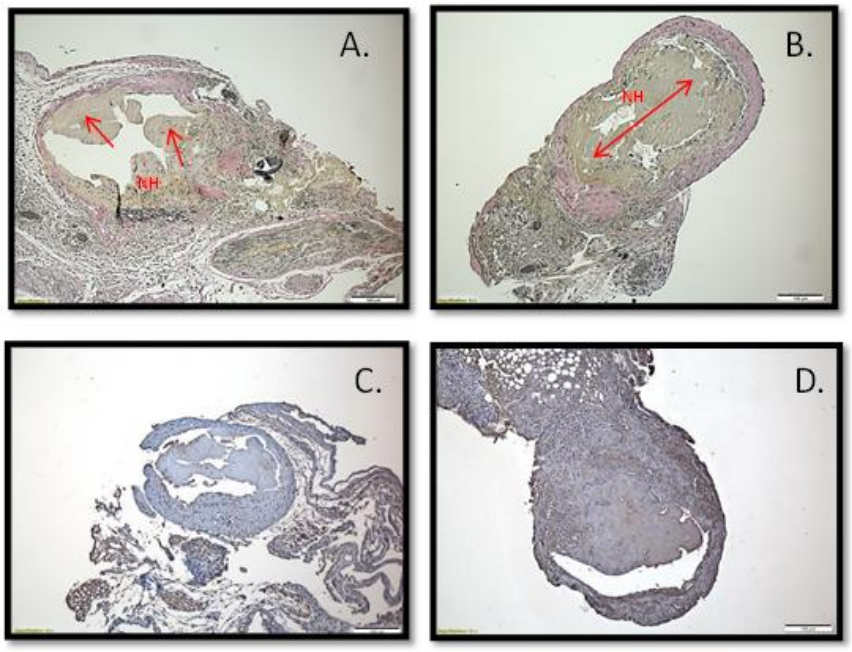


Figure 1. Development of Neointima hyperplasia (NH) and p62/SQSTM1 expression at day 7 post-AVF creation in ATG7 WT (A and C) and EC-ATG7$^{-/-}$ (B and D) mice.

13 Vein preservation: use of arteriovenous fistulas for venepuncture on a transplant ward

Heather Trimble, Jennifer Hanko

Belfast Health and Social Care Trust, Belfast, United Kingdom

Introduction:
For patients admitted to our kidney transplant ward, accepted practice has been to only use the patient's arteriovenous fistula (AVF) as a 'last resort' for inpatient venepuncture. Concerns were raised that this strategy limited future AVF creation options and caused unnecessary pain and discomfort to patients by limiting potential venepuncture sites. Current practice was reviewed.

Methods and Results:
Clinical notes for all patients admitted to the transplant ward from January to November 2018 were retrospectively reviewed to obtain details of inpatient venepuncture practice. Patients were phoned to confirm clinical history and to establish their views on the use of their AVF for venepuncture. There were 112 patients admitted of whom 35 (31%) had a functioning AVF; 14 (40%) of the AVFs were used for venepuncture during their admission. Of those patients contacted by telephone 10 responded. All 10 confirmed they would be happy for trained staff on the transplant ward to use their AVF for venepuncture.

Conclusion and Discussion:
Vein preservation for future AVF creation is critical to patients with end-stage renal disease. Despite our practice of only using AVFs as a last resort for venepuncture, this was still necessary in 40% of the patients with AVF. We plan to change our practice: all staff on the transplant ward will be trained to use AVF for venepuncture. A functioning AVF will be used 'first line' for venepuncture with a view to preserving the veins on the other arm for future AVF creation.

14 A novel hybrid silk-fibroin/polyurethane three-layered vascular graft: towards in situ tissue-engineered vascular accesses for hemodialysis

Sebastião van Uden[1], Valentina Catto[1], Noemi Vanerio[2], Barbara Bonandrini[3], Matteo Tironi[4], Marina Figliuzzi[4], Andrea Remuzzi[5], Linda Kock[2], Alberto Cesare Luigi Redaelli[3], Francesco Giovanni Greco[1], Stefania Adele Riboldi[1]

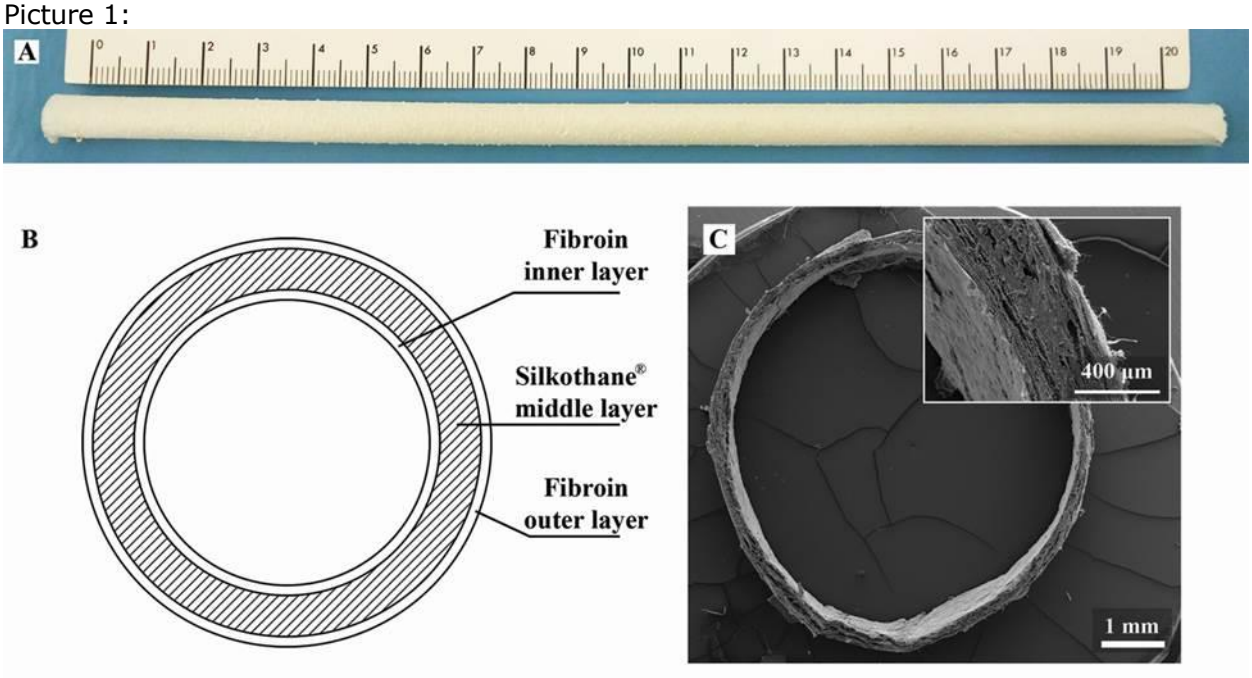
[1]Bioengineering Laboratories S.r.l., Cantù, Italy
[2]LifeTec Group BV, Eindhoven, Netherlands
[3]Politecnico di Milano, Milano, Italy
[4]Istituto di Ricerche Farmacologiche Mario Negri IRCCS, Bergamo, Italy
[5]Università degli Studi di Bergamo, Bergamo, Italy

Introduction:
Clinically available alternatives of vascular access for long-term hemodialysis, namely native fistulae and synthetic grafts, suffer from several drawbacks and are associated to high failure rates. *In situ* tissue engineering (i.e. the implantation of an acellular scaffold to be remodeled over time by the host) could provide the ideal solution that combines the short-term advantages of vascular grafts (early cannulation) and the long-term ones of fistulae (high success rates driven by biointegration). Hence, in this study a novel silk fibroin/polyurethane (Silkothane®) vascular graft was developed to be applied as long-term vascular access pursuing a "hybrid" *in situ* engineering approach (i.e. based on a semi-degradable scaffold).

Methods and Results:
Three-layered grafts (with fibroin-only inner and outer layers and a Silkothane® core, Fig. 1) were manufactured by electrospinning, and characterized concerning morphology, mechanics, physical properties, blood contact and vascular cell adhesion/viability. The grafts showed ECM-*like* morphology and favorable mechanical properties (e.g., vein-graft compliance matching and early-cannulation potential in line with self-sealing commercial synthetic grafts), were subject to bioactive-only degradation, revealed promising hemocompatibility properties (i.e. non-hemolytic character, long clotting time), and demonstrated the ability to host human umbilical vein endothelial cells on their surface for up to 7 days in vitro.

Conclusion and Discussion:
Although further *in vitro*, *in vivo* and clinical studies are needed to verify the feasibility of the transition from a hybrid graft into an arteriovenous blood vessel, the proposed approach may represent a step forward towards an *in situ* engineered hybrid vascular access with potentialities for vein-graft matching, early cannulation, and biointegration.

Picture 1:



Macroscopical appearance of the Silkothane® graft (A); schematic representation of its three-layered structure (B) and morphological analysis

15 Percutaneous peritoneal dialysis catheter placement under local anaesthesia, a 4 year retrospective single-centre experience

Jacob Lutjeboer, Mieke Moses, Joris Rotmans, Arian van Erkel

Leiden University Medical Centre, Leiden, Netherlands

Introduction:
Proper insertion of a peritoneal dialysis catheter (PDC) is of pivotal importance for patients that initiate peritoneal dialysis (PD). Currently laparoscopic or open surgical techniques are most frequently utilized for PDC insertion. Percutaneous PDC insertion has emerged as a less invasive option performed under local anesthesia. To make PDC insertion accessible to inoperable patients and to avoid surgical waiting list, it is decided to place percutaneous PDC in the Leiden University Medical Centre. The aim of this study is to report our experience with radiological PDC insertion placed under local anesthesia from 2014.

Methods and Results:
The medical records and dialysis registries of patients who initiated PDC between October 2014 and July 2018 were retrospectively reviewed. Relevant data such as complications, previous PDC, peritonitis were collected. In this 4-year period, 48 PDC placements in 41 patients were performed. The technical success rate was 94%. Three PDC placements were not successful because of adhesions due to previous peritonitis. The complication free survival rate at 90 days is 75 %. In 4 patients, PDC migration was observed (3 previous PDC, 2 with peritonitis). Three patients had an episode of PDC infection (two within 30 days, 1 pseudomonas and 1 peritonitis by diverticulitis).

Conclusion and Discussion:
The percutaneous radiological PDC insertion under local anaesthesia is a safe and feasible procedure. The complication rate was low during the observation period. The relatively easy and fast percutaneous PDC insertion has resulted in a sharp increase in percentage of patients on PD in our centre and made PD accessible to inoperable patients.

16 The development of a perfusion device to apply varying hemodynamic parameters to bovine arteriovenous tissue

David O'Connor[1], Marco Franzoni[1], David Power[2], Tony Moloney[2], Eamonn Kavanagh[2], Michael Walsh[1]

[1]University of Limerick, Limerick, Ireland
[2]University Hospital Limerick, Limerick, Ireland

Introduction:
Hemodynamics is strongly correlated with vascular remodelling, especially within arteriovenous fistulas (AVF) due to the untypical arterial flow conditions presented at the vascular access site [1–3]. Previous attempts to replicate in-vivo settings have led to developments in identifying key components of the flow interfering with biological responses in AVFs [4–6]. A perfusion system capable of analysing a physiologically comparable setup and maintaining tissue viability in a surgical constructed living ex-vivo AVF, for up to two weeks, at various timepoints has been developed.

Methods and Results:
The tissue samples were prepared by a surgical procedure ensuring simulation of AVF clinical settings, and exposure of the tissue was completed for up to 3-weeks. H&E staining, MTT assays and immunofluorescence staining provided an evaluation of structural components of the tissue along with the tissue's viability post-experimentation.
The system provides evidence that we can maintain AVF physiological hemodynamic parameters exposure in bovine ex-vivo tissue for up to two weeks. Tissue integrity was preserved in comparison to the static control and native samples. Confirmation of the cell viability from both the MTT assay and immunofluorescent images identifies cell activity.

Conclusion and Discussion:
The system can be used as an ex-vivo AVF simulation to evaluate the varied hemodynamics parameters driving the cellular mechanotransduction process due to this altered environment. We show tissue and cell viability at a two-week period leading to confirmation that the system can provide a platform for AVF ex-vivo simulation. It is desirable to reach four weeks to have a clinical comparison with the fistula maturation process.

Picture 1:

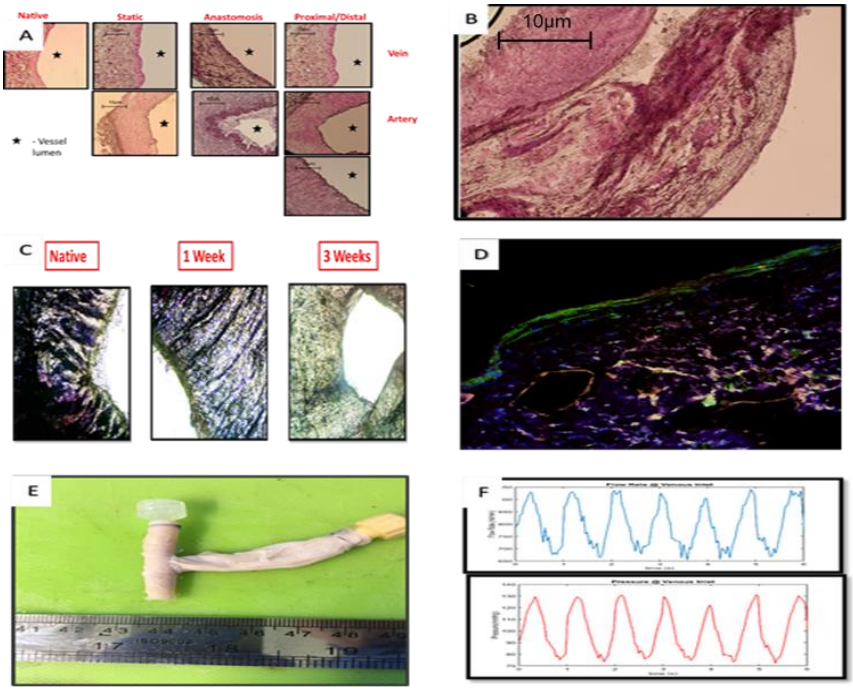


Illustration of H&E, MTT Assays, and Immunofluorescence staining along with results from system control parameters and living bovine AVF.

17 Strategy for constructing vascular access in our hospital when patients scheduled for preemptive kidney transplantation (pekt) start dialysis.

Toshinori Ishizuka, Satoshi Hamanoue, Akira Miyata

Japanese Red Cross Kumamoto Hospital, Kumamoto, Japan

Introduction:
In kidney transplantation (KT) in Japan, living-donor KT accounts for the majority. Recently, the number of patients who wish to receive PEKT is increasing. However, renal function has already declined at the time of first visit in transplant outpatient, and many patients need dialysis before transplantation. In that cases, there is no guideline to construct or select appropriative vascular access (VA).

Methods and Results:
From 2013 to 2018, 123 living-donor kidney transplantations were performed at our hospital, and 57 patients wished to perform the PEKT in first visit. Among them, 31 patients received dialysis introduction before transplantation (PD: 2 cases).At the first visit, average estimated-glomerular filtration rate (eGFR) was 9.9±3.8 mL/min/1.73m2, which was superiorly lower in the dialysis-introduced group (10.8 vs 8.4, P=0.008). In the dialysis introduction group, 10 cases were arteriovenous fistula (AVF), 4 cases were tunneled cuffed catheter (TCC). The averaged waiting period before KT was 104±43.3 days by AVF, and 75.5± 50.9 days by TCC. Although in 15 cases using un-cuffed non-tunneled catheter (double lumen catheter :DLC) that catheter related blood stream infection occurred in one case.

Conclusion and Discussion:
The advantage of selecting TCC is avoidance of cardiac burden caused by AVF creation and avoidance of VA troubles after KT. Disadvantages of TCC include risk of infection, but risk is lower than DLC. If the waiting period before transplantation is short, short term use of TCC seems to be useful as a method to avoid troubles due to AVF creation.

18 Vascular remodeling and hemodynamic changes in a patient-specific arteriovenous fistula for hemodialysis

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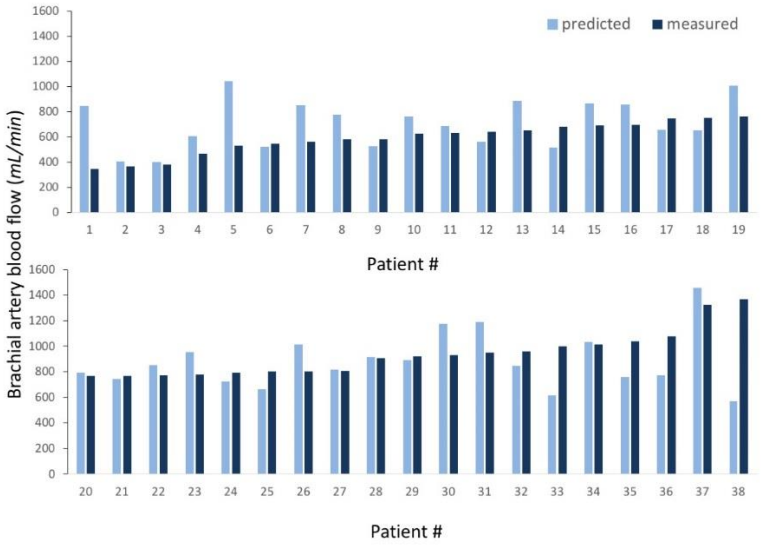
Introduction:
Native arteriovenous fistula (AVF) is the preferred vascular access for hemodialysis, but it still has high rate of failure due to stenosis formation. Convincing evidence supports a key role of local hemodynamics in vascular remodeling, suggesting that disturbed flow conditions may be related to stenosis development. The purpose of our investigation was to explore the feasibility of coupling contrast-free 3D fast-spin echo MRI and high-resolution computational fluid dynamics (HR-CFD) to relate morphological vessel changes to local hemodynamics in AVF over time.

Methods and Results:
We acquired contrast-free 3D fast spin echo MRI (CUBE T1) at 1 and 6 weeks, 6 months and 1 year after radio-cephalic AVF creation in one patient. We generated 3D models and evaluated lumen cross-sectional area changes over time. We observed a dilatation in the vein over time until 6 months, followed by a narrowing of the juxta-anastomotic vein at 1 year after surgery (*Figure 1A*). We performed HR-CFD using flow waveforms boundary conditions derived from Ultrasound and we computedthe two components of the wall shear stress vector over time, namely WSSdir, the component in the mean direction of the WSS vector and WSStr, the transversal component.We observed high frequency fluctuations in different locations of the vein at 6-week and 6-month, that damped at 1-year after AVF creation, as a result of vessel remodeling (*Figure 1B*).

Conclusion and Discussion:
Optimized CUBE T1, coupled with CFD, represents a promising approach to elucidate mechanisms of vascular remodeling and can be used for clinical investigations aimed at identifying critical hemodynamic factors responsible for AVF failure.

Picture 1:



Representation of venous cross-sectional area changes over time. 1B) WSSdir and WSStr traces throughout the cardiac cycle

19 Influence of chronic kidney disease on in situ tissue formation in vascular access grafts

Paul Besseling[1], Merle Krebber[1], Joost Fledderus[1], Martin Teraa[1], Arturo Lichauco[2], Aurelie Serrero[2], Carlijn Bouten[3], Patricia Dankers[3], Martijn Cox[2], Marianne Verhaar[1]

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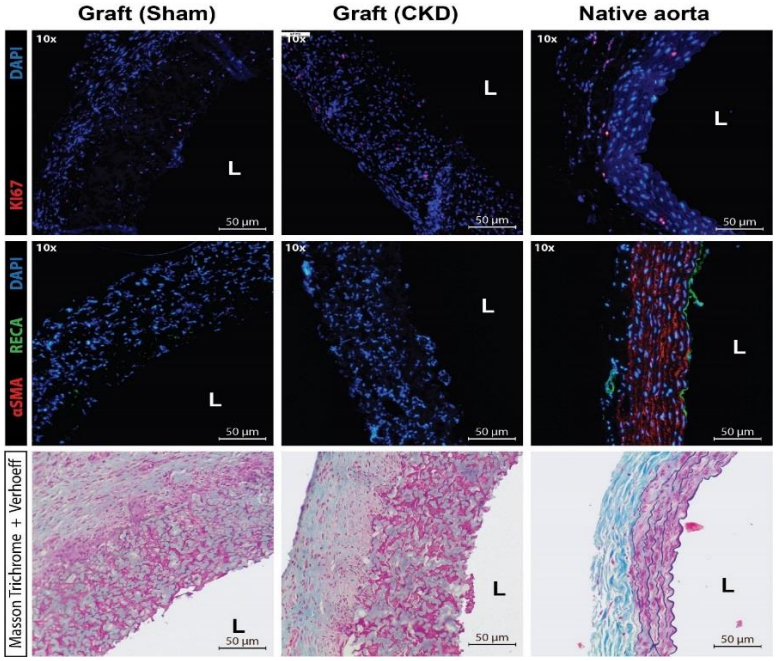
[2]Xeltis, Eindhoven, Netherlands
[3]TU/e, Eindhoven, Netherlands

Introduction:
Vascular access is considered the Achilles' heel of hemodialysis, requiring frequent interven-tions to maintain patency[1–3]. A proposed solution is self-healing vascular access grafts by means of *in situ* tissue engineering. One major limitation is the reliance upon the presence of a functional wound healing/immune response that has a sufficient capacity to initiate regeneration/healing. However, this is negatively affected by chronic kidney disease (CKD)[4]. Therefore, we aim to study the effect of CKD on *in situ* tissue formation in vascular access grafts in a rat model.

Methods and Results:
To mimic the effect of CKD in humans a rat model is created by 5/6th nephrectomy. Control animals receive a sham operation. When CKD animals reach a threshold of 50mg/24h proteinuria a vascular graft is implanted by end-to-end interposition in the abdominal aorta. Explantation is performed at 2, 4, 8 and 12 weeks. Explants are monitored for cell infiltration, proliferation, immune-, endothelial-, smooth muscle cells presence and ECM components.
Initial results indicate that after two weeks all implanted grafts contain numerous infiltrated cells, but no endothelial or smooth muscle cells (figure1). No difference is observed in the number of infiltrating or dividing cells between grafts from CKD and control animals. Results from later timepoints and immune analysis are expected in the coming months.

Conclusion and Discussion:
After 2 weeks, CKD does not seem to alter early cell infiltration in the grafts. Later time points will be essential in the investigation of the wound healing process in CKD and its effects on tissue formation.

Picture 1:



Immunofluorescent and histochemical comparison of two week implanted grafts in Sham and CKD animals; compared to native abdominal aorta.

20 Arteriovenous fistula after successful kidney transplantation

Dean Markic, Kristian Krpina, Antun Grškovic, Dražen Rahelic, Nino Rubinic, Mauro Materljan, Ivan Vukelic, Lidija Orlic, Josip Š panjol

University Hospital Rijeka, Rijeka, Croatia

Introduction:
The modalities of renal replacement therapy included hemodialysis, peritoneal dialysis and kidney transplantation. Kidney transplantation is still the most efficient type of therapy but because of organ shortage the majority of the patients are on hemodialysis. In the most patients hemodialysis is performed using arteriovenous fistula (AVF). After successful kidney transplantation the AVF fistula was not needed. We will present the function of AVF fistula in the patients after kidney transplantation.

Methods and Results:
We retrospectively analyzed all patients with kidney transplantation in the Department of Urology, between 2014 and 2016. From this three year period we extract and analyzed patients who were, before transplantation, on hemodialysis using AVF. The patients were mnjimally followed 18 months. In the three year period we performed 88 kidney transplantations. Overall 49/88 (55,7%) patients has AVF before successfull kidney transplantation. One year after kidney transplantation AVF was in function in 37 (75,5%) patients. Losing of AVF during first year was due to: spontaneous thrombosis (9 patients-18,3%) and lethal outcome with functional AVF (3 patients-6,1%). Survival of AVF after 18 months was 73,5%. During the prolonged follow-up in 4 (8,2%) patients AVF was surgically closed.

Conclusion and Discussion:
Before the kidney transplantation the most of our patients was on the hemodialysis. One year after successful kidney transplantation in the majority of the patients AVF is still in the function. In patients with complications related to AVF (volume overload, development of aneurysm) the surgically closing is indicated.

21 Is vessel wall compliance required to characterise the hemodynamics in an arteriovenous fistula

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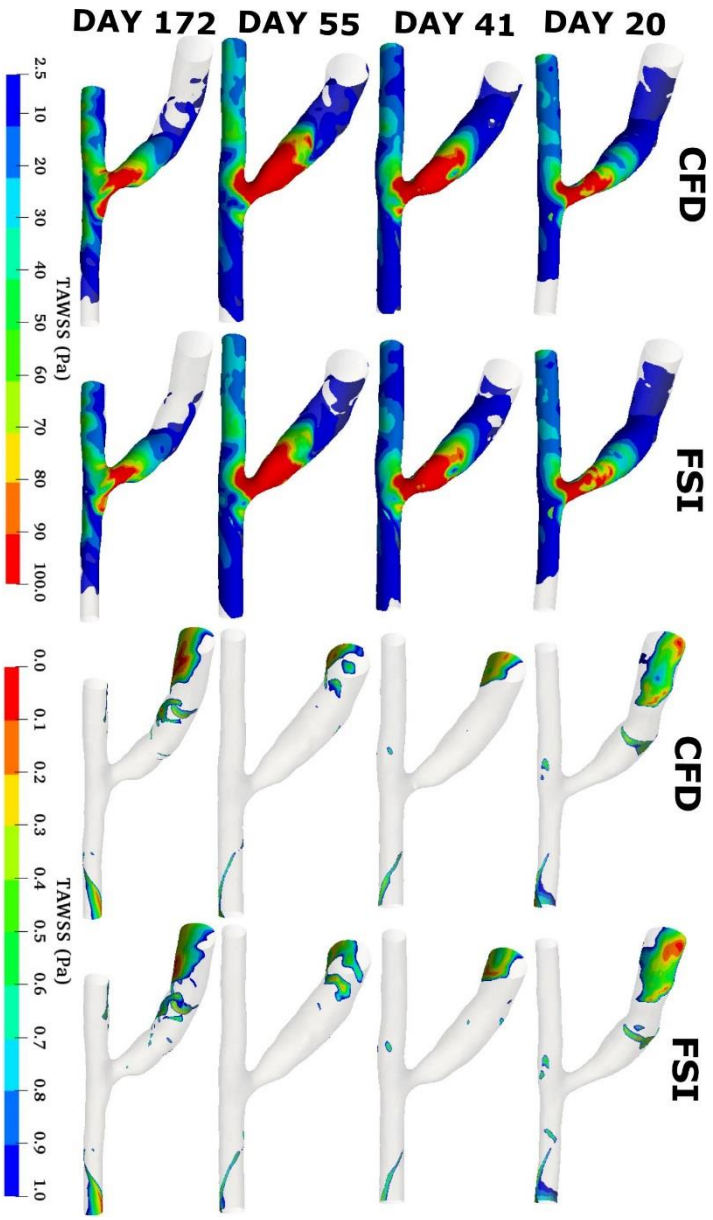
University of Limerick, Limerick, Ireland

Introduction:
Arteriovenous fistulas (AVFs) are the preferred type of vascular access to facilitate dialysis. Despite this, AVF primary failure rates range between 18%-28% [(1)]. The complex geometries and flow, associated with fistulas, are implicated in the initiation of disturbed shear (DS). DS has been correlated with the development of Intimal hyperplasia [(2)]. Computational models use wall shear stress (WSS) based metrics to retrospectively identify areas of DS. Traditionally, this is achieved using computational fluid dynamics (CFD). CFD makes the unrealistic assumption of rigid vessel walls. Recent studies have deployed Fluid Structure Interaction (FSI) simulations to determine the effect of vessel compliance [(3)]. The present study investigates hemodynamic alterations in patient-specific AVFs at four time-points allowing hemodynamics at one time-point to be correlated to morphological changes at later time-points. Facilitating identification of the hemodynamic characteristics responsible for AVF dysfunction. However, the effect vessel compliance has on fistula hemodynamics remains unclear.

Methods and Results:
Contour plots of high and low TAWSS distributions, calculated by CFD and FSI, display similar distribution patterns. However, FSI exhibits systematically lower WSS magnitudes. Similar patterns were seen across all WSS metrics.

Conclusion and Discussion:
Results demonstrate qualitatively there is good agreement between FSI and CFD in terms of the distribution of WSS. However, quantitatively there are noticeable differences in the peak values for some metrics. These findings suggest, CFD can predict the distribution of WSS. However, FSI is required when analysing the magnitude of WSS.

Picture 1:



Contour plots of high and low TAWSS distributions, calculated by CFD and FSI, display similar distribution patterns.

22 Placement of tunneled cuffed catheters through right external jugular vein in patients with internal jugular vein insertion site occlusions

Lihua Wang, Fang Wei, Aili Jiang

Department of Kidney Disease and Blood Purification Centre, Institute of Urology, Tianjin, China

Introduction:
Although some studies of external jugular vein for permanent hemodialysis access via tunneled catheter have been reported[1,2], either in surgical or percutaneously way, but the survival of cuffed tunneled catheters using right external jugular vein in patients with internal jugular vein insertion site occlusions has not been fully investigated. Therefore, we evaluated the surgical technique of using right EJV to insert tunneled cuffed catheters in hemodialysis patients while their ipsilateral internal jugular vein insertion sites were occluded.

Methods and Results:
A total of 30 patients were included in this study. All of them had history of catheter insertion in right internal jugular vein and insertion site was occluded. Tunneled cuffed catheters were inserted via right external jugular vein surgically. The baseline anthropometric and laboratory parameters were collected. The catheter dysfunction and catheter-related infection were documented. During the 3 year of study time period, technical success rate was 100%. Median infection-free survival and dysfunction-free survival after catheterization were 544 and 773 catheter days. Mean survival time per catheter was 975 catheter days.

Conclusion and Discussion:
Tunneled cuffed catheter using right external jugular vein was both technically feasible and effective for hemodialysis patients with internal jugular vein insertion site occlusions. It can be a second choice of insertion site for hemodialysis patients with a history of catheter insertion in internal jugular vein.

Picture 1:

Disection of right external jugular vein before tunneled cuffed catheter insertion

23 Vascular access for dialysis - role of heparin coated central venous catheters?

Dario Nakic[1], Petra Grbic Pavlovic[2], Danijela Santini Dusevic[2], Marina Vojkovic[2]

[1]General Hospital Zadar, University of Zadar, Zadar, Croatia
[2]General Hospital Zadar, Zadar, Croatia

Introduction:
Comorbid conditions affecting vasculature combined with an aging of population have an influence on the choice for vascular access. The aim of study was to clarify differencies in the quality of dialysis and ferquency of complications in the patients with arteriovenous fistula (AVF), standard and heparin coated central venous catheters (CVC).

Methods and Results:
In this prospective study performed from 2016 to 2018 we observed 63 patients with AV fistula, standard CVC and heparin coated CVC, each group consisted of 21 member. There was no statistical difference in the age, time spent on the dialysis, sex, blood flow, diabetic patients, anemia and nutritional status. Follow up period was 1 year, with controls every 3 months, in each was measured ferquency of complications and quality of dialysis estimated by Kt/V: AVF 1.7, standard CVC 1.2 and heparin coated CVC 1,52. T-test was used to find out differencies between the groups and values $p<0.05$ was considered significant.

Conclusion and Discussion:
There was no significant diferencies in the number of infections and dysfunction between the groups. Generaly 75% of patients have no complications, highest number was noticed for flow disturbancies in group with standard CVC 24% vs. 14% in heparin coated CVC and 5% in AVF group.There was significant difference in the quality of dialysis in AVF vs standard CVC, but no significant difference between AVF vs. heparin coated CVC, even the AVF showed better quality of dialysis. Improving performances of CVC could perform high quality of dialysis, very close but still not the same as AVF.

24 Efficacy of thrombectomy using multiple guidewires to treat thrombotic dysfunction of tunneled hemodialysis catheters.

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[1]Nephrology, National Hospital Organization KURE Medical Center, Kure, Japan
[2]Nephrology, Graduate School of Biomedical Sciences, Hiroshima University, Hiroshima, Japan

Introduction:
The purpose of this study was to assess the efficacy and safety of thrombectomy using multiple guidewires to treat thrombotic dysfunction of tunneled hemodialysis catheters (TCCs).

Methods and Results:
This single-center retrospective study analyzed 12 catheters used for 10 patients who had TCCs inserted between 2014 and 2018, with the occurrence of thrombotic dysfunction. Thrombotic dysfunction of the TCCs was diagnosed by catheter angiography. Thrombectomy was performed using multiple guidewires, adjusted for catheter lumen. Initial success was defined when contrast agent jets were observed from the distal hole of the TCCs using postoperative catheter angiography, and when the TCCs was usable for hemodialysis. The initial success rate and duration of postoperative catheter patency were analyzed. Initial success was achieved in all 12 cases. In 8 of these 12 cases, TCCs remained within the patent for 61.4 ± 52.7 postoperative days, after which the catheter was removed due to infection, maturing of shunt, or patient death. In 4 of the 12 cases,

there was a recurrence of thrombotic dysfunction after 119.5 ± 47.2 postoperative days. However, in all cases, successful thrombectomy using multiple guidewires was re-performed. No TCCs were removed due to thrombotic dysfunction. Adverse events were not observed in all 12 cases.

Conclusion and Discussion:
Our study confirmed the utility and safety of thrombectomy using multiple guidewires to treat thrombotic dysfunction of TCCs.

25 Evaluation of hemodialysis catheter dysfunction - a dutch survey

Sheena Bhagirath, Marcel Weijmer

Onze Lieve Vrouwe Gasthuis, Amsterdam, Netherlands

Introduction:
Hemodialysis catheter (HC) dysfunction occurs in 30-50% of hemodialysis sessions. Guidelines give several recommendations but it is unclear how they are implemented. In this study we investigated the inter-center differences in protocols and practice.

Methods and Results:
A survey on current practice in HC dysfunction was sent to Dutch nephrologists, dialysis nurse practioners and nurses. If available, HC dysfunction protocols were evaluated. Seventy-one clinicians took part in the survey. Eight percent defined dysfunction as no flow, 30% as a flow <150mL/min, 41% as a flow <200mL/min, 17% as a flow <250mL/min and 3% as a flow <300mL/min. At first, 65% used a thrombolytic lock for 30 minutes, 23% used a lock until the next dialysis, 1% used a thrombolytic pump while dialysis. If flow remained impaired, 34% exchanged the HC over guidewire, 20% placed a HC at a new site, 4% accepted low flow, 3% removed the fibrin sheath and exchanged the HC, 21% combined the previous. Of all participants 22% did not have a protocol and 11% did not know whether a protocol was present. In total 15 protocols were acquired. One was a workflow on how to manage HC dysfunction. The other 14 were incomplete instructions and/or were only concerning thrombolytic agents with numerous dosage and method recommendations.

Conclusion and Discussion:
There is large variability in HC dysfunction treatment. Thirty-three percent of the participants do not use a protocol. This clearly emphasizes the need for a standardized approach in HC dysfunction.

26 Cardiovascular effects following arteriovenous fistula creation in a mouse model

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UNIVERSITY OF ALABAMA AT BIRMINGHAM, Birmingham, United States of America

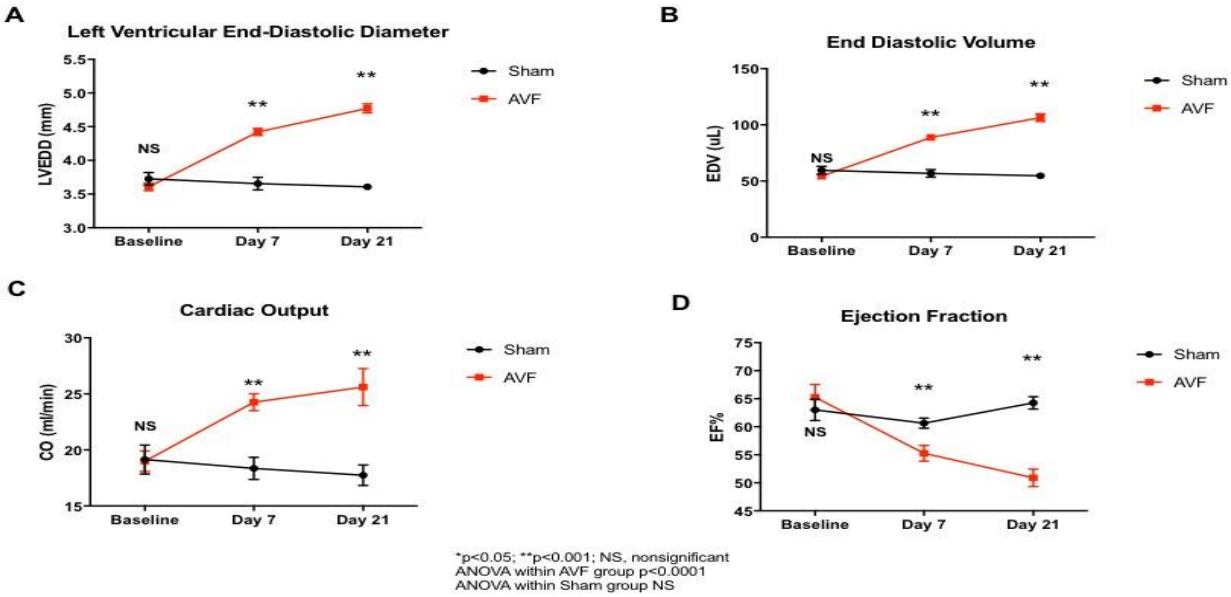
Introduction:
Cardiovascular disease is the leading cause of morbidity and mortality among hemodialysis patients. Arteriovenous fistula (AVF) creation may negatively affect cardiac structure and function further impacting cardiovascular mortality. We hypothesized that AVF creation results in high cardiac workload, inducing structural and functional changes in the heart.

Methods and Results:
AVFs were constructed using the carotid artery/jugular vein in C57B6 mice. Sham-operated mice served as controls. Echocardiography was performed prior to creation (baseline) and at 7 and 21 days creation in AVF and sham-operated mice. The cardiac

output (CO), left ventricular end-diastolic diameter (LVEDD), and end-diastolic volume (EDV) were significantly increased at 7 and 21 days in AVF compared to sham-operated mice(Figure 1). There was also a significant increase in CO, LVEDD, and EDV from baseline to 21 days within the AVF group, but not the sham-operated group(Figure 1). Ejection fraction was significantly decreased in AVF mice from baseline to 21 days, which was not observed in sham-operated mice(Figure 1). Picrosirius red was used to stain the left ventricle for collagen production, which was increasingly prominent around the perivascular areas of the cardiac tissue in AVF mice.

Conclusion and Discussion:
The creation of an AVF leads to high cardiac workload, which induces changes to several clinically important cardiovascular parameters. Additionally, the presence of an AVF over time shows signs of dilated cardiomyopathy, which may further increase risks of cardiovascular mortality. Our future studies will evaluate specific mechanisms leading AVF-induced cardiovascular structure and function and the ability to attenuate and reverse these changes.

Picture 1:



Cardiovascular parameters from baseline to 7 and 21 days after AVF surgery

27 Why prognostic factors of cardiovascular complications have low clinical benefit? statistical and clinical tricks

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Moscow Regional Research and Clinical Institute, Moscow, Russian Federation

Introduction:
Stratification at risk of cardiovascular complications and death is widely used in patients with CKD. However, high statistical significance does not always ensure clinical efficacy.

Methods and Results:
Many of the risk factors associated with mortality become statistically insignificant when stronger predictors are included in the model – (fig. 1). The severity of diastolic dysfunction is strongly associated with mortality. The informativity of this predictor is reduced by the lack of clear diagnostic criteria, the complexity of measuring highly informative parameters, which are not included in the routine protocol of echocardiography. The ejection fraction (EF) is also strongly associated with mortality. Despite the fact that the AUC-ROC reaches 0.8-0.85, clinically valuable prognosis can be perform only in the marginal values, i.e. approximately 10-15% of patients. In other

cases, positive predictive value and negative predictive value are close to 50-60% (i.e. useless). Thus, EF as a prognostic factor actually becomes binary, which makes it less informative in risk stratification. Qa/cardiac output ratio is a known risk factor. However, during the HD session there is a decrease in CO against the background of a relatively stable value of Qa, which leads to a significant increase in Qa/CO at the end of the session. Echocardiography is usually performed before HD or on a non-dialysis day, leading to an underestimation of the risk.

Conclusion and Discussion:
In addition, most of the risk factors are non-modifiable, so it is impossible to fully manage the risks. Multivariate analysis may not always provide benefits. It is necessary to use more objective risk measures.

Picture 1:

	HR	95% CI	P-value
Age	1.03	0.99-1.06	0.39
BMI	1.02	0.97-1.05	0.68
Sex (M/F)	1.2	0.97-1.31	0.09
Hb	0.99	0.96-1.03	0.57
CRP	1.04	0.98-1.07	0.18
PTG	**1.03**	**1.01-1.06**	**0.02**
Albumin	0.96	0.81-1.05	0.61
Time on GD	1.09	0.98-1.08	0.13
MAP	1.01	0.99-1.03	0.77
kT/V	0.97	0.88-1.12	0.64
Cumulative illness rating score	**1.11**	**1.07-1.17**	**0.001**
Diastolic dysfunction (reference quantile) 0			
1	1.03	0.96-1.16	0.18
2	**1.1**	**1.02-1.21**	**0.016**
3	**1.74**	**1.68-1.83**	**<0.0001**
Ejection fraction (reference quantile) 50-59%			
40-49%	**1.22**	**1.02-1.76**	**0.014**
30-39%	**3.21**	**2.04-6.1**	**<0.0001**
<30%	**4.72**	**3.23-7.44**	**<0.0001**
PASP (reference quantile) <25mmHg			
25-45mmHg	1.03	0.93-1.13	0.56
45-65mmHg	**1.46**	**1.1-1.95**	**0.01**
>65mmHg	**2.2**	**1.48-3.25**	**<0.0001**
Qa (per each 100ml)	**1.11**	**1.05-1.22**	**0.001**
Qa/CO	**1.12**	**1.07-1.18**	**0.001**
CHF (reference quantile) NYHA 0			
1	1.14	0.92-1.4	0.21
2	**1.72**	**1.12-2.4**	**0.01**
3	**3.1**	**2.31-4.16**	**<0.0001**
Diabetes Yes/No	**2.1**	**1.84-2.34**	**<0.0001**
Pre-HD CHF Yes/No	**1.59**	**1.28-1.89**	**<0.0001**

Risk factors (Cox proportional hazards regression model)

28 Cohort study of vascular access on the effect of new onset atrial fibrillation in end-stage renal disease patients

Haibo Yu[1], Xuewen Wang[2], Bo Li, Hongye Dong, Aili Jiang

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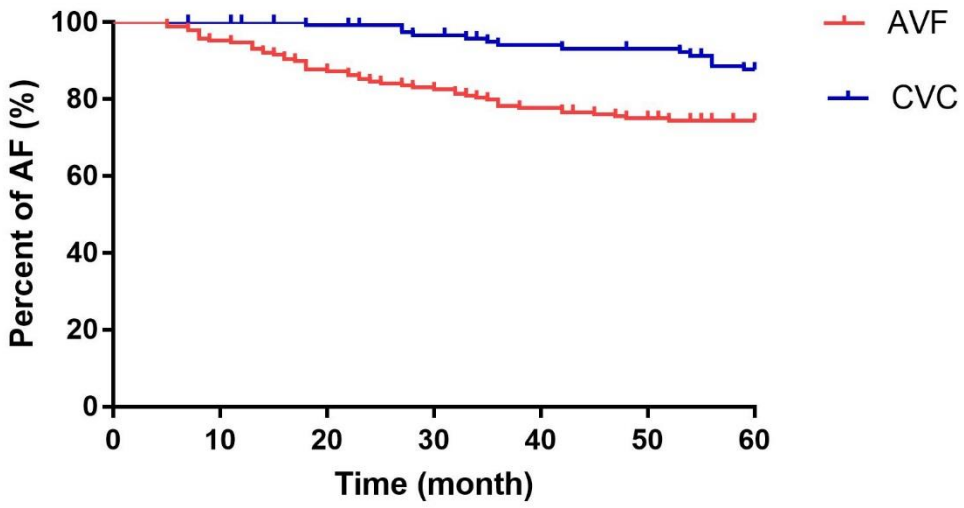
[2]Tianjin Institute of Cardiology, Tianjin, China

Introduction:
Atrial fibrillation(AF) is a serious complication, especially in patients on dialysis. The effect of different hemodialysis vascular access on new onset atrial fibrillation remains unclear. This study will investigate the effect of vascular access on new onset atrial fibrillation in hemodialysis patients.

Methods and Results:
This is a single - center retrospective cohort study. Patients were divided into fistula group (Autogenous arteriovenous fistula) and catheter group (Tunneled cuffed Internal jugular vein catheter). The incidence of new onset atrial fibrillation was compared between the two groups. COX survival analysis and ROC curve were used to assess the risk factors of new onset atrial fibrillation.A total of 315 eligible patients were included in this study. Multivariate COX regression analysis showed that age (HR: 95% CI: 1.003～1.040), pathway type (HR: 95% CI: 0.283～0.981), left atrial diameter (HR: 95% CI: 1.022～1.177) and dialysis blood flow (HR: 95% CI: 1.010～1.051) were independent risk factors for new atrial fibrillation. Kaplan_Meier survival analysis showed that the incidence of new atrial fibrillation in arteriovenous fistula group was higher than that in catheter group, with statistical significance.

Conclusion and Discussion:
This study provides insight in the pathogeny of AF onset in relation to the role of vascular access. In HD patients, AF occurred significantly more often on patients with arteriovenous fistula. In addition to age and left atrial diameter, vascular access type and blood flow during dialysis may also be independent risk factors for new atrial fibrillation.

Picture 1:



K-M Survival Curve of Arteriovenous Fistula and Internal Jugular Vein Tunnel Catheter

29 Initial low dose of heparin lock therapy in tunnelated catheters for hemodialysis. experience of two years.

Sonia Mendoza[1], Jose Luis Merino, Esther Garcia[1], Blanca Bueno[1], Patricia Dominguez[1], Luca Caserta[1], Veronica Sanchez[1], Beatriz Espejo[1], Laura Baena[1], Vicente Paraiso[1]

[1]Hospital del Henares Nephrology, Coslada, Spain

Introduction:
Tunneled catheters(TC) for hemodialysis(HD) present risks of severe complications. The use of low doses of heparin(20U/ml) of catheter-lock, ensuring its administration to the distal end, allows a correct functionality with few side effects.

Methods and Results:
All implanted TC by nephrology have been included since November-2015. Catheter-lock with low-dose of heparin was performed from the first HD session, ensuring that the distal portion of TC was correctly reached in both lumens. To date, 30 TC have been performed in 27 patients. The mean age of the patients was 62±15 years. Mean use of heparin at low concentration locking was 6±5 months, with an average of sessions per patient of 31±31 (median:20, range:1-110months). Low concentration heparin locking was administrated in 9 TC (30%) in all the overall follow-up. Eleven TCs did not require UK locking (37%).The reasons for the withdrawal of low doses of heparin locking were: functioning AVF in 10 cases(33%), TC dysfunction in 9 cases(30%), TC infection in 2 cases(7%), one catheter removal, deceased in 2 cases, KT in 3 patients, and one for return to PD. Two TC remain functionating to date. Locking therapy was modified in 17 cases: taurolidine-heparin in 10 patients, taurolidine-UK in 5 cases, heparin 5% in 4 patients and UK in two TC.

Conclusion and Discussion:
The locking therapy of incident TCs for HD with low doses of heparin could be a valid alternative. However, its use in a protocolized pattern does not avoid complications, such as CT dysfunction or several infections.

30 Hero graft, fully implantable device for vascular access. experience from a centre actively implanting herograft

Fabrizio Lo Iacono

Consorzio Servizi Sanitari, Napoli, Italy

Introduction:
In the scope of ongoing research to achieve a fully implantable vascular access for patients undergoing hemodialysis, the HeroGraft Device represents an innovative solution.

Methods and Results:
It is composed of a vascular prosthesis, that can be punctured with fistula needles, connected to an endoprosthesis inserted with Seldinger technique directly in right atrium through a central vena. The result is a vascular prosthesis that drains directly in atrium. The principal indication is the presence of steno/trombosis of central vessels, not eligible for treatment with angioplasty techniques, which are literally bypassed with this Device. Such technique allows to create a prostethic arteriovenous fistula whereas the insurmountable anatomical obstacle would have exclusively driven to the implantation of a tunneled central venous catheter.

Conclusion and Discussion:
The Author reports his own experience of 18 implants in 4 years, analyzing the primary and secondary patency, the survival and the utilization.
Kaplan-Meier statistic diagrams show the incidence of mortality in those patients who underwent implantation of HeroGraft Device.

31 Overcoming the challenge of haemodialysis access for needle phobic patient: a case report

Debbie Knagge, Aphrodite Stathis

Royal North Shore Hospital, Sydney, Australia

Introduction:
An arteriovenous fistula is the preferred access for patients undertaking haemodialysis although not all patients are suitable to receive this access type. The long term uses of Central Venous Catheter (CVC) comes with inherent risks, including infection and are associated with high rates of morbidity and mortality and increased health care costs. How should we best care for a young gentleman with severe autism and needle phobia?

Methods and Results:
This paper reports the challenges of managing a patient on haemodialysis who also has severe autism and needle phobia. Following presentation with end stage renal failure the family chose renal replacement therapy over conservative care. Haemodialysis through a CVC was commenced and tolerated. However 6 months into treatment a pattern of recurrent CVC removal by the patient occurred with ethical and clinical challenges associated. Lumbar CVC proved to be a successful solution. Strategies to overcome the challenges nursing and medical staff faced in caring for this patient will be discussed. When it seemed impossible to keep a CVC secured for dialysis, a safe and logical solution was found. The unique insertion site for tunnelling the CVC to prevent its removal was performed

Conclusion and Discussion:
The aim of this case presentation is to highlight the unusual and unique placement of a tunnelled CVC in a young man with severe autism. This unique situation required a unique solution only achieved by thinking outside the square.

32 Radiation exposure in nephrologist led tunelled haemodialysis line insertion

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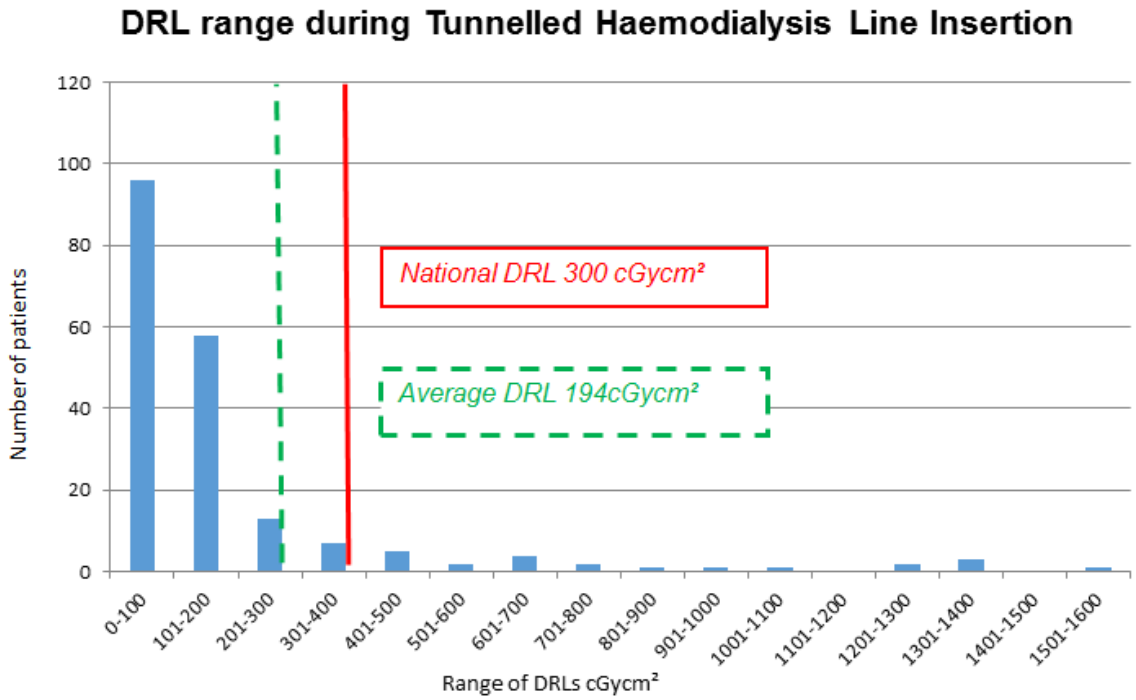
Introduction:
The goal of all radiological procedures is to minimise radiation exposure without compromising procedural safety. The complexity of the procedure, patient anatomy, co-morbidity and operator variability, can influence radiation exposure.
In our unit, nephrologists routinely use fluoroscopy to insert tunnelled haemodialysis lines independently. The International Commission on Radiological Protection (ICRP) has set good practice guidelines on radiation exposure using diagnostic reference levels (DRL). It is nationally recommended that tunnelled haemodialysis lines are inserted within 90 seconds of screening time and DRL of 300cGycm². We retrospectively collected data to ascertain whether nephrologists in our unit met this recommendation.

Methods and Results:
Data was collected retrospectively from the local radiology system between 01/01/2015 to 31/09/2018. Patient dose was recorded in cGycm² and screening time was recorded in seconds. 196 patients had a tunnelled haemodialysis line inserted in this period. 17 patients were excluded as a tunnelled femoral line was inserted or a temporary line was removed and a tunnelled line inserted. The average DRL was 194cGycm² with an average screening time of 58 seconds. 29 patients (15%) had a DRL greater than 300cGycm². A

further 29 patients (15%) had a screening time greater than 90 seconds.

Conclusion and Discussion:
In our unit, radiation exposure was on average lower than national recommended values, during fluoroscopic guided insertion of tunnelled haemodialysis catheters, by nephrologists. Average DRL was 35% lower than recommended by ICRP. This may be due to a sole nephrologist doing this procedure, leading to heightened expertise. Access complexity was not considered in this population.

Picture 1:



DRL range during Tunnelled Haemodialysis Line Insertion

33 Association of vascular access type with hemodynamic parameters of cardiovascular system among hemodialyzed patients

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Introduction:
Ambulatory pulse wave velocity is independent predictor of cardiovascular outcomes in hemodialysis(HD) patients. High-flow fistulamay exert ventricular hypertrophy-one the leadingcardiovascular risk factors. Aim of the study was to investigate differences in hemodynamic parameters between two types of vascular access; namely arteriovenous fistula(AVF) and cuffed catheter(cCath).

Methods and Results:
Cross-sectional study of ambulatory measurements of hemodynamic parameters with Mobil-O-Graph monitor was performed in HDpatients. Mobil-O-Graph records oscillometric brachial BP, central systolic(cSBP), central diastolic(cDBP), pulse pressure(PP), vascular resistance(TVR), stroke volume(SV), cardiac output(CO) and pulse waves. It calculates augmentation index(AIx) as measure of wave reflections, and pulse wave velocity(PWV) as measure of arterial stiffness.

Finally, measures were taken in 180HDpatients (mean age69.9y;102males and 78females) equipped with peripheral AVF (n=135, mean age) or cCath(n=45). In entire cohort following significant correlations were found: age&PWV(r0,9), cDBP(R-0,3), PP(r 0,2), Aix(r0,2), CO(r-0,2), dialysis vintage(months)&HR(r 0,2), SV(r-0,2). Significant differences were found for brachial and central systolicBP between patients with AVF and cCath in shorter time (up to 3years) from dialysis beginning (see Table), but this effect was not seen in patients more than 3y in HD programme. Heart rate in AVF patient was higher in patients with older fistula. Left ventricular stroke volume showed negative correlation with dialysis vintage in patients with AVF(r-0.18;p-0,018).

Conclusion and Discussion:
In patients with AVF systolic peripheral and central blood pressures were significantly lower in comparison to cCath patients. This effect was not observed 3years after HDbeginning. Heart rate in AVFpatient tend to increase and stroke volume decrease with dialysis vintage.

Picture 1:

Only patients on HD <33 months	p-value	AVF, n=51 mean	cCath, n=37 mean
age	p > .10	66,2±13,8	66,6±15
SBP	**p < .01**	**136,6**±27	**147,0**±27
DBP	p > .10	80,3±15	83,2±15
pPP	p < .10	56,3±20	63,8±18
HR	p > .10	70,0±13	69,9±14
cSBP	**p < .05**	**120,7**±20	**129,8**±22
cDBP	p > .10	81,9±15	85,2±16
cPP	p > .10	38,7±12	44,4±14
AIx@75	p > .10	22,0±14	24,3±14
SV	p > .10	75,3±15	75,6±15
CO	p > .10	5,2±1	5,2±1,1
Aix	p > .10	25,0±15	27,1±12
TVR	p > .10	1,3±0,3	1,4±0,2
HD vintage (m)	p < .005	18,5±8,2	10,8±7
PWV (m/s)	p > .10	10,0±2	10,4±1,2

Hemodynamic parameters in patients with dialysis vintage lower than 33 months

34 Survey results of 1000 cuffed catheters implanted at our hospital: prognosis and features of cuffed catheter cases in japan

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Introduction:
More than 90% of Japanese vascular access (VA) is arterial-venous fistulas (AVF). However, as the number of older patients with end-stage renal failure and patients with diabetic nephropathy increase, AVF creation is becoming difficult, while use of cuffed catheters (TCC) is increasing. In order to examine the indication for TCC which is expected to increase further in Japan, we examined 1000 patients who were implanted with cuff type catheter at our hospital.

Methods and Results:
1095 cases of cuffed catheter implanted in 2003 - 2018 were examined. 180 patients were undergoing multiple surgeries, the most frequent patients had been replaced 11 times because of obstruction and infection of catheters . The average age was 74.5 years old, and in recent years the aging is progressing.The major reasons for selecting TCC was decline in cardiac function and the vascular decay. The reasons for replacement of catheters was poor blood flow and obstruction. The insertion site was the largest in the right internal jugular vein with 60%, followed by the right femoral vein. The survival period from selecting TCC was 615 ± 515 days. The longest case was 3900 catheter days. The most common reason for withdrawal of the catheter was infection, and the factors associated with infection were DM nephropathy and decreased daily activity.

Conclusion and Discussion:
In Japan, the need for catheter dialysis is increasing. TCC is useful especially in elderly dialysis patients, but measures against infection and obstruction are necessary for long-term maintenance of dialysis using TCC.

35 The best solution down the line: citrate versus taurolidine-based lock solutions for central venous catheters in hemodialysis patients

Sabine Meijvis[1], Sonja van Roeden[1], Mathijs van Oevelen[1], Alferso Abrahams[1], Friedo Dekker[2], Joris Rotmans[2]

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Introduction:
Introduction: To prevent infection and thrombosis of central venous catheters (CVCs) in hemodialysis patients, different CVC lock solutions are available. Taurolidine-based solutions and citrate in different concentrations are frequently used, but no definite conclusions with regard to superiority have been drawn.

Methods and Results:
Methods In this retrospective, observational, multicenter study, we aimed to assess the risk for removal of CVC due to infection or catheter malfunction in hemodialysis patients with CVC access for different lock solutions: taurolidine, low concentrated citrate (4 or 30%) and high concentrated citrate (46.7%). A multivariable Cox-regression model was used to calculate hazard ratio's (HR). Results We identified 1603 patients (median age 65 years, 59% male). In 1418 (88%), citrate lock solutions were used. In 96 (6%), taurolidine-based lock solutions were used. Taurolidine-based lock solutions were associated with a significantly lower hazard for removal of CVC due to infection or malfunction combined (HR0.34, 95%CI 0.19-0.64), and for removal of CVC due to

infection or malfunction separately (HR0.36, 95% CI 0.15 – 0.88 and HR0.33, 95% CI 0.14 – 0.79). High concentrated citrate lock solutions were not associated with a decreased hazard for our outcomes, compared to low concentrated citrate lock solutions.

Conclusion and Discussion:
Conclusion Removal of CVC due to infection or catheter malfunction occurred less often with taurolidine-based lock solutions. We present the largest cohort comparing citrate and taurolidine-based lock solutions yet. However, due to the retrospective observational nature of this study, conclusions with regard to superiority should be drawn with caution.

36 Long durability peripherally inserted central catheter in pediatric oncological patients: application of a guideline: first 5 experiences in a latin american country.

Carlos Perez, Carlos Roman, Pilar Valdez, Isabella Caicedo

Fundacion Cardioinfantil-IC, Bogota, Colombia

Introduction:
Introdution: Vascular accesses in children for treating oncological patients is a challenge. Two important factors help to this. One is the size of the vessel, another is variation of each patient's body surface area. There are also social-financial factors involved in this. Colombia is a country with low-medium income index, so using resources in these high-cost pathologies makes treatment safer and more efficient.

Methods and Results:
Data base of the Vascular Vessels Service between the months of January 2017 and January 2018 is checked. 5 oncological patients are found using peripherally inserted central catheter for full chemo therapy treatment. PICC placement is made with the aid of a sonogram performed by qualified personnel from vessels access team. Such team in our institution consists of one General Surgeon, the Head of Nurses and trained personnel. There is also a peripherally inserted central catheter care guide that is followed that assures completion of treatment with only one vascular access. Rate of success: 100%. Average age: 8.8 (3-17 years old), the basilic vain was used in all cases. None of them had complications related to the procedure. 5 different oncological diseases were tretated.

Conclusion and Discussion:
The keystone for using PICC in pediatric oncological patients as vascular access for completion of oncological treatment is having highly qualified personnel as well as a guideline for care and use by nursing personnel.

37 Peronal variation in hong technique

Guido Saracino, Fabrizio Lo Iacono

Clinica Maria Rosaria di Pompei, Naples, Italy

Introduction:
CVC could be difficult to remove in the standard manner. In this cases the best up to date and less invasive technique is represented by the Hong Technique. This study is related to a series of 12 consecutive patients treated with an original modification of the original technique.

Methods and Results:
The Hong technique is an endoluminal dilatation of CVC with low profile balloons that causes the disruption of the fibrin sheath. All the patient had been a previous unsuccessful attempt of removal in other hospital. We suggest the exclusive use of a very high pressure

balloon with a reduced numbers of dilatation; in all patient the procedures were successful and performed under local anesthesia in some case with a mild sedation. There were no major complication except for a case of prolonged bradicardia that required the implantation of a pacemaker.

Conclusion and Discussion:
In our experience the use of an high pressure (non compliant) balloon allows a reduced time of the procedure and a reduced numbers of dilatations; the balloon could be inflated until the dilatation is effective without change balloon and avoiding a potential risk of rupture of the balloon; this because in many case we had to inflate the balloon even to > 30 ATM. In our experience in the Hong technique the use of a high pressure balloon should be mandatory for the removal of a stuck catheter.

38 Chalenging removal of embedded tunneled central venous catheter in dialysis patient via endovascular extraction

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Clinical Hospital Dubrava, Zagreb, Croatia

Introduction:
Tunneled central venous catheters serve as a temporary vascular access for dialysis patients or as a long term solution in patients in whom arterio-venous fistula (AVF) fails or who are unsuitable for AVF formation. Its presence carries some complications including complications during the removal of catheter.

Methods and Results:
We present a case of 35-year-old woman who was underogoing hemodialysis and had a permanent catheter in right jugular vein with the tip in right atrium. After years, we noticed reduction in blood flow so she was scheduled for an exchange, but we weren't able to pull it out with simple traction after removing catheter cuff. Transesophageal echocardiography was done, which showed tip of catheter that seems to be buried in interatrial septum. First method of choice that was done was clamping and cutting of proximal part of catheter and its removal from tunnel, but rupture of part of catheter occured. She was sent to another hospital where transvenous procedure was done. To make the catheter more rigid and, stylet was placed in lumen of catheter. They used mechanical dilator sheath and catheter was completely detached from fibrous tissue in proximal part, and shifted for powered rotation dilator sheath, with whom all the adhesions were resolved. There were no complications during this procedure.

Conclusion and Discussion:
Through this case, we demonstrated usage of different techniques in removal of thetered or embedded catether. With implentation of new methods for catheter removal, there is no need for open surgical procedures.

39 Vascular external support device for native arteriovenious fistula: impact on maturation

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Introduction:
Distal RadioCefalic Vascular Access , despite considered the gold standard, is correlated with high incidence of maturation failure ranging between 18-58%. Non maturation is defined as unsuitable vascular access for adequate hd treatment after 3 months from its creation. AVF results in a 10-fold or more increase in blood flow, producing a significant stress all along the fistula outflow vein. Although this increased flow is distributed all along the vein, is particularly limited to the first few centimeters of the vein segment. Turbulent flow has been identifed as a driver for neointimal hyperplasia and as a cause of stenosis. A laminar flow has been postulated to be protective and as a predictor for successful maturation in a newly formed AVF.

Methods and Results:
Preliminary study on 6 personal cases of implantation of small size VasQ , an external support device, for distal radiocephalic arterovenous fistulas. Results at 6 months follow-up, show an improvement in term of maturation comparing to native distal non supported fistulas.

Conclusion and Discussion:
The VasQ device seems to be correlated to improvement of maturation of distal upper arm arterovenous native fistulas . The inplantation is easy and requiring minimal changes to the standard AVF technique even in term of operative time.

40 A new vascular graft technique for hemodialysis ~insert technique~

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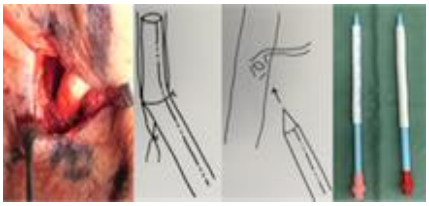
Introduction:
We have devised a technique to avoid this type of vascular access problem in the venous anastomotic site. For the vein, instead of anastomosing a vascular graft, a vascular graft is inserted. This insertion is done the same way as inserting large diameter sheaths into arteries and veins in PCPS or endovascular aneurysm repair, with the inner sheath being pulled out and a 2-3 centimeter vascular graft is placed in the vein. Simple fixation is done to the vascular graft and the vein, while the artery is anastomosed as conventionally done.

Methods and Results:
In a retrospectiveanalysis, 21 patients (mean age 68±14 years; 11 men) who received the insert technique for hemodialysis access over a 1-year period. Criteria forthe insert technique were (1) exhausted or inadequate peripheral veins for arteriovenous fistula (AVF) creation and concomitant small target veins that precluded conventional PTFE graft placement, (2) previous graft anastomosis or a stent in the venous target at the level of the axilla, or (3) failed brachial-basilic or brachial-brachial upper arm transposition AVF with a small target vein at the axilla. Efficacy, anatomic and clinical considerations, and technique were reviewed; patency rates, complications, and reinterventions were examined.

Conclusion and Discussion:
Technical success was achieved in all cases, and all grafts were usable for hemodialysis. There was no perioperative mortality or procedure-related morbidity in this group. Median follow-up was 8 months. The patient survival estimate was 90% at 1 year. Estimated primary patency (73%@3months 23%@6months 23%@12months), assisted primary patency (93%@3months 70%@6months 70%@12months)

Picture 1:



42 Reduced intervention rate with covered stents for central venous stenosis in haemodialysis patients

Bostjan Leskovar[1], Tjasa Furlan, Daniel Kosuta, Simona Poznic, Anton Adamlje

[1]Trbovlje General Hospital, Trbovlje, Slovenia

Introduction:
Central vein stenosis (CVS) is a common consequence of central venous catheter or cardiac intravascular devices insertion and compromises arteriovenous fistula (AVF) performance[1]. Treatment of CVS is challenging, percutaneous angioplasty has poor long-term results and stents are often used in recurrent stenosis[1]. Covered stents showed promising results with lower intervention rate than bare metal stents[3].

Methods and Results:
We implanted a covered venous stent (Bard Covera Vascular Stent) in two patients with recurrent CVS. Both patients had stenosis of cephalic arch and had several previous angioplasties. One patient had one CVS angioplasty per year but the cephalic arch ruptured during the last angioplasty and a covered stent was placed. The second patient had 6 CVS angioplasties done in two years and 3 self-expandable stents were placed due to extensive recoil. No complications were observed during the procedure, stent grafts were inserted under angiography guidance. In both patients, no additional interventions were required after covered stent insertion (follow up period of 11 and 13 months). Both AVFs are functioning well with a mean brachial artery flow of 1300 ml/min.

Conclusion and Discussion:
Central venous stenosis requires repeated interventions for maintaining a well-functioning vascular access. The number of interventions might be reduced by using covered stents in a selected group of patients with recurrent (previously stented) stenosis.

43 Drug eluting balloon for the treatment of recurrent in-stent stenosis in arteriovenous fistula or graft

Bostjan Leskovar[1], Tjasa Furlan, Daniel Kosuta, Simona Poznic, Anton Adamlje

[1]Trbovlje General Hospital, Trbovlje, Slovenia

Introduction:
In-stent stenosis due to neointimal hyperplasia is very common[1]in arteriovenous fistula (AVF) or graft (AVG) and requires repeated angioplasty interventions[2]. The rationale of drug eluting balloon (DEB) is to block neointimal hyperplasia response[3,4]. We compared re-intervention rate and percentage of patients that required no intervention in the first 3 months after stent placement and after using DEB.

Methods and Results:
We followed 20 hemodialysis patients with in-stent stenosis of AVF or AVG treated with DEB. All patients had in-stent stenosis diagnosed by duplex ultrasound. Fourteen patients had PTFE AVG, two patients AVG with CorMatrix and four patients a native AVF. In 12 patients, DEB was used for in-stent stenosis of stented venous anastomosis with PTFE graft, in 6 patients of stented cephalic arch, in 1 patient of stented native antebrachial vein and in 1 patient of stented arteriovenous anastomosis. Follow-up period after DEB was 5.3±1.7 months and 8 patients (40%) required additional PTA in this period. All angioplasties were successful, with no procedural complications.In the first 3 months after DEB, 90% of patients did not require any intervention, in contrast to 70% of intervention-free patients in the first three months after stent placement. Number of angioplasty interventions per year after DEB was significantly lower than before DEB (1.4±1.0 interventions per year prior DEB vs. 0.9±1.2 after DEB, p=0.03).

Conclusion and Discussion:
Our study suggests favorable results and reduced re-intervention rate for treatment of in-stent stenosis with DEB.

44 Insertion of self-expandable stent for permanent repair of juxta-anastomotic stenosis due to a crushed balloon-expandable stent

Bostjan Leskovar[1], Tjasa Furlan, Simona Poznic, Anton Adamlje

[1]Trbovlje General Hospital, Trbovlje, Slovenia

Introduction:
Juxta-anastomotic stenosis is difficult to treat with percutaneous transluminal balloon angioplasty (PTA)[1]. When repeated PTA is insufficient, a stent can be placed. Balloon-expandable stents are easily and permanently crushed when exposed to minimal trauma[2]. We present a case where a self-expandable stent was used to align the crushed balloon-expandable stent.

Methods and Results:
A native distal radio-cephalic AVF was created on the left arm in 69-year old men with end-stage kidney disease. Because of severe juxta-anastomotic stenosis with immediate recoil after PTA, a balloon-expandable stent was placed 4 months after AVF creation. Two months after stent placement, a slight trauma to the wrist caused the balloon-expandable stent to crush and flatten. AVF thrombosis was prevented with an immediate PTA with a transvenous approach. The deformed stent was successfully passed with a guidewire and a self-expandable stent was placed over the previous stent. The final angiographic result was excellent. In 33 months after self-expandable stent placement, 3 PTA of in-stent stenosis were performed, the last one with drug-eluting balloon, all due to endothelial hyperplasia within the stent. AVF is functioning well, with mean brachial flow of 1000 ml/min at 33 months follow-up and no recurrent stent deformity.

Conclusion and Discussion:
In case of severe juxta-anastomotic stenosis of native AVF with extreme recoil, a stent can be placed. Due to resistance against compression and deformity, self-expandable stents are recommended. In case of severe balloon-expandable stent deformity, PTA with self-expandable stent is a feasible option to prevent recurrent stent deformity.

45 The role of endovascular interventions in treatment of avf/avg dysfunction. just a bridge to a new vascular access?

Alexey Zulkarnaev, Zurab Kardanakhishvili

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Introduction:
Endovascular interventions are increasingly used to treat stenosis of central and peripheral veins in patients on hemodialysis.

Methods and Results:
79 patients with stenosis of the peripheral fistula vein and 61 patients with central vein stenosis underwent endovascular interventions (N=245). Technical success in all endovascular interventions was 96%. In the localization of stenosis in the cephalic arch and graft-venous anastomosis, the frequency of rigid stenosis and early recoil was significantly higher. The use of cutting balloon catheters and high-pressure balloon catheters has increased a technical success, but not the primary patency. The use of bare stents did not increase the access survival rate. An increase in secondary patency was achieved only with the use of stent-grafts (compared with balloon angioplasty only).
In the case of early recurrent stenosis, it was possible to increase the vascular access survival rate only with multiple repeated operations and the use of covered stents. This significantly increases the number of hospitalizations, reduces the quality of life and increases the risk of local and systemic complications. In addition, this approach significantly increases the cost of treatment, making it inaccessible to many centers. Given the high prevalence of stenotic lesions, it is necessary to reconsider the therapeutic tactics.

Conclusion and Discussion:
Endovascular interventions in most cases have a temporary effect. Multiple repeated interventions are advisable only if it is impossible to create a new vascular access or in a case of severe clinical symptoms of venous hypertension. In other cases, it only gives a reserve of time to create a new vascular access.

46 The use of angioscopy in vascular access surgery: shedding new light.

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Introduction:
Angioscopy is a well-recognised surgical technique used in luminal assessment of native vessels and grafts. It is increasingly being utilised in coronary arteries, lower limb vessels and vascular grafts. However, its role in vascular access for haemodialysis is still uncertain. We present our case series of angioscopy usage in dysfunctional arterio-venous(AV) fistula and evaluate the use of angioscopy in vascular access surgery based on available literature.

Methods and Results:
Angioscopy outcomes for dysfunctional AV fistula in a district general hospital were analysed. In addition, a review of available literature on Pubmed was also performed from inception to September 2018 for English-language studies on the use of angioscopy for vascular access for haemodialysis. Six angioscopies for AV fistula were performed in our hospital. Abnormalities identified include the presence of thrombus and irregular surface of the intima. Retrieval of thrombus using a Fogarty catheter via the operating port of the angioscope under direct vision was also performed. Our literature review revealed only 4 retrospective observational studies that met the inclusion criteria. 131 patients were included in the eligible studies with 185 angioscopies performed. 97 angioscopies were performed during revision of grafts, and 88 in primary grafts. A total of 94 (97%) revision angioscopies successfully identified abnormalities (thrombus or stenosis), which led to additional surgical intervention including repeated thrombectomies and angioplasties.

Conclusion and Discussion:
Angioscopy is a valuable, but under-utilised technique in the assessment and management of vascular access for haemodialysis. The limited available data on this subject provides opportunity for further studies.

48 Comparison of balloon inflation time in angioplasty for failed arteriovenous fistula among hemodialysis patients (carp study).

Shigehiro Doi, Takao Masaki

Hiroshima University Hospital, Hiroshima-city, Japan

Introduction:
Previous studies demonstrated that the 1-, 3-, and 6-month postintervention patencies were not significantly different between 3- and 1-minute inflation group for failed hemodialysis fistulas, and that a 1-minute inflation time was associated with greater incidence of access failure than a 30-second. These findings raise the possibility that shorter balloon inflation times may be associated with improved access patency.

Methods and Results:
In this study, we investigate the 6-months patency rate between 30- and 0-second inflation group in patients who underwent the percutaneous transluminal angioplasty (PTA) for the restenosed arteriovenous fistulas (AVF) after PTA within 6 months. Study design is multicenter, prospective, randomized, two comparison trial. The same diameter of SHIRANUI™ or OICHO™ (Kaneka Medics, Osaka, Japan) as the previous PTA was used for dilation of stenotic lesion. Balloons are inflated to a pressure of up to 22 atm to achieve complete expansion for 30-second (30-second inflation group), whereas balloons are inflated for 0-second (0-second inflation group). The 6-months patency rate after balloon angioplasty was analyzed by Kaplan-Meier method and log-rank test. 38 patients who received the repeated PTA were enrolled in this study. 26 and 12 patients were assigned to 30- and 0-second dilation group, respectively. One patient in 30-second inflation group died during the observation period. 6-months patency rates did not show significant difference between 30- and 0-second dilation group (P=0.38).

Conclusion and Discussion:
These results suggest that a 0-second inflation time does not improve patency rate.

49 A novel technique to restore central venous access in patients with chronic central venous occlusion using the surfacer® inside-out® access catheter system.

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Leiden University Medical Center, Leiden, Netherlands

Introduction:
Exhausted central venous access is a potentially life-threating situation for patients dependent on hemodialysis. If standard guidewire recanalization fails, unconventional venous access or needle recanalization can be considered but are often associated with higher rates of complications and/or dysfunction. We present the first two patients in the Netherlands who were successfully treated with The Surfacer® Inside-Out® Access Catheter System (Bluegrass Vascular Technologies, San Antonio, USA) to achieve transmediastinal central venous access.

Methods and Results:
-

Conclusion and Discussion:
-

50 Drug-coated balloon use in dysfunctional arterio-venous access treatment. the effect of consecutive treatments in target lesion primary patency.

Panagiotis Kitrou, Ioannis Spyridonidis, Konstantinos Katsanos, Panagiotis Papadimatos, Michail Theofanis, George Lampropoulos, Evaggelos Papchristou, Dimitrios Karnabatidis

Patras University Hospital, Patras, Greece

Introduction:
This was a retrospective longitudinal analysis investigating the safety and effectiveness of consecutive treatments with the Lutonix Drug-Coated Balloons (DCB) in dysfunctional arteriovenous access; both fistulae (AVF) and grafts (AVG).

Methods and Results:
From January 2015 to December 2017 (3 years), 339 Lutonix DCB were used in 257 procedures of 165 patients with a dysfunctional AVF or AVG. Of these patients, 33 had ≥2 procedures, adequate data and were included in the analysis. In these patients, 112 procedures were performed (22 treated twice, 4 patients 3 times, 7 patients 4 times, 2 patients 5 times and 3 patients 6 times) using 133 devices. Mean lesion follow-up was 247 days (min. 20 days – max. 908 days). Mean balloon diameter was 8.13mm (3-12mm) and length 63.16mm (40-150mm). Primary outcome measure safety, defined as freedom from any serious adverse event(s) involving the AV access circuit through 30 days for all procedures and target lesion primary patency (TLPP). Secondary outcome measures included investigation of independent factors that may influence outcomes.
Safety was reached in all cases (112/112 procedures, 100%). Median TLPP was 227 days for the first intervention and 280 days for the second consecutive intervention [p=0.37; Hazard ratio: 1.271 (CI: 0.75-2.16)].

Conclusion and Discussion:
Consecutive use of the Lutonix DCB for the treatment of dysfunctional dialysis access was safe. There was no significant difference in TLPP between the 1st and 2nd procedure, although a numerical improvement was observed. Results suggest consistency in TLPP regardless of the aging arterio-venous access.

51 The viabahn stent graft for the treatment of stenosis/thrombosis in the hemodialysis access.

David Carro Herrero, Rafael Diaz-Tejeiro Izquierdo, Francisco Javier Ahijado Hormigos, Mercedes Acevedo Ribó, Dabaiba Regidor Rodríguez, Maite Padron Romero, Laura Cueto Bravo, Cristina Herráiz Corredor, Carlos Jesús Cabezas Reina, Diego Mauricio Gonzalez Lara

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Introduction:
Mantaining patency of vascular access is a crucial target for treating hemodialysis (HD) patients. Efforts to achieve a functional arteriovenous fistula (AVF), either native or grafts, driving to less use of catheters, have shown improvement in morbi-mortality rates in these patients.Stenosis and subsequent thrombosis are the most common complication of AVFs mainly in the grafts which show the most unpredictable course and a very limited patency after simple percutaneous angioplasty (PTA).

Methods and Results:
Between January 1, 2005, and March 30, 2017, we retrospectively reviewed data of 47 procedures for failing 39 AVFs (36 PTFE grafts, 3 native AVF) by using PTA and implantation of the Viabahn stent graft. Intervention was preventive in five stenotics access (3 AVFs and 2 Grafts) and after thrombectomy in the remaining ones. They were 39 patients (age 61,6±13.3 years, 66% males, 33% diabetics), on HD for a mean 52,8±72.6 months, (1-240 months). Endoprosthesis placement was successfull in 96% instances (45/47) without any major complications (only one light hematoma). Overall vascular access survival was 55%, 45% and 27% at 6,12 and 24 months respectively. Mean survival was 12±13.5 months (median 3.9 months; range 2.3-22). All of 3 native AVFs repaired were permeable at the end of study.

Conclusion and Discussion:
Use of Viabahn Stent Graft to repair vascular access stenosis/thrombosis has proven to be a safe and effective procedure with survival rates higher than using simple PTA or drug eluted stents according to published data.

52 Patency outcomes after initial percutaneous transluminal angioplasty(pta) of hemodialysis vascular access(va)

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Introduction:
Percutaneous transluminal angioplasty (PTA) for hemodialysis vascular access (VA) has an advantage of preserving currently used VA; however, its patency outcomes are inferior to those of VA reconstruction. We calculated the patency outcomes of initial PTA for hemodialysis VA and investigated the conditions required to improve the patency rate.

Methods and Results:
We investigated retrospectively 39 hemodialysis patients who underwent initial PTA between October 2015 and March 2016.The Kaplan-Meier method and the log-rank test were used for the calculation and comparison of the patency rate.(P=0.05 was considered statistically significant.) The patency rate was considerably worse in women compared to men (P=0.019), and tended to be worse in ≥74-year-old patients compared to younger patients (not significant. P=0.075) Patency rate was also significantly worse in patients

with an interval of <600 days than longer one between shunt creation and the initial PTA. (P=0.001) Patency rate was not significantly (P=0.361) different ,although it tended to be worse with a stenosis diameter of 1.3 mm compared to larger diameters.

Conclusion and Discussion:
Based on our investigation, approaches that "avoid female and older patients" and "provide early PTA intervention" may improve the patency outcomes of initial PTA. Patency rate was poor in women and older patients. We speculate the cause that was related to the size of the blood vessels and artery. Since patients with a stenosis diameter of ≥1.4 mm had better patency outcomes, it was suggested that performing PTA before the development of severe stenosis may improve the patency rate.

53 Experiment about appropriate pressurization rate of balloon catheter

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Introduction:
In PTA for vascular access, the pressurization rate (PR) of the balloon catheter (BC) varies depending on the operator or institution. Empirically it seems that slow PR reduces vascular injury, but there is no report on appropriate rate. In dilatation experiments to observe a diameter of the BC, we investigate and discuss the appropriate PR.

Methods and Results:
The BC(6mm semi-compliant) is connected to a pressurizing device and pressurized at room temperature in the air. The diameter of the central part of the BC is measured with a laser diameter measuring instrument and the change in diameter at each pressure is recorded. The change in the diameter at a PR of 1 atm / 5 sec don't differ from the PR 1 atm / 20 sec. At the same pressure, the diameter at the PR of 1 atm / 0.5 sec is smaller than the diameter at the PR of 1 atm / 20 sec.

Conclusion and Discussion:
From these results, it can be said that a higher pressure is required for the BC to reach a certain diameter at a high PR . In other words, the BC is dilated to a larger diameter at the process to be fully dilated. As a result, the vessels are over-dilated and the risk of injury is considered to be high. To reduce the risk of vascular injury, it is considered the PR slower than 1 atm / 5 sec is appropriate.

Picture 1:

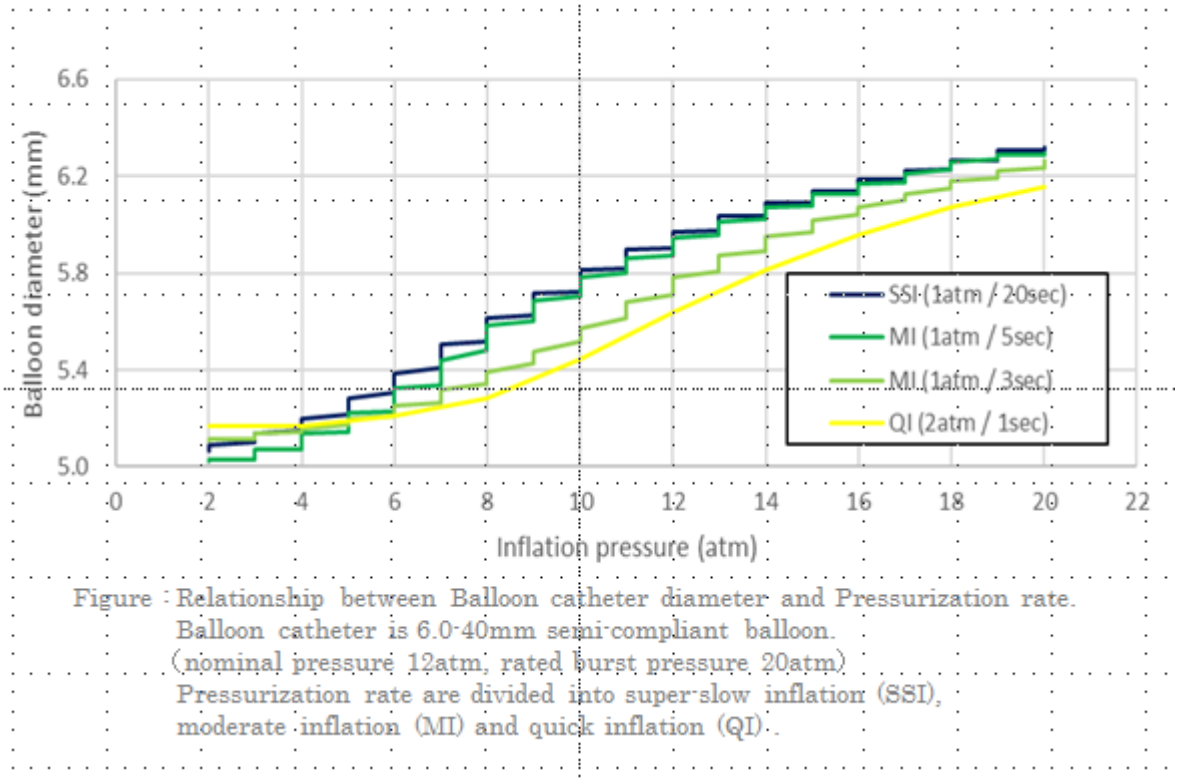

Figure : Relationship between Balloon catheter diameter and Pressurization rate. Balloon catheter is 6.0-40mm semi-compliant balloon. (nominal pressure 12atm, rated burst pressure 20atm) Pressurization rate are divided into super-slow inflation (SSI), moderate inflation (MI) and quick inflation (QI).

54 Preliminary evaluation of the effectiveness of the covera stent in the treatment of arteriovenous fistulas.

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Wojewódzki Szpital im. Sw.Ojca Pio w Przemyslu, Przemysl, Poland

Introduction:
In our study we used Covera stent® - self expanding, PTFE covered stent dedicated to the narrowing of dialysis fistulas. The study was to confirm the high efficiency of coated stents in the treatment of arteriovenous fistulas strictures (1). Covera™ Vascular Covered Stents in the Management of Dysfunctional AV Access. Bart L. Dolmatch, M.D., FSIR Palo Alto Medical Foundation Mountain View, CA USA; LINC 2018, Leipzig

Methods and Results:
Between May 2017 and December 2018, the Covera stent was implanted in 13 patients. The indications for implantation was: restenosis after earlier baloon angioplasty (11 patients, 8 of them udergone thrombectomy and baloon angioplasty at first procedure), or residual stenosis after first step baloon angioplasty (2 patients). The follow-up period was twelve months for 6 patients, six months for 4 patients and tree months for 3 of them. Evaluation of fistula patency was based on ultrasound Doppler examination. The primamry patency of stenosis site - 13 patients, the primary patency of access -10 patients.

Conclusion and Discussion:
Implantation of the Covera stent is a good option in the endovascular treatment of dialysis fistula strictures. The observation period shows, that the use of the Covera stent assisted with the dual antiplatelet drug therapy extends the period of patency of the dialysis fistula, thus extending the vascular access functionality and reducing the number of interventions.

55 Can arteriovenous graft haemodynamics be optimized with the use of electrospun polyurethane grafts?

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Introduction:
Venous neointimal hyperplasia (NIH) is the main reason for arteriovenous graft (AVG) patency loss. Disturbed flow and non-physiological or oscillatory wall shear stress (WSS) are believed to trigger NIH development. Traditionally, grafts are made from expanded polytetrafluoroethylene (ePTFE), which is much stiffer than natural vessels. We hypothesize that graft materials with a better biomechanical match can help optimize AVG haemodynamics. In this study we assess whether novel electrospun polyurethane (ePU) grafts, whose compliance can be better tuned to match that of natural vessels, can help optimize AVG haemodynamics.

Methods and Results:
Patient-specific fluid structure interaction (FSI) models of the venous anastomosis of an ePTFE and an ePU graft were created to assess the influence of graft material on disturbed flow and WSS metrics related to NIH development. It was observed that the anastomotic areas exposed to very high WSS levels (>40 Pa) and high OSI (>0.25) were approximately twice as large for the ePTFE graft than those observed for the ePU graft (Figure 1). The magnitude of turbulent velocity perturbations proximal to the venous anastomosis of the ePTFE graft were higher than those observed proximal to the anastomosis of the ePU graft (Figure 1).

Conclusion and Discussion:
In this study we demonstrated that the amount of disturbed flow and non-physiological WSS could be reduced with the use of ePU grafts instead of ePTFE grafts. Since these haemodynamic metrics are related to NIH development, AVG longevity might be improved by using ePU grafts.

Picture 1:

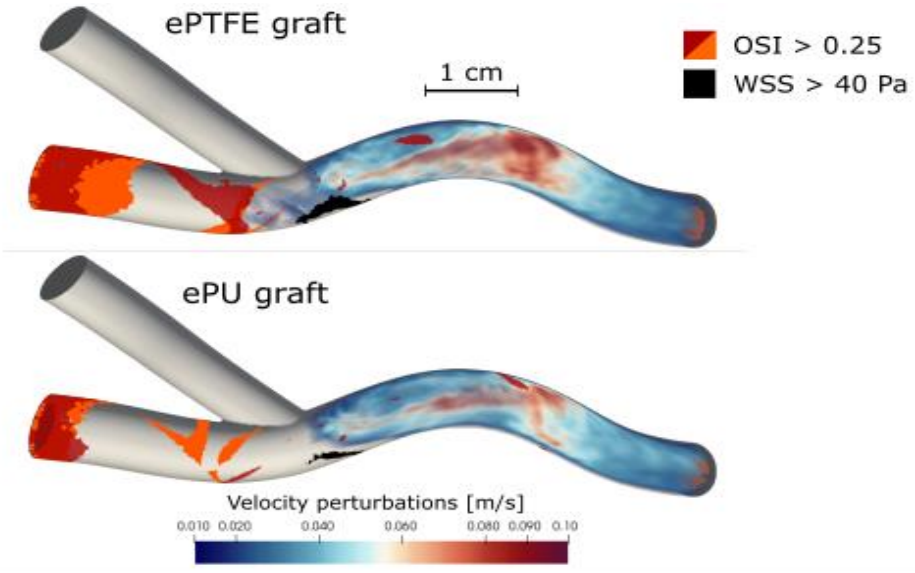

Figure 1: Overview of the magnitude of venous turbulent velocity perturbations and the venous areas exposed to high OSI (>0.25) or very high (>40 Pa) WSS for the ePTFE (top) and ePU (bottom) graft. Note that the red regions denote high OSI on the front of the geometry, whereas the orange regions denote high OSI on the back of the geometry.

56 Vitae registry: vascular access indigo catd thrombo aspiration registry

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Introduction:
Vascular Access for Haemodialysis is in constant development but thrombosis still remains Achille's Heel for Vascular Surgeons.
Surgical thrombectomy is at present the gold standard, but this technique is burdened by several factors. Many mechanical endovascular techniques for thrombus removal have been explored over the last two decades following the clinician's needs and observations. One of the main difficulties is designing a device that can remove adequate volumes of variable age thrombus while also maintaining an acceptably small size, flexibility, and ease of use. Penumbra's Indigo System was born for cerebral vessel thromboaspiration in Stroke and cerebral sinus thrombosis. With the recent addition of CatD, the System acquires a more powerful, larger-bore aspiration catheter with greater trackability.

Methods and Results:
VITAE is a prospective multicenters observational registry, involving 15 centers. The study includes patient > 18 years old affected from IRC, requiring haemodialysis and affected from vascular access thrombosis from < 72 hours, treated with Penumbra Indigo CatD. Patient cohort includes either autologous vascular access or prosthetic vascular access.

Conclusion and Discussion:
At present, we have treated 50 patients with 100% technical success. No surgical conversion has been necessary. 95% patients underwent effective emodialysis within 24 hours after the procedure, 5% underwent catheter emodialysis. We observed a reduction in inpatient treatment and in "door-to-dialysis" time compared to surgical thrombectomy. Thromboaspiration with Indigo Cat D proved effective in Vascular Access Thrombetomy. VITAE registry is still ongoing enrolling patients and new centres. Follow-up prosecution is necessary in order to prove long term results.

57 Patient reported benefits of a percutaneously created avf with shared outflow may lead to increased uptake of this procedure for haemodialysis dialysis

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Introduction:
Arteriovenous fistulas(AVF) are the preferred modality of access for dialysis[1–4]. These are known to carry a risk of developing high flow and aneurysmal change[5–7]. This is interpreted by patients as significant disfigurement, higher risk of bleeding and infiltration injury[8–10]. This fear can contribute to patients refusing AVFs and electing for central venous catheters[11,12]. Percutaneously created AVFs(endo-AVFs) develop a shared outflow that may minimize the risks of a single high flow conduit and consequently present a more appealing option for patients.

Methods and Results:
Patients receiving dialysis via endo-AVFs at our centre were followed as part of a prospective study. Flow rates, needle configuration patient satisfaction and adverse events

were recorded. Of the 20 patients being actively cannulated, mean brachial artery flow was 1000ml/min(95CI±219). Mean cephalic vein outflow was 300ml/min(95CI±88) while basilic was 279ml/min(95CI±130). Median follow up was 272 days and 80% were using median cubital and cephalic veins for their arterial and venous cannulation. None of the patients have developed significant aneurysmal change during the study time period. Two minor incidents of infiltration were observed that resolved within 10 min with no significant post-cannulation ecchymosis or clinical sequelae. All patients reported being satisfied with the appearance of the fistula arms at follow up.

Conclusion and Discussion:
Arm disfigurement, risk of bleeding and significant cannulation injuries are patient reported factors that can influence reduced uptake and acceptance of AVFs. The endo-AVF with a shared flow configuration may minimize risk of developing high flow AVFs, early aneurysm formation and may lead to a change in patient preference.

58 Percutaneously created av fistulas: a dialysis nurses' perspectives of cannulation?

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Introduction:
Advances in technology have allowed creation of percutaneous arteriovenous fistulas (endo-AVF). A proximal forearm artery and adjacent deep vein is used as the fistula creation site. This distributes shared flow between the superficial cephalic and basilic system via a communicating perforator vein. Due to this phenomenon a change in conceptual approach to dialysis cannulation of these may be required.

Methods and Results:
Observational data was collected for endo-AVFs created using the WavelinQ™ device (BD Medical, NJ, US). Descriptive and photographic records, cannulation logs and dialysis parameters were collated with patient consent. All patients were cannulated with steel needles. As per local policy, tourniquet use, gradual increase of pump speeds and upsize of all steel needles were carried out. Included patients have been achieving full 4 hour sessions with their endo-AVFs and averaged dialysis pump speeds of 300-400mls/min with brachial artery flows of 1000mls/min(95CI±219). Cannulation was described as akin to a non-fistularised peripheral vein with no traditional high pressure flashback or significant pushback of syringe piston on needle insertion. Post treatment bleeding is low flow, does not require significant pressure or time for

Conclusion and Discussion:
In reported studies of endo-AVF intervention rates appear reduced. This may be a result of shared flow. Individual vein flow rates may be below those expected but cannulation and dialysis is successful. This may question traditional concepts in fistula cannulation and needling

Picture 1: Sites of needle placement in endo-AVFs

Arterial Needle Sites	Venous Needle Sites	Patient Nos	Needle	BA flow	Average pump speed	Bleeding time post treatment
MCV, CV	CV	11	15G-Steel	989 mls/min	310mls/min	<2min
MCV, BV	CV	5	15G-Steel	1082 mls/min	400mls/min	<2min
MCV, BV, BVT	BV, BVT	4	15G-Steel	930 mls/min	215mls/min*	<2min

Table-1.Sites of needle placement in endo-AVFs; CV-Cephalic vein; MCV-median cephalic; BV-basilic vein, BVT-basilic vein transposition, BA-Brachial artery; *As per patient choice

Poster session B – 12 April 2019

Organization of care

61 Clinical and economic outcomes associated with treatment of hemodialysis arteriovenous fistula or graft stenosis

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Introduction:
Patients with end-stage renal disease often require long-term hemodialysis (HD) for which a well-functioning arteriovenous (AV) access is crucial. AV access failure is primarily due to thrombosis resulting from stenosis, which leads to increased clinical and economic burden. Several interventions treat AV access stenosis in mature fistulae and grafts in HD patients, however a comprehensive comparison of their effectiveness is lacking in the literature.

Methods and Results:
A systematic literature review of studies published in English during the last 15 years was conducted using PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), and conference proceedings of 10 conferences (last 5 years).
39 studies conducted in 16 countries were included. Based on patency rates, drug-coated balloon (DCB) angioplasty was significantly better than percutaneous transluminal balloon angioplasty (PTA) and conventional angioplasty for stenosis treatment. Stent grafts were significantly better than PTA or stents (including drug-eluting stents). Cutting balloon angioplasty was better than high-pressure balloon angioplasty or PTA. The effectiveness of surgical revision compared to PTA remains unclear. The restenosis rates for DCB angioplasty (compared to PTA) and stent grafts±PTA (compared to PTA and bare stents) were significantly lower. DCB angioplasty and stent grafts were associated with lower costs than PTA.

Conclusion and Discussion:
In the absence of standardized guidelines for AV stenosis treatment in HD patients, a detailed understanding of patency and complication rates associated with available treatment options can help healthcare professionals make informed clinical decisions. DCB angioplasty and stent grafts can be considered an efficient, safe and economical option for AV stenosis treatment in HD patients.

Picture 1:

Table 1. Comparisons of patency outcomes between stenosis treatment interventions at different follow up times

Intervention comparison†	Outcome	Difference in patency outcome (%) at various follow-up times*			
		3 mos.	6 mos.	12 mos.	24 mos.
DCB angioplasty vs. PTA	Primary patency	-	2.2% - 9.0% higher	3.7% - 32.0% higher	7.0% higher
	ACPP	-	20.0% – 45.0% higher	-	-
	TLPP	-	11.0%* - 45.0% higher	17.0% - 48.4% higher	29.0% higher
Stent graft vs. PTA or stents	Primary patency	26.4% higher	67.0% higher	21.0% (vs. stents) 32.0% - 39.1% higher (vs. PTA)	-
	ACPP	-	13.1% - 18% higher	13.8% higher	4.0% higher
	TLPP	-	17.4% - 54.1% higher	22.8% higher	13.4% higher
CBA vs. PTA	Assisted primary patency	-	30.0% higher**	26.0% higher**	-
CBA vs. HPBA	TLPP	-	26.5% higher	-	-
	Target lesion secondary patency	-	16.5% higher	-	-
PCB vs. CBA or HPBA	TLPP	-	11.6% higher	-	-
Surgical revision + PTA vs. surgical revision alone	Primary patency	25.0% higher	31.0% higher	-	-

†Outcomes reported are for interventions in boldface as compared to the comparator
*Significant differences are shown in the table
‡Value derived from exploratory analysis that applied a 30-day window to the 6-month end point to minimize missing data due to patients completing their 6-month visit by 210 days as opposed to 180 days.
** In stenosis of graft-to-vein anastomosis group
ACPP - Access circuit primary patency; CBA - cutting balloon angioplasty; DCB - drug-coated balloon; HPBA - high-pressure balloon angioplasty; PCB - percutaneous cutting balloon; PTA - percutaneous transluminal balloon angioplasty; TLPP - Target lesion primary patency

Comparisons of patency outcomes between stenosis treatment interventions at different follow up times

62 Economic burden and healthcare resource utilization associated with hemodialysis arteriovenous accesses

Smeet Gala[1], Mia Weiss[1], Noran Osman[1], Erik P. Erdal[1], Rajesh Ramachandran[1], David Dawson[1], Chinelo Onyekwelu[2]

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[2]BD Bard, Crawley, w susx, United Kingdom

Introduction:
Creating and maintaining AV access is critical for successful hemodialysis (HD) treatment but is associated with significant economic burden and healthcare resource utilization (HRU). Therefore, it is important to understand the economic implications of creating and maintaining the three main types of accesses: autogenous arteriovenous fistulas (AVFs), arteriovenous grafts (AVGs), and central venous catheters (CVCs).

Methods and Results:
To assess the economic and HRU associated with HD AV access, we conducted a systematic literature review using PubMed and Cochrane Central Register of Controlled Trials (studies published between 2003-2018) and conference proceedings (abstracts published between 2013-2018). A total of 23 studies (18 full-texts; 5 conference abstracts) were included.
The 17 economic and HRU studies showed that CVCs were associated with a higher HRU (19% higher risk of hospitalization; longer length of stay for complications) and cost

burden ($18,000-$22,000 higher costs) than AVFs and AVGs. Additionally, these studies showed that it is more costly to recreate a new access than to salvage an existing AVF (2-6 times costlier). The 6 model-based studies confirmed these results and showed that AVFs and/or AVGs are more cost-effective than CVCs for most HD patients. Additionally, AVFs were shown to be more cost-effective than AVGs.

Conclusion and Discussion:
For many HD patients, AVFs may be the preferred initial AV access and if thrombosed should be salvaged. Given the significant cost burden and HRU associated with different AV accesses, healthcare providers must understand the economic implications of various AV accesses in addition to their clinical outcomes.

64 Vascular access care team: a novel approach

Hicham Bouanane, Athar Ibrahim, Hoda Tolba, Abdullah Hamad, Fadwa Alali, Ghalib Yousef, Sahar Ismail, Ahmad Fouda, Tarek Ghonimi, Hany Ismail, Aisha Elsayed

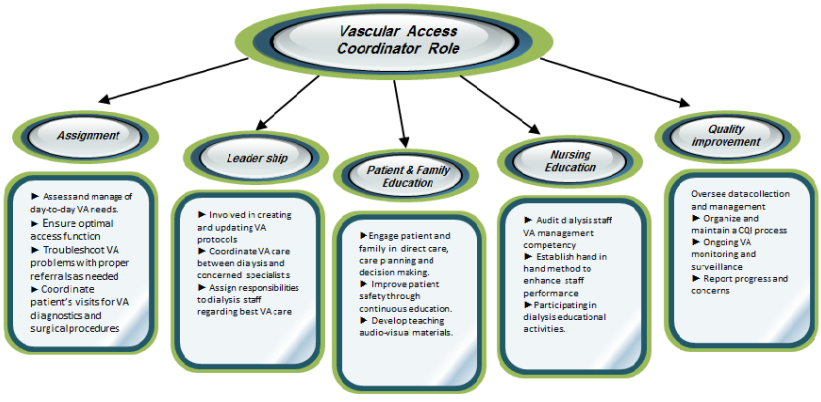
HAMAD MEDICAL CORPORATION, Doha, Qatar

Introduction:
Vascular access (VA) is the lifeline of hemodialysis patients. VA complications are the leading cause of morbidity in HD population. VAC team was established in 2011 to improve VA care in the State of Qatar (decrease infection rate, improve fistula rate...).

Methods and Results:
Our dialysis nurses received special training for 6 months regarding VA care under vascular surgeons, interventional radiologist, and nephrologists. Diagram below shows duties of VAC team. We evaluated outcomes related to implementing VAC team. We tracked catheter related infection (CRI) rate, fistula prevalence, catheter prevalence, hospitalization related to VA and dialysis adequacy Our hemodialysis program has expanded from 350 to 600 patients from 2011 to 2018. Our VAC team has increased from 2 to 4 over the same period. Our catheter related infection has dropped from 1.4 episode/1000 catheter days in 2011 to 0.1 episode/1000 catheter days consistently in 2016-2018. Our fistula prevalence improved from 46% to 71%. CVC rate decreased from 45% to 29%. Dialysis adequacy has improved from 80% to 96 %. Total hospitalization days related to VA was reduced from 666 days in 2011 to 263 in 2018 despite the increase in hemodialysis population. Fistula rate in low clearance clinic (2016-2018) increased from 8% to 43 %.

Conclusion and Discussion:
VAC team implementation led to great improvement in outcomes regarding access type and dialysis care in general. We are planning to expand VAC team role to further aspects of VA care like surveillance.

Picture 1:



VAC ROLE

65 Our transport system for dialysis patients who need vascular access treatment

Tomohiro Nakamura

Rakuwakai Otowa Memorial Hospital, Kyoto, Japan

Introduction:
Our hospital is the vascular access center in Kyoto Prefecture and Shiga prefecture, and the number of dialysis patients supporting vascular access is about 8000 people. We have medical area of about 200km around. It is inconvenient for dialysis patients to visit themselves or to use public transportation. So we created a transport system for dialysis patients who need VA treatment in 2011 and made a system to operate surgery on the day of hospitalization as much as possible from 2015.

Methods and Results:
From January 2015 to October 2018, the total number of hospitalized patients for VA treatment was 5889, the number of semi-emergency hospitalizations was 1530, of which 551 patients underwent surgery on that day. Patients who underwent surgery on the day of hospitalization were mainly acute occlusion and stenosis, blood flow problems, shunt aneurysm formation, bleeding, and infection. However, our hospital has about 600 applications per year now, and costs 150 million per year. Therefore, other dialysis hospitals and clinics in Japan cannot imitate the this system. But thanks to this system, the number of operations at our hospital has increased from 700 to over 1600 dramatically.

Conclusion and Discussion:
Dialysis patients who need VA treatment by our transport system can be hospitalized promptly and surgery on the day of the onset of trouble becomes possible.

66 Epidemiology of renal replacement therapy and vascular access - links of one chain

Alexey Zulkarnaev

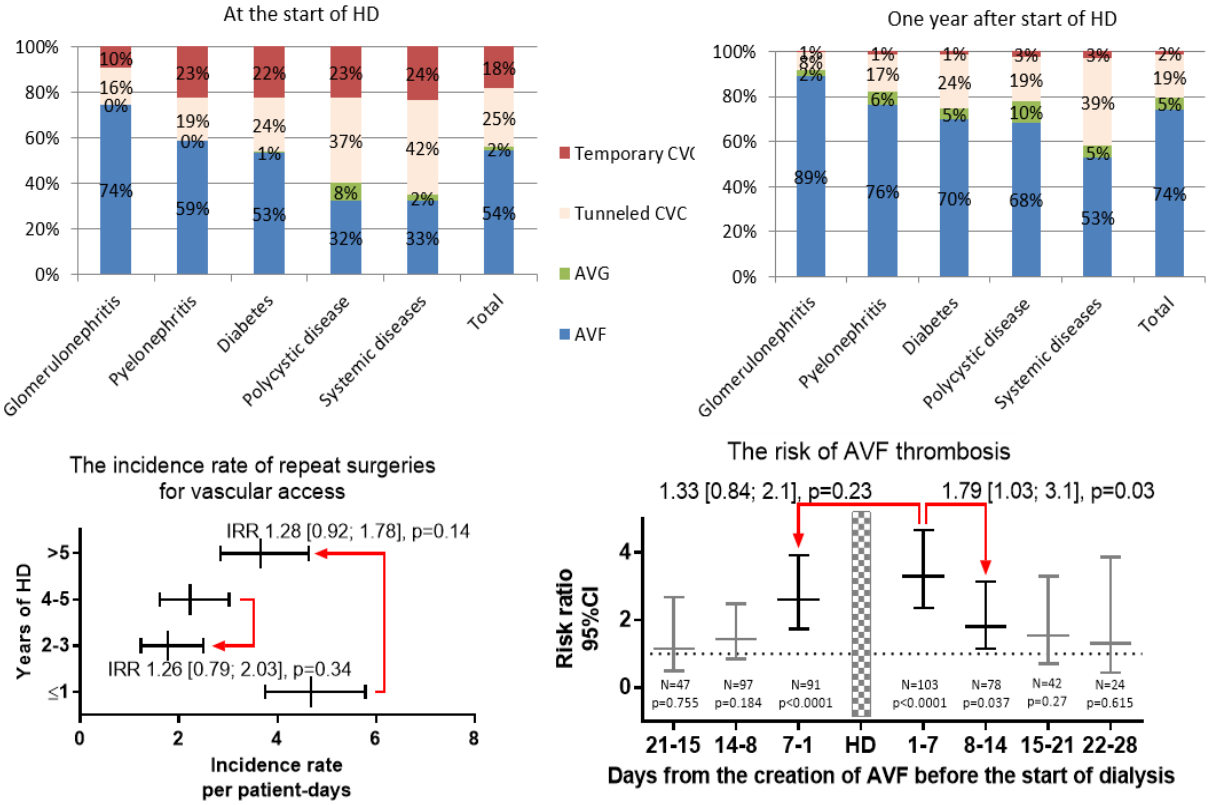
Moscow Regional Research and Clinical Institute, Moscow, Russian Federation

Introduction:
-

Methods and Results:
We present the data of 1862 patients with CKD from the local register.
We noted a strong dependence between the type of vascular access and the cause of CKD 5D – Fig. 1. The risk of starting HD with CVC depends largely on the cause of CKD. In diabetes, AVF functioned in many patients, but matured slowly. This increases the risk of non-matured AVF at the time of starting HD. However, the majority of patients received AVF during the year (fig. 2). In the case of polycystic kidney disease non-solitary vein type required multiple repeat operations. The proportion of patients with graft was the highest compared to other causes of CKD. Systemic processes (lupus nephritis, HIV nephropathy, cancer, drug addiction, rheumatoid arthritis, etc.) are the most adverse causes of CKD in the context of vascular access. In this group a large number of repeated operations were required. Only 53% of patients received functional AVF. Survival in this group was the lowest.
Repeated surgical interventions are most often required in patients who are just starting HD, as well as in patients with long HD treatment (fig. 3). The AVF creation in one week before or 1-2 after the unscheduled start of HD significantly increases the risk of AVF thrombosis. We believe that it is better to start HD through tunneled CVC and to create AVF after stabilization of the patient’s condition.

Conclusion and Discussion:
The cause of CKD and other patient characteristics have a direct impact on approaches to creating permanent vascular access.

Picture 1:



67 Helping renal patients with central venous lines to maintain the integrity of their dressings whilst attending to personal hygiene in the tropics

Wendy Smyth[1], Joleen Mcardle[2], Kim Hughes[2], Kristin Wicking[3], Cate Nagle[3], Kimberley Quayle[2]

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[2]Townsville Renal Service, Townsville, Australia
[3]James Cook University, Townsville, Australia

Introduction:
A previous randomised controlled trial found that different central venous catheter (CVC) exit site dressings only stayed intact two-thirds of the time in the tropics. We explored how to assist patients undergoing haemodialysis via central lines to maintain the integrity of their exit site dressings whilst attending to their daily hygiene needs.

Methods and Results:
A three-phase mixed methods study design commenced in August 2018.
Phase 1- 37 renal nurses completed an electronic questionnaire that included feedback about the acceptability and feasibility of two options used to assist with hygiene: a packet of 8 bath wipes, and a waterproof dressing cover. Both options were considered favourable, with some practical concerns expressed.
Phase 2- 28 patients with CVCs discussed their hygiene preferences, difficulties they encountered with keeping dressings dry, and their immediate impressions about the two

options shown to them. Participants welcomed the opportunity to stand under a shower. Phase 3- this will be a multiple case study involving patients providing feedback about the utility and effectiveness of the hygiene options that they choose to use over a six-week period. The integrity (dryness and intactness) of the dressings will be audited at each dialysis session during this phase.

Conclusion and Discussion:
Phase 3 commences in January 2019, with patient selection and hygiene options informed by the findings of the first two phases. It is anticipated that this study will assist in reducing the hospital's high bacteraemia rates, simultaneously increasing patients' involvement in self-care and improving their self-esteem.

68 Clinical engineering technician's vascular access(va) related work at our hospital

Kentarou Kitamura[1], Yuya Yamada[1], Hiroyuki Sekihara[1], Masaki Nagasawa[2], Mariko Anayama[2], Hironori Nakamura[2], Yasushi Makino[2], Katsuhiko Tamura[2]

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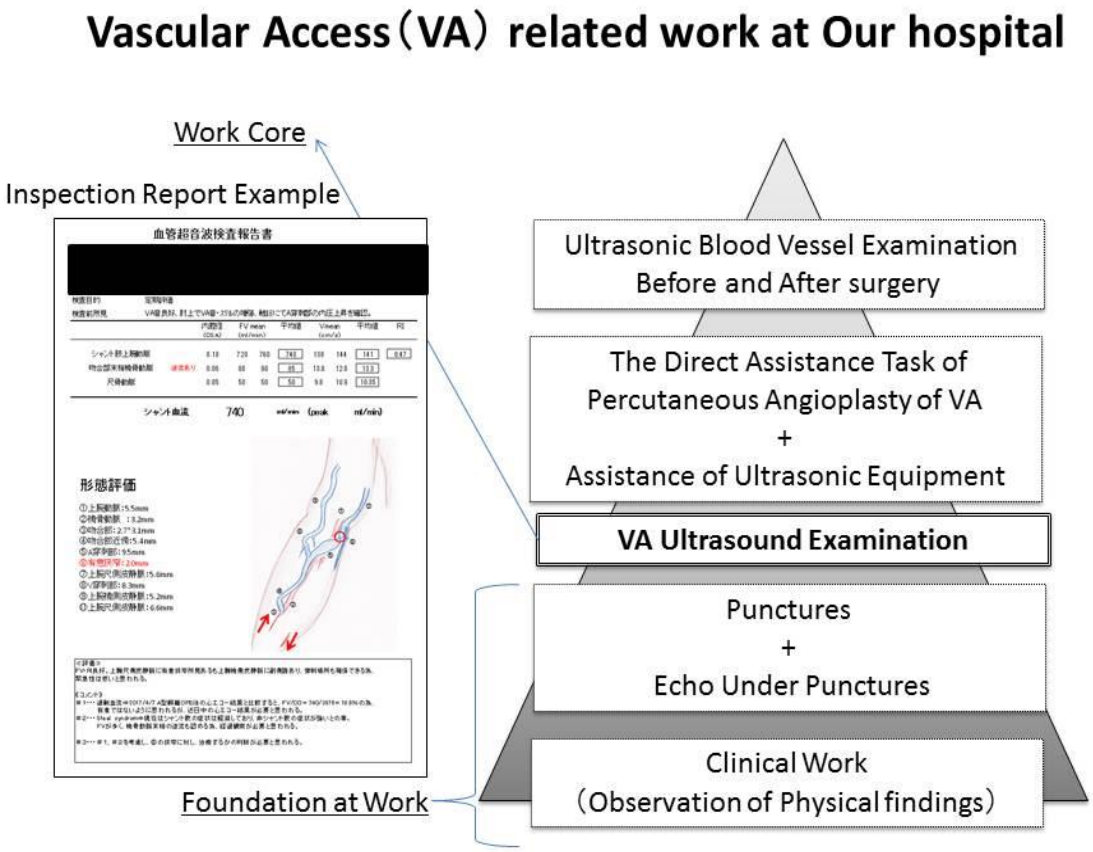
[2]Department of Nephrology,Shinonoi Jeneral Hospital, Nagano city, Japan

Introduction:
The clinical engineering technician in Japan is expanding the role of Vascular Access（VA）‰ work by utilizing ultrasonic inspection equipment. According to a survey by the Japan Clinical Engineering Technical Association in 2016, 49.8% of facilities utilize ultrasonic diagnostic equipment for VA management, and our hospital also introduced VA ultrasonic blood vessel examination work from fiscal 2010.

Methods and Results:
Knowledge, experience, and technology obtained in the VA blood vessel ultrasonography inspection work contribute to improvement of other VA related work. In VA preparation surgery, not only ultrasonic blood vessel examination before and after surgery, but also its design is examined and evaluated, and it is advocating to a doctor. In puncture, puncture under ultrasound is introduced, and its success rate is 99%. Also, in the direct assistance task of percutaneous angioplasty of VA, assistance is provided by using ultrasonic examination technology. Also, we utilize the knowledge and observation power gained from that experience in daily VA management, and we strive to make an abnormality early.

Conclusion and Discussion:
In this way the role of clinical engineering technician for VA in our hospital is getting bigger year by year, so we will introduce the work of clinical engineering technician related to our VA.

Picture 1:



Vascular Access（VA）‰ related work at Our hospital

69 Effects of the implantation of a vascular access multidisciplinary group in our area

Israel Leblic Ramirez[1], Rafael Sanchez, Stefan Stefanov Kiuri, Laura Alvarez, Antonio Cirujeda, Ana Blanco, Pilar Martinez, Echarri Rocio

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Introduction:
To analyze the effects of the implantation of a multidisciplinary group and a quality plan in the management of the creation, maintenance and use of the vascular accesses for hemodialysis (VA) in our area.

Methods and Results:
The organization of a multidisciplinary AV group is described. The changes in the indication, patency and maturation of VAs in the period before and after the implantation of the group are analyzed, as well as the changes in the surgical waiting list and consultations and the prevalence in the use of CVC as a method. of incident or prevalent dialysis.

Conclusion and Discussion:
The average waiting time for the first assessment in period A was 41.1 days compared to 12.0 days in period B. The waiting time in the surgical list was 48.5 versus 43.2 days. The type of AVF in the first period was Radiocephalic (RC) 37%, Humerocephalic or Humerobasilic (HC, HB) 53% and prosthetic (FAVp) 8%. Between 2011 and 2018 43% were RC, 49% HC / HB and 6% FAVp. Primary permeability was 81% Vs 96% in both

periods. The maturation rate for native AVFs per month was 61% Vs 73%. The rate of initiation of HD by CVC was 67% and the prevalence of CVC as hemodialysis access was 30% in both periods.

70 Vascular access in a district general hospital kidney unit: an 18 year experience

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Introduction:
Aim:Continuous audit of our vascular access experience against UK Renal Association standards and published practice

Methods and Results:
A retrospective (2000-2003) and prospective (2004-2018) review of patient electronic records. The haemodialysis (HD) population increased from 66 patients in 2000 to 312 in 2018. Our 10 year experience 2000-10 was reported at VASBI, 2011. From 2010 we introduced buttonhole cannulation following our randomised controlled trial (Am J Kid Dis 2013); our 8 experience is summarised in Table 1. The % stock HD population with a functioning AVF has risen from 39% (2000) to 68% (2018); % starting with AVF has risen from 17% (2000) to 63% (2018). 1 year primary patency was 69% (2000-9 cohort) and 72% (2011-18). 1 year secondary patency was 76% (2000-9) and 91% (2011-18). AVF survival rate is significantly better with buttonhole cannulation and with fewer interventions needed to maintain patency. There was no significant difference in infection rate; MSSA bacteraemias remain a concern for all access.

Conclusion and Discussion:
Establishment of a consultant nephrologist vascular lead (2003), a vascular access nurse (2006), focused pre-dialysis care, regular monitoring of access with Transonic QC ™ (2006) in parallel with responsive and accessible interventional radiology and vascular access surgical services have all contributed to our rise in HD stock AVF in the face of an expanding HD population. In addition, buttonhole cannulation is associated with an AVF survival advantage. Although infection rates are in line with published figures, our efforts are concentrated on understanding reasons for the rise MSSA bacteraemias across all dialysis access.

Picture 1:

Table 1

Year Access created	2011	2012	2013	2014	2015	2016	2017	2018	
HD Stock (number)	276	275	284	294	305	306	306	312 ytd.	
HD take on/year(number)	102	72	83	105	123	91	109	94 ytd	
% start HD with AVF	45	34	52	66	77	80	57	63	
% Stock with AVF	76	78	76	77	74	77	68	72 ytd.	
Number new AVF/year	67	83	77	82	49	57	61	56 ytd.	
Brachial	47	57	51	56	37	48	54	48	
Radial	20	26	26	26	12	9	7	8	
Failed AVF attempts (at operation)	0	2	3	4	2	2	3	1	
Number grafts/year	8	11	7	15	8	7	12	4	
Number AVF not developed (required intervention pre-use)	6	4	4	5	3	5	5	6	7%
Number never used (LCC, Tx, death, transfer out)	2	2	2	7	3	7	8	4	7%
Number clotted +failed	9	16	14	9	6	10	9	3	7%
Before use	1	6	5	4	3	8	7	3	
After use	8	10	9	5	3	2	2	0	
Primary failure 10%		**Declotted + patent** Buttonhole 8 Ropeladder 20 p=0.055 NS				**Plasty rate/new access year** Buttonhole 0.26 Ropeladder 0.35 p= 0.0017			
1 year primary patency*		**2 year primary patency***				**3 year primary patency***			p=0.008
Buttonhole	76			66				61	
Ropeladder	67			54				48	
1 year secondary patency*		**2 year secondary patency***				**3 year secondary patency***			p<0.0001
Buttonhole	96			94				86	
Ropeladder	86			81				74	
AVF ES infection/1000 AVF days	0.06	0.03	0.05	0.02	0.10	0.11	0.00	0.05	
AVF Bacteraemia/1000 AVF days	0	0.03	0.05	0.06	0.04	0.0	0.04	0.06	BH vs RL (13) (9) p=0.2 NS

Patency definitions: Sidawy *et al* J Vasc Surgery 2002 35 (3);
*censored for death/transplant/transferred out with a functioning fistula (excludes failed attempts on table)

71 Pre operative routine ultrasound mapping impact on a vascular access center

Maria Guedes-Marques, Pedro Maia, Pedro Ponce

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Introduction:
Achieving functioning arteriovenous fistulae (AVF) in patients with end stage renal disease remains challenging, as the primary failure rate reaches 40% in some series.
Despite the lack of indisputable evidence to support routine pre-operative ultrasound examination, the existing DOQI and ERBP Guidelines suggest its routine use.

Methods and Results:
A retrospective study was conducted on hemodialysis patients referred to our Vascular Access Centre during the year before and after ultrasound pre surgical vascular mapping routine procedure. Only patients referenced for a new access creation were included.
We compared both groups regarding their demographic characteristics, new VA created and its outcome during the follow up (6 months).
All (100%) patients included had failed at least one vascular access (VA) attempt, more than 60% with more than one. Age, gender, diabetes and previous VA were not significantly different between both groups (NS).
After the introduction of routine pre surgical doppler ultrasound mapping, 94% new VA were created against only 66% before the mapping (S). The inability to create a new access due to no suitable vessels decreased from 34% to only 5,1% after mapping introduction (S). Primary failure rate also decreased from 41% to 19% (S).

Conclusion and Discussion:
Pre-operative doppler ultrasound evaluation should be routinely performed before VA creation because it significantly increases the possibility of autologous access creation and reduces the immediate failure rate. In our experience, it is especially important in patients in whom the superficial veins are already sold out and to evaluate hemodynamic behavior of the arteries.

72 Functional unit vascular access: a multidisciplinary approach for comprehensive care of vascular access

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Introduction:
Maintenance of functional vascular access (VA) is a challenge in hemodialysis (HD) patients. Several VA guidelines recommend the creation of multidisciplinary VA teams in order to avoid related complications. To describe the first year effect of our multidisciplinary VA team, the Functional Unit vascular Access (FUVA), in the main VA outcomes.

Methods and Results:
A multidisciplinary VA team (FUVA) including nephrologist and vascular surgeon was performed. All patients with VA requirement were assessed with Doppler ultrasound (DUS) preoperative mapping. Main VA outcomes as well as VA national quality indicators were analyzed and compared with the previous year. 85 patients were evaluated (63% men).66.5±13.1 years. 132 DUS (70% preoperative).43 outpatient endovascular procedures (85% PTA).49 VA were performed (69% ambulatory, without 1-month readmissions).44% radio-cephalic, 35% braquio-cephalic.18% re-anastomosis. After DUS mapping statistical increases in RCAVF (47.6vs69.2%) and permeability rate (55 vs 89.2%) were observed. Moreover, lower mean days of hospitalization (3.8vs1.8) and short time to VA intervention was achieved (31vs19 days). Improvement in incident (41.3vs47.8%) and prevalent (66.7vs71.8%) AVF quality indicators were obtained, without changes in AVF thrombosis-rate year/patient (0.07).

Conclusion and Discussion:
The introduction of our multidisciplinary VA team (FUVA) results in a better management of the VA outcomes particularly in the optimization of the distal vascular territory. Most procedures related to VA were performed on an outpatient basis as a consequence of prospective protocols monitoring VA and computer-based collection of VA follow-up data established. These results lead us to a comprehensive care and a quality management in the vascular access.

73 Impact of the guidelines on the process of nephrologists' catheters insertion training

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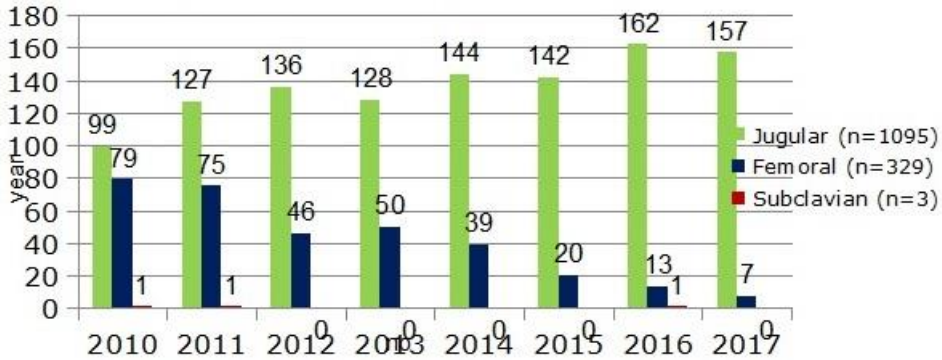
Introduction:
The insertion of hemodialysis catheters is a part of nephrologists'training. Although in Canadian Journal of Kidney Health and Disease the author conclude, that cathetersinsertion should not be mandatory for all nephrology trainees□, in Poland all theresidentsshould carry out a certain amount of such procedures.Through the years we observe the need of change of the training manner.

Methods and Results:
The comparative analysis of the localization and the type of insertedhemodialysis catheters in our center in the previous years was performed;in years 2010-2016the number of acute catheters has decreasedin favor of tunneled ones, and the femoral access has declinedwhile the jugular hasincreased.The analysis of the first thirty catheters' insertionsperformed by vascular access trainees in years2006, 2010 and 2015 showed thatin previous years trainees started predominantly with acute femoral access and in next years the tunneled jugular catheterswere inserted more oftenat the beginning of young nehrologists'training.

Conclusion and Discussion:
In the past, more difficult procedures which have higher risk of even severecomplications were performed later, when more experience and skills had been gained. As long as the observed trend is to insert tunneled rather than acute catheters andto the jugular rather than femoral vein, the changeinresidents' specialization program should be considered.

Picture 1:



Localization of the catheters inserted 01.2010-10.2017 in Clinic of Nephrology and Transplantation Medicine in Wroclaw

74 A systematic approach to avf monitoring reduces the rate of avf salvage

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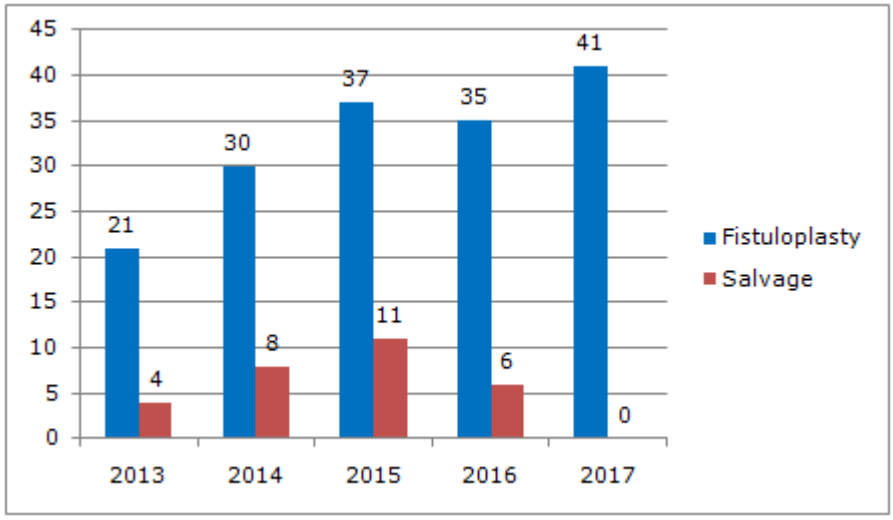
Introduction:
In patients with end stage renal disease who commence haemodialysis (HD), an arteriovenous fistula (AVF) is the preferred type of vascular access. AVF are reliable, efficient, associated with fewer infections and overall reduce mortality in this population. Renal association guidelines recommend that vascular access is monitored to minimise failure and allow timely planning for replacement definitive access. In our unit there were increasing numbers of emergency AVF salvage procedures.

Methods and Results:
In 2016 a quality improvement project was set up with the aim of reducing the AVF salvage rate by 33% in 12 months and 50% by 24 months. 3 pronged approach to AVF monitoring was adopted:
1. Clinical assessment: Look, feel and auscultate AVF at each HD session. Report issues with needling, prolonged bleeding time or high venous pressures
2. AVF flow monitoring using Transonic machine
3. Estimate "re-circulation" on HD machines
At initiation of the project there were 120 HD patients in the trust. 65 patients (54%) had a functioning AVF. A further 12 patients (10%) were awaiting AVF creation.
Following implementation, the number of fistuloplasty procedures increased and AVF salvage procedures decreased.

Conclusion and Discussion:
By adopting this systematic approach to AVF monitoring, we have increased the number of fistuloplasty procedures and reduced the number of AVF salvage procedures. This also prompts decisions to be taken on "end of the road" AVF, avoiding unnecessary and potentially unsuccessful AVF salvage. Such patients can have alternate access timely planned.

Picture 1:



75 Which parameters are best for thrombosis risk assessement?

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Introduction:
Though surveillance is proposed as a method to improve access patency and reduce mortality and morbidity associated with access failure, its benefit has not been universally demonstrated. Several other factors such as patient demographics may influence the risk of access thrombosis, making it difficult to achieve desirable sensitivity and specificity of surveillance methods. Authors like Malik et al, have introduced the concept of borderline stenosis based in additional criteria to define a stenosis that a have good prognosis with a lower risk of thrombosis, which benefits from continuing surveillance rather than intervention. Portuguese units may define their surveillance protocols according to their resources but no unanimous criteria have been defined to refer a patient (neither the degree of urgency) to vascular access evalution. In our daily practice, patients may be referred based on only one parameter alteration, which sometimes may overload consultations with non dysfunctional accesses or overcome more urgent patients.
The purpose of our study was to find which parameters (or combination of them) are more sensitive and specific to predict thrombosis risk.

Methods and Results:
Prospective, observational study including all patients referred to consultation due to a dysfunctional vascular access. Echographic study will be performed to all patients. Morphologic and functional evaluation will be performed. Demographic and clinical variables will be recorded. Non parametric tests will analyze which surveillance parameters correlate better with ultrasound criteria for significant stenosis.

Conclusion and Discussion:
This abstract is submitted as a Late breaking Trial and results will be presented in April.

76 Improving vascular access outcomes through multidisciplinary low clearance clinic model

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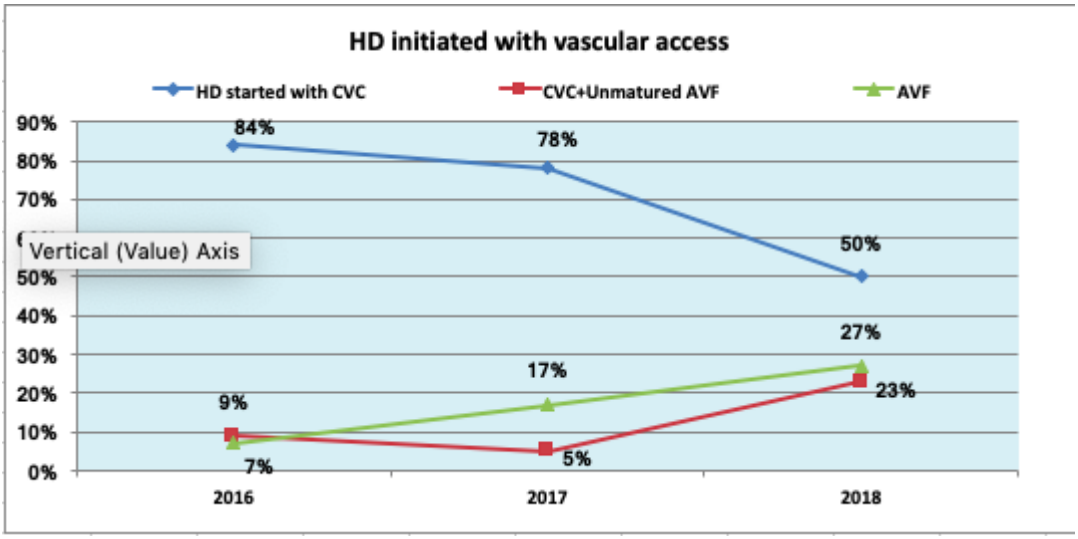
Introduction:
Transitioning patients with ESRD from predialysis clinic setting to dialysis is challenging. Patient need to be prepared timely especially regarding dialysis modalities and vascular access (VA). Low clearance clinic (LCC) provides multidisciplinary solution. Our LCC team includes nephrologist, vascular access coordinator (VAC) and vascular surgeon, patient educator, dietitian and administrator that cover the state of Qatar. We are reporting VA related outcomes in our LCC over 3 years' period.

Methods and Results:
We retrospectively reviewed record from 2016-2018 for all LCC patients and all new patients starting on dialysis in Qatar. We collected data regarding demographics, vascular access, hospitalization and dialysis modalities. Our LCC patients have increased from 115 in 2016 to 300 in 2018. Patients started HD with created fistula increased significantly (Figure) from 8% to 50% (p value <0.01) while permanent catheter decreased from 84% to 50% (p value <0.01) (Figure). LCC patients choose and started on peritoneal dialysis (PD) improved from in 2016 38 % to 48.5% in 2018 (pValue <0.01). No emergency temporary HD or hospitalization required for PD initiated patients from LCC in 2018. LCC patients had more fistula and less permcath HD initiation, PD choice selection, less permcath HD initiation, and less hospitalization for emergency HD initiation compared to

non-LCC patients in 2018 (50% vs 28%, 50 %vs 72%, 48.5% vs 18% and 11% vs 36% respectively)

Conclusion and Discussion:
Implementing a multidisciplinary LCC improved ESRD patient care outcomes especially regarding modality choices and VA.

Picture 1:



HD initiated with vascular access

77 Dual surveillance system of haemodialysis access

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Introduction:
To report the efficacy of a dual Surveillance system for arterio-venous fistulas in detecting stenosis and improving access patency.

Methods and Results:
Over 12 months period, all arteriovenous fistulas in two dialysis units were regularly monitored using transonic flow measurements and Sonosite imaging. Fistulas with drop of access flow on two consecutive readings were imaged by dialysis nurses with Sonosite and then reviewed in a weekly surveillance clinic. Fistulas with inconclusive imaging results are investigated further using duplex scanning in the vascular lab. Subsequently decisions were made regarding fistulography/Fistuloplasty as required. 71 fistulas were investigated. 44 fistulas required radiological intervention with successful outcome. Only one fistula was lost. 3 fistulas required frequent interventions over a short period of time and were labelled as failing fistulas. Back-up fistulas were created in the contra-lateral arms while the original fistulas were kept functioning to prevent interruption of dialysis and to avoid the use of central line. There was only one false negative result on fistulogram.

Conclusion and Discussion:
The dual monitoring system has been found to be effective in early detection of fistula problems with improvement of access patency. It also ensures that endovascular intervention is only reserved for those fistulas with genuine problems and minimise unnecessary interventions. Implementation of such a system is highly dependent on good teamwork between the dialysis staff, surgeons and the radiology department.

78 Challenge of the vascular access in two hemodialysis centres in angola

Vanessa Pinto, Alfredo Carvalho

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Introduction:
The possibilities of dialysis in Angola had prolonged lives of end-stage renal disease patients. Since 2000 that is possible, but to maintain these patients on long term dialysis a permanent vascular access procedures are required. Until nowadays is a challenge. The objective of this study was to analyse the problems of vascular access in two centres and plan intervention.

Methods and Results:
Data were collected from medical records in each centre from October 1st 2016 to October 30th 2018 in the unity of Hemodialysis of Military Hospital an Hemodialysis Centre Pluribus Africa in Luanda, Angola. There were 405 patients with end-stage renal disease. They ages ranged from 17-76 years. 98,2% of the patients start dialysis through a temporary vascular access. 443 arteriovenous fistulas (AVF) constructions are performed, 67,2% distal and 32,7 proximal. 15,86% was brachial to basilic. The time between the beginning of the dialysis and the surgery was about 120 days. Complications arising from permanent vascular access were noted in 14,89% of the AVF and these included failed or difficult cannulation, poor flow, hemorrhage, haematoma, thrombosis and infection.

Conclusion and Discussion:
Vascular access for hemodialysis is a important problem in Angola. Almost 90% of the patients start dialysis on venous catheters, faraway from the clinical practice guidelines.

79 Pre-dialysis vascular access: experience from a dedicated clinic model challenges the guidelines

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Introduction:
In patients nearing end stage kidney disease vascular access(VA) planning is required. Despite clear guidelines over 50% of incident dialysis patients start on a catheter. The aims of this study was to assess the impact of a dedicated pre-dialysis access clinic on outcomes including type of access at dialysis initiation

Methods and Results:
From January 2015 to January 2018 prospectively collected data on 203 patients who were assessed in a dedicated predialysis VA assessment clinic was analysed. Mean followup from referral was 665.62+/-307 days. Median GFR at referral was 13(5.0 to 24.0). An arteriovenous fistula(AVF) was formed before dialysis initiation in 80.7% of patients and 61.9% patients started on dialysis in the follow up period. Of the patients that had a fistula operation 29.6% did not reach end stage;50.3% initiated dialysis on an AVF and 21.3% started on a CVC. In those with an AVF prior to starting dialysis 29.2% started on a CVC and 68.1% on an AVF but when the whole group is considered only 40.1% started on a fistula and 17.1% on a CVC.

Conclusion and Discussion:
Despite a focussed and dedicated approach to VA planning and a high frequency of fistula creation less than half of the patients referred started dialysis on an AV fistula. A high number of patients had access created yet did not start dialysis Current guidelines to vascular access creation may may require questioning as these may risk unnecessary procedures, increasing healtcare costs and patient fatigure from repeated surgery, intervention and follow up for surveillace or dysfunction.

80 Chemo-port occlusion due to calcium phosphate crystals: a case report

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Introduction:
We report a case of medication or parenteral nutrition-related chemo-port occlusion by calcium phosphate crystals.

Methods and Results:
A 72-year-old man with angioimmunoblastic T cell lymphoma (stage IIIB, Eastern Cooperative Oncology Group Performance Status 3) had a 6.5-French catheter chemo-port (Venous Celsite® Access Port, B. Brown medical Ltd, Sheffield, United Kingdom) inserted for chemotherapy. After four months it was completely blocked and was removed. Another chemo-port had to be reinserted. The occlusion was due to calcium phosphate crystals. We analyzed the composition of the crystals using electron probe microanalysis (EPMA) using JXA-8530F (JEOL, MA, USA) to know which substance caused them to form. The EPMA photographs and results are shown in Table 1, respectively. The main components of the crystals were calcium, phosphorus, and oxygen.

Conclusion and Discussion:
Identifying the cause of occlusion and treating it appropriately, by evaluating its characteristics and the medication and parenteral nutrition used, is important. Additionally, clearing the occluded catheter with 0.1% hydrochloric acid could be more beneficial and cost-effective than replacement.

81 Experience with using cormatrix for different types of arteriovenous fistula (re)construction

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[1]Trbovlje General Hospital, Trbovlje, Slovenia

Introduction:
CorMatrix is an acellular extracellular matrix made from porcine small intestine submucosa and acts as a scaffold that allows cells to migrate from adjacent tissues[1]. In 4-6 weeks, it degrades and only native tissue remains[2]. We present our experience with using CorMatrix for AVF (re)construction.

Methods and Results:
Between May 2016 and July 2018 6 patients were included (kidney transplant candidates) who required AVF reconstruction with graft. A tubular graft of appropriate length was sutured from CorMatrix plates and used as a loop reduction segment in a high-flow AVF, as a bridge graft, as a graft for PAI and RUDY procedures and for complete construction of a new AVF. No periprocedural complications were observed, no CorMatrix-related infections, bleeding or limb swelling. CorMatrix was first punctured 8-10 weeks after implantation. Stenoses in CorMatrix segment were successfully resolved with PTA. Stenoses were observed in patients where a 5.0-6.5 mm CorMatrix tubular graft was used and no interventions were required when 7.5-8.8 mm graft was used. No high flow AVFs were observed. After a median observation period of 12.5 (range 4–23) months all AVFs are patent with a median brachial artery flow of 1450 (range 700–1700) ml/min.

Conclusion and Discussion:
CorMatrix seems to be a safe and feasible option for different types of AVF (re)construction. After CorMatrix degradation, fistula functions more as a native AVF than AVG. We suggest using a 4-layer CorMatrix to construct a 7.5-8.8 mm tubular graft and avoid repeated angioplasties and thromboses due to neointimal hyperplasia.

82 Gracz arteriovenous fistula with dominant jugular outflow

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[1]Trbovlje General Hospital, Trbovlje, Slovenia

Introduction:
Gracz arteriovenous fistula (gAVF) is constructed with a side-to-end anastomosis between brachial artery and perforant vein in the elbow with good patency results[1]. Double outflow through basilic and cephalic vein with dominant cephalic outflow to subclavian vein is common. We present a case of a patient with gAVF and dominant jugular outflow.

Methods and Results:
55-year old woman with end stage kidney disease and hypertension had a gAVF constructed on the left arm. The main outflow was the cephalic vein, besides basilic vein. Fifteen months after construction, the AVF thrombosed. Relative stenosis at cephalic vein aneurism outflow was observed, Doppler showed no stenosis at cephalic outflow to subclavian vein. Open thrombectomy and PTA of cephalic vein was performed. Seven months later, re-thrombosis was observed. Because of subacute thrombosis and vascular wall degeneration, we had to excise the aneurism and insert a 4 cm PTFE bridge graft. Open thrombectomy was successful, but central angiography showed a minor venous outflow through subtotally stenosed subclavian vein and dominant outflow through stenosed jugular vein. We performed angiography guided PTA of stenotic jugular vein and a self-expandable stent was inserted because of severe recoil. At 7 months follow-up, the gAVF was functioning well.

Conclusion and Discussion:
In a patient with repeated thromboses of gAVF and no signs of subclavian vein stenosis, a dominant gAVF outflow through jugular vein was observed. Stenosis of jugular vein was resolved with PTA and self-expandable stent placement. No further thrombosis and no signs of cerebral venous hypertension were observed.

83 Diagnosis of hemodynamically significant stenosis of dialysis access.

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Introduction:
Overwhelmingly, the loss of access due to thrombosis is due to hemodynamically significant stenosis (HdSS).

Methods and Results:
35 patients without pathology of dialysis access and 41 patients with identified HdSS by the results of ultrasound examination. The data of clinical, hardware and laboratory tests included in the mandatory monthly standard of examination of both groups were compared by statistical analysis methods for non-parametric statistics (Mann – Whitney test). Methods of multidimensional statistics and discriminant analysis. To test the capabilities of the studied and obtained indicators to serve as a diagnostic criterion for HdSS, we used the analysis of ROC curves. Significant differences exist for the 15 indicators from studied 51. But all of them are far from the ideal diagnostic test. Using the methods of

multidimensional statistics, ten indicators were used to construct a mathematical model which gives the possibility to determine the subclinical HdSS.
DF HdSS = 31.567+0.071×Effective Convective Volume+0.599×Lean Tissue Index(LTI)–0.772×UF/Dry Body Weight–0.284×HR Post–0.057×Qb+0.875×Total Choles+0.326×Alb+0.152×b2-microglobulin–0.302×Urea reduction rate+0.005×Ferritin.
If the value is higher than "O", there is a HdSS. The area under the ROC - DF HdSS curve is 0.987 ± 0.0085 units, 95% confidence interval for the area under the curve [0.929–1,000]. The diagnostic sensitivity of the test is 100.0 (91.4–100)%, specificity 88.57 (73.3–96.8)%, the level of significance of the difference between the ROC curve and the diagonal of the graph is p =<0.0001.

Conclusion and Discussion:
The proposed test allows you to automatically detect individuals who need additional control of the AVF.

Picture 1:

Indicator	Group without pathology	Group with identified HdSS	Level of significance
	Me (25%;75%)	Me (25%;75%)	differences p=
OH/ECW post HD (%)	2,5 (–1,4; 7,6)	6,7 (2,7; 10,9)	0,045971
Dry Body Weight (Kg)	81,7 (70,8; 89,3)	70,5 (65,9; 78,9)	0,04267
UF / Dry Body Weight (%)	1,2 (1,1; 1,4)	1,5 (1,3; 1,6)	0,037138
b2 microglobulin (mg/L)	25,4 (20,3; 29,5)	30,0 (25,5; 35,2)	0,013954
HR Pre (p/min)	77 (70; 87)	74 (67; 77)	0,048883
HR Post (p/min)	74 (71; 83)	71 (68; 75)	0,0122
Cholest. (mmol/l)	4,32 (3,56; 4,91)	4,72 (4,27; 5,39)	0,045971
LDL Cholest. (mmol/l)	2,88 (2,25; 3,4)	3,18 (2,94; 3,85)	0,008769
Alb (g/l)	39 (36; 40)	40,9 (38,0; 42,0)	0,007997
Fat Tissue Index (FTI) (Kg/m²)	14,2 (10,1; 18,9)	11,4 (6,4; 13,6)	0,007287
Transfer Saturat. (%)	19 (14; 27)	28 (20; 39)	0,004159
Lean Tissue Index (LTI) (Kg/m²)	12,4 (10,9; 14,5)	14,1 (13,3;16,0)	0,003295
Relative Lean Tissue Mass (%)	42,6 (36,2; 55,8)	55,3 (48,2; 64,6)	0,002185
Relative Fat Tissue Mass (%)	40,1 (31,7; 44,3)	31,1 (21,5; 35,1)	0,001481
Ferritin (µg/l)	193 (114; 333)	739 (443; 1193)	0,000000001

Clinical and laboratory indicators are significantly different in the studied population.

84 Evaluation of blood flow suppression methods performed in 188 patients with high flow access

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Introduction:
A vascular access route is described as high flow access (HFA) when an elevated flow volume (FV) impairs circulatory dynamics. High-output heart failure risk is significantly increased with the vascular access FV exceeding 1500-2000 ml/min or the FV/cardiac output ratio (Flow/CO) exceeding 30-35%. Even when FV is less than 1500 ml/min, the Flow/CO ratio may be elevated in patients with impaired CO. Moreover, lower values may be indicative of relatively excessive blood flow, depending on the patient's condition. In the event of high-output heart failure, blood flow suppression surgery is required.

Methods and Results:
Altogether, 188 patients with high-output heart failure caused by HFA in an AVF or AVG underwent blood flow suppression procedures between October 2007 and June 2018. The blood flow suppression methods performed included proximal artery banding (A-ban), AVF anastomosis run-off . Blood flow suppression was evaluated by the form, region, presence

of calcification, and vascular access run-off vein thickness; recurrence rates of HFA, AVF or AVG occlusion, and postoperative infection were also assessed.

Conclusion and Discussion:
Overall, the rates of HFA recurrence, AVF or AVG occlusion, and postoperative infection were 8.0%, 17.6%, and 0.5%, respectively. The recurrence rate with A-ban was the highest at 27.3%, while that with A-ban and A-lig was 4.8% being the lowest among all methods. We speculated that the inflow bloodstream from the distal anastomotic region gradually increased after blood flow suppression by A-ban and excessive blood flow recurred.

85 The indication of arterial superficialization and its management

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Introduction:
Arterial superficialization is sometimes used as the vascular access of hemodialysis. And its indication were described in guidelines of vascular access construction and repair for chronic hemodialysis in Japan as below. Cases for which arterial superficialization are applicable can be divided into next groups. Group 1 includes those patients in whom cardiac function is insufficient, and construction of an AVF (AVG) will lead to cardiac failure. Group 2 includes cases in which vascular damage has occurred, making AVF (AVG) construction difficult. Group 3 consists of those whose AVF (AVG) has caused steal syndrome to occur.

Methods and Results:
We reported the arterial superficialization is useful as vascular access for some cases on 10th Congress of the Vascular Access Society. The cases are central vein obstruction and excessive blood flow shunt. They have large arteries and shunt veins. Arterial venous shunt were closed later.

Conclusion and Discussion:
We performed twenty six arterial superficialization recently in these five years, and investigated the patency and complications. Ten cases of them were occluded central veins and their upper arm were edematous and swollen. Sixteen cases of excessive blood flow shunt. The longest case passes to four years and ten months without complication. Three cases had complications.Two cases complicated with pseuedaneurysm. But they were easily healed by closure of holes of pseudaneurysm. One case had infection on artery ,but it healed by antibiotic agent. Perfect hemostasis after hemodialysis and protection of infection were important. Arterial superficialization is thought one of the convincing choices in some hemodialysis cases.

86 Open stenosis plastic: air refueling as art

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Introduction:
Stenosis of the native fistula veins often leads to dysfunction of vascular access and increases the risk of its loss. We bring the experience of 97 cases of open surgery interventions for plastic of the stenosis. In 87 cases stenosis plastic were supplemented with an aneurysm resection, in 10 cases it was just plastic.

Methods and Results:
The surgery consisted in local access to the place of stenosis, dissection of the vein lumen. We used the aneurysm wall if we resected it at the same time. If no aneurysm resection was performed, we used any autologous vein. The volume of the operation was always the minimum possible to keep the maximum segment for the puncture.
Primary patency was 89% in two years. Secondary patency in two years 95%. Extended (2-3 cm) stenosis was not a predictor of access loss. Access was completely lost only in cases of multiple stenoses or parietal thrombi in the proximal vein segments on a shoulder and the inability to switch blood flow from the *v. cephalic*a into *v. basilica* (or vice versa). However, on rare occasions we used a graft to drain the outflow into the axillary vein, this allowed us to maintain access.

Conclusion and Discussion:
Our experience clearly shows that preventive stenosis surgery is possible without stopping the use of AVF and without the need for Central venous catheter implantation. This tactic allows to achieve greater secondary patency of AVF, but requires constant monitoring, extensive experience of the surgeon and is possible only in the regional center.

87 Aneurysmectomy for repair of a true venous aneurysm (va) of arterio- venous fistula (avf) for haemodialysis (hd)-a single surgeon experience.

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Introduction:
The incidence of AVF aneurysm formation is 0-6%. Treatment options for VA are simple ligation, excision with end-to-end anastomosis of the remaining vein or a PTFE bridge graft placement. Aneurysmorraphy, surgical plication, stapling re-fashioning and endovascular covered stent placement are also proposed.

Methods and Results:
Between 2010-2018 682 AVF/AVG and 338 open and endovascular repairs were performed. In 27 patients VAs were identified. 25 VAs were multiple with diameter 27-45 mm. Diagnosis was based on clinical grounds-size of VA, blood flow characteristics, augmented by ultrasound and venography when appropriate. 17 VAs underwent a partial, longitudinal excision of the aneurysm with reconstruction of the remaining anterior wall with a running Prolene 5/0, 5 VAs underwent a complete excision and PTFE graft interposition and remaining 2 were ligated with no simultaneous reconstruction. In aneurysmectomy group (17 VAs) there were 12 males and 5 females, age 22-84, average 50.6 y.HT-16/17,DM-2/17 and HIV(+)-3/17.Five patients at aneurysmectomy required additional stenting of the ipsilateral cephalic vein arch or basilic vein due to stenosis. Permanent catheters were inserted into the IJV in all repairs. All reconstructed AVFs were rested from HD for 3-4 weeks. All wounds healed well. There were no cases of post-operative thrombosis. Primary patency after 1,3 and 6 months was 100% and at 12 months–88%.

Conclusion and Discussion:
A true VA of AVF is rare. To avoid rupture or thrombosis of VA treatment is recommended. Aneurysmectomy is a preferred operation in our Hospital to prevent these problems and maintain a long term function of AVF.

88 Ultrasound-guided puncture for insufficient vascular acces

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Introduction:
To ensure adequate and functional vascular access (VA) under conditions of insufficient VA (iVA) can be challenging, the effectiveness of using US-guided puncture (US-p) to obtain VA in iVA was examined.

Methods and Results:
Case 1 (Occluded arteriovenous fistula: AVF): A 70-year-old man on haemodialysis underwent percutaneous transluminal angioplasty (PTA) for several failed AVFs. Previously, AVF occlusion was successfully resolved 13 times by US-p of the occluded AVF, wherein a needle was inserted into the radial artery from the anastomosis site. Case 2 (Occluded superficialised artery): A 52-year-old man on haemodialysis underwent PTA for several failed AVFs. The left brachial artery was bifurcated at the axilla and the larger-sized left ulnar artery in the upper arm was superficialised. However, it subsequently occluded. We performed a US-p of the left radial artery in the upper arm, which was continued for two years to obtain VA. Case 3 (Occluded arteriovenous graft: AVG): A 76-year-old woman on haemodialysis had a failed AVG and refused new graft implantation. We performed a US-p of the occluded AVG near the arterial anastomosis and inserted a needle into the brachial artery. This method was continued for a year to obtain VA.

Conclusion and Discussion:
These cases demonstrate the usefulness and application of US-p in iVA or in cases with challenging VA, and the advantage of using US-p as a bridge procedure until PTA or VA reconstruction without additional load on cardiac function .

89 Important factors to prevent vascular access obstruction.

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Introduction:
Vascular access (VA) management is essential for chronic hemodialysis (HD). Daily observation and evaluation of VA are very important to prevent troubles of VA. In this study we try to clarify common evaluation points that can predict acute AVF obstruction and verify them to be useful for future VA management.

Methods and Results:
From January 2016 to June 2018, patient background and examination data were compared and validated for 40 patients with AV obstruction with the need for surgical reconstruction and 40 patients without VA impairment.
Logistic regression analysis of age, gender, BMI, hypotension showed a significant difference only in hypotension (P value 0.0007, odds ratio 8.72, 92% confidence interval (2.49 - 30.52)). In the group with VA disorder, diabetes accounted for 58% and serum albumin value was low. However, there was, no significant difference in the hemodialysis period, hemoglobin, cardiothoracic ratio (presence or absence of dehydration), low dialysis blood flow, infection, and antiplatelet drug history. In the group with AV impairment, average of RI and PI value of Doppler ultrasound examination of AV vein were 0.63 (0.32-0.95) and 1.25 (0.49-1.97) respectively. These values were not significantly different from those of the group without AV trouble.

Conclusion and Discussion:
The most important factor in VA obstruction was hypotension. We consider that stable blood pressure management is indispensable in addition to meticulous daily observation of VA for future dialysis management.

91 Surveillance in the outcome of surgical treatment for aneurysm of avf in esrd patients

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Introduction:
The aim of the study is to evaluate the surveillance and the outcomes of surgical treatment in aneurysm of Arteriovenous fistular patients who undergo hemodialysis.

Methods and Results:
The authors have retrospective reviews on electrical medical records and image system, PACS. The data were collected from 2014 to 2018 in a single institution. The surgical procedures varied from aneurysmectomy alone to partial aneurysmectomy with reservation of the fistula, to aneurysmectomy and creation of a new fistula. The authors had 62 patients for surgical repair of aneurysmal change on AVF. The main reasons for surgical repair were cosmetic issues on patients' arm. Mean aneurysm diameter was 50 ± 20 mm. In all of the cases, the authors took a look at all aneurysm histopathology and thrombotic materials were removed from the surgical field. Mean graft length was 40 ± 20 mm. Post-operative mortality was none. 3 patients needed for additional surgical revision / endovascular intervention because of postoperative bleeding and thrombosis. Postoperative related 30-days infection was noted in 1 patient. Vascular access was started from the reconstructed venous area 2 or 4 days later in all patients. The patency rate was 100% in 5 years.

Conclusion and Discussion:
Aneurysmectomy and pseudoaneurysmectomy would be one of the treatment options for achieving patient's satisfaction of cosmesis and functional correction.

92 Dialysis vascular access- related nerve compression syndrome

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Introduction:
Sensory and/or motoric deficits after vascular access (VA) surgery may be caused by diabetic neuropathy, iatrogenic nerve damage, reflex sympathetic dystrophy or ischemic monomelic neuropathy. Nerve compression due to vessel dilation in arteriovenous fistulas (AVF) or prosthesis in arteriovenous grafts (AVG), is a relatively unknown condition.
We report the outcome of surgical intervention in symptomatic patients with nerve compression in upper extremity vascular access.

Methods and Results:
Results. Seven patients (6 female; 1 male; mean age 54 yrs) with sensory (5) and/or motoric (2) deficits had preoperative ultrasound and MRI imaging. All patients had upper arm VA (3 loop AVG; 3 brachiobasilic/1 brachiocephalic AVF) with median (5), ulnar (1) and medial cutaneous nerve compression.. Median and/or ulnar/cutaneous nerve release (5) and prosthetic graft interposition (2) resulted in complete pain relief in 5 patients. Minor residual symptoms persisted in 2 patients. In two patients the VA was closed and dialysis was continued with a central vein catheter (CVC).

Conclusion and Discussion:
Nerve compression is an underestimated cause for persistent pain after VA surgery. Upper arm/elbow AVF and AVG are the most common VA types. Axillary vessel anastomoses are prone for AVG related nerve compression. Surgical nerve release with or without AVF/AVG revision is the treatment of choice.

93 True donor brachial artery aneurysm after fistula ligation: is it an uncommon complication?

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Introduction:
True donor brachial artery aneurysm (DBAA) is reported to be an infrequent complication after vascular access ligation, and it occurs in graft recipient under immunosuppressant therapy. When identified, it can represent a challenge for the surgeon. Literature is mainly anecdotal with case report or small series, consequently there are not clear criteria for treatment.

Methods and Results:
Overall 12 DBAA were identified (11 males, mean age 53±10years, range 44-68): n=4 in emergency for hand ischemia, n=2 referred to our unit for arm pulsatile mass, n=6 identified between June 2016 and June 2018 after introduction of a routine six-months ultrasound examination. Among incident patients, aneurysm onset was 6±2 years after intervention. Surprisingly, in patients routinely examined, onset was within 6 months except for 1 case at 12 months. At diagnosis mean aneurysmal diameter was 38±17mm. Treatment was mandatory in 6 (50%) cases: ischemic patients (n=4, 33.3%), and in case of asymptomatic aneurysms with large increase in diameter (n=2, 16.7%). In all cases aneurysmectomy was performed and heparin-bonded ePTFE graft bypass was created.

Conclusion and Discussion:
Despite the small number of patients, we have to notice that in our series aneurysm onset was faster in comparison to others. Noteworthy, literature generally take in count large symptomatic dilatations, never considering the opportunity of screening program. In our experience DBAA is more frequent than reported. Aneurysm onset is frequently underestimated because of lack in follow-up. Therefore, a screening program after fistula ligation should be adopted to identify patients at risk for further complications.

95 'low flow' arteriovenous grafts as an alternative to central line in cardiopathic patients with low cardiac output

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Introduction:
Blood flow rate between 800 and 600mL/min or less increases the risk of arteriovenous grafts (AVG) thrombosis. Guidelines recommend AVG flow rates greater than 800mL/minute. For that reason, AVG is sometimes considered a not viable alternative for patients with low cardiac output (LCO). We present our experience with 'low flow' AVG in LCO patients.

Methods and Results:
We include in present study 16 patients (M:F=3:2, mean age 70±9 years range 17 – 76) referred to our centre between January 2016 and June 2018, with history of LCO and 1)high flow native vascular access (n=9), or 2)CVC malfunction (n=7). They underwent VAG creation. To increase blood resistance thought the graft reducing flow rate, arterial-to-graft anastomosis was performed with a smaller area (technical trick n=14, tapered graft n=2). During follow-up (20±7 months,range 6-32) all patients were still alive, mean AVG flow rate was 730mL/min ± 27, primary assisted patency 62.5% and 37.5% at 12 and 24 months, graft survival was 87.5% and 75.0% at 12 and 24 months respectively. In all cases an increase in cardiac output was registerd, except for one case where a small decrease in cardiac output did not required VAG removal.

Conclusion and Discussion:
Present study demonstrates that a modification in conventional technique, or the use of especially designed grafts, can extend the use of vascular access also to patients candidate to CVC. It does not affect the patency and the survival of the circuit, reducing the risk of CVC complication.

96 Examination of patency rates after thrombectomy and angioplasty only using duplex ultrasound for grafts

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Introduction:
Thrombotic occlusion of grafts influences daily hemodialysis and needs more invasive treatments rather than simple angioplasty.In the case of thrombotic occlusion of grafts, we can place new graft in opposite arm.We can also place new graft in proximal blood vessel.But this is not good from a perspective of preserving blood vessel.In adition, many patients have been on hemodialysis for many years in Japan.So it is very important to keep each patient’s vascular access not in proximal blood vessel or another arm.In our hospital,we usually incise skin and prosthetic graft for thrombectomy.And thus angioplasty only using Duplex Ultrasound is conducted.In this time,we examined patency rates at 3-month and at one year for these patients using Kaplan-Meier method.

Methods and Results:
From April 1st 2015 to March 1st 2017,there were consective 82 patients who underwent angioplasty after thrombectomy for thrombotic occlusion of grafts.36 patients(43.9%) were male,46 patients(56.1%) were female.The mean age was 69±12 years old.Patients with diabetes were 46(56.0%).
At 3-month after thrombectomy and angioplasty,22% of patients were patent without additinal angioplasty,and 52.2% of patients were reoccluded with thombosis before additinal angioplasty.The primary patency was 39.7% at 12-month that estimated using Kaplan-Meier method.

Conclusion and Discussion:
The efficacy of angioplaty after thrombectomy is not demonstrated in this study.However angioplasty after thrombectomy for thrombotic occlusion of grafts seems to be same results as angioplasty for simple stenosis or occlusion of grafts.This suggests that angioplasty after thrombectomy for thrombotic occlusion of grafts seems to be acceptable in terms of maintaining the current grafts as long as possible.

97 Surgical treatment of avg damages - single center experience

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Introduction:
In some cases the arterio-venous graft (AVG) is the last chance for a patient to get permanent vascular access for haemodialysis, and the saving of the AVG in such cases is therefore same as saving life. In this study we reviewed our experience in the surgical treatment of AVG damages.

Methods and Results:
During the period from 01.01.2008 till 31.12.2017 eleven AVG damage cases were observed: 7 cases of mechanical defects with pseudoaneurism (due to "area cannulation technique") without signs of infection, 2 cases of the similar AVG defects and presence of local infection, and 2 cases of infection of the AVG cannulation site without significant mechanical damages of the graft. In all cases the partial graft excision was performed and a bypass with a new "bridging" graft was made, accompanied by antibacterial therapy. In 9 cases the treatment was successful. Two patients lost their graft due to persistent infection postoperatively (one with cannulation site isolated infection and one with AVG damages and infection)

Conclusion and Discussion:
Partial AVG excision with "bridging graft" and antibacterial therapy could be successfully used in cases of vascular graft damages to save vascular access for haemodialysis.

98 The efficacy of the secondary extension technique in the management of dialysis access associated steal syndrome

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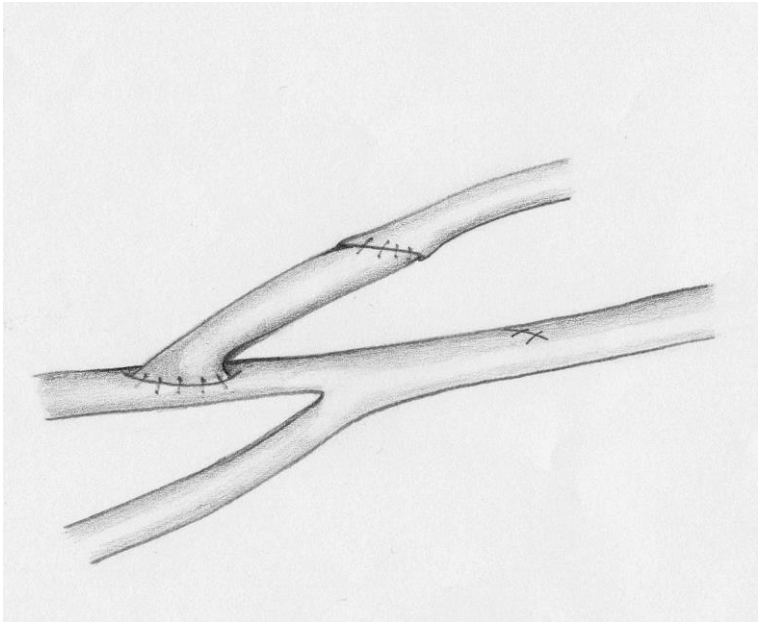
Introduction:
Dialysis-associated steal syndrome (DASS) remains a difficult clinical scenario for vascular access surgeons. The ideal treatment would improve blood flow to the hand without compromising the fistula, however most treatment options rarely allow for both. The study describes an innovative technique used in clinical practice over a 17 year period for the treatment of DASS. The procedure and long term results are presented.

Methods and Results:
27 patients with DASS were recruited over 17 years at two large UK University Teaching Hospitals and treated with the extension technique. All patients were evaluated for resolution of symptoms, patency and adequacy of needling. 27 patients were admitted with DASS and underwent surgery using the extension technique. Complete symptom resolution was seen in 26 of the 27 patients (96%), with improvements in pain, sensori-motor disturbance and temperature. All 26 patients had a patent fistula at six-months follow up. 3 of 27 (11.1%) developed fistula thrombosis which could not be salvaged, and 2 of 27 (7.4%) developed thrombosis successfully salvaged by fistulaplasty at 12-months follow up.

Conclusion and Discussion:
Our study shows that the Extension Technique is an effective treatment for Dialysis Access Associated Steal Syndrome and results have demonstrated a high level of fistula patency and a low rate of complications. It has several advantages when compared to other established treatment methods and has the versatility to be used as a method for DASS prevention as well as treatment.

Picture 1:



Outline of the secondary extension technique

99 Dialysis access salvage- a single centre experience

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Introduction:
Vascular access for dialysis commonly fails due to technical reasons, usually seen early after access creation and prior to dialysis. Stenosis, bleeding and low flow are often encountered in dialysing patients. Due to limited vascular access, early salvage is a priority. Our aim was to review the management practice in our unit.

Methods and Results:
A retrospective study, using patient hospital records between January 2012 and September 2017 was conducted. Types of access included; autogenous A-V fistulas at wrist and elbow, HeRO graft, forearm and thigh prosthetic ePTFe loop. 55 patients presented with dialysing problems, who were having successful dialysis prior. 46 patient records were analysed, as 4 patients were lost to follow up, 2 had transplants and 3 died. 43 patients presented with thrombosis and 3 with bleeding. 34 presented within 48 hours. 35 patients were treated surgically, 22 had surgical thrombectomy, 3 had ligation, 2 had surgical patch-plasty using a Bovine patch. Three had endovascular treatment with mechanical breakdown of clot and suction using Angiojet. Six patients had hybrid procedures with thrombectomy followed by angioplasty of stenosis. Ten patients had failed rescue procedure due to late presentation and had alternative mode for dialysis. After initial successful treatment, 26 patients underwent further salvage procedures within 3 months. Over all 73.9% treated patients were still dialysing from salvaged access after 6 months.

Conclusion and Discussion:
Higher rate for dialysis access salvage can be achieved by regular monitoring and early presentation and intervention either by surgical, endovascular or hybrid procedures. Some, need further procedures.

100 Surgical higher reimplantation of the anastomosis has an important role in radiocephalic fistula rescue

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Introduction:
The presence of juxta-anastomotic stenosis of radiocephalic fistulae is a frequent problem that precludes fistula maturation and can lead to access failure and progression to a more proximal fistula. In our centre both endovascular and surgical rescue are commonly used. We specifically looked at the value of higher reimplantation and fistuloplasty to improve primary patency of radiocephalic AVFs.

Methods and Results:
We retrospectively collected data on all radiocephalic fistulae between 2012 and 2016. All operative data were collected reviewing the surgical operation note.
49 patients underwent procedures to improve primary patency rates within the first 12 months following fistula creation from a total of 331 radiocephalic fistulae created. 16 fistulae underwent primary surgical rescue with higher reimplantation, of which only 2 failed maturation and 1 thrombosed during follow up. 33 fistulae underwent primary fistuloplasty, of which 9 required surgical revision (in the form of higher reimplantation) and 1 required further fistuloplasty to maintain patency. Furthermore, 6 fistulae were abandoned after fistuloplasty to form a more proximal fistula during follow up.

Conclusion and Discussion:
Higher reimplantation is an uncommonly practised technique to preserve radial fistulae. Here we demonstrate that it has an important role in radial fistula salvage and that it potentially is more efficacious than radiological rescue.

Vascular access outcome / Elderly patients

102 Factors determining short term arteriovenous fistula outcomes in the dialysis population: a single center study

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Introduction:
To determine factors affecting fistula success rates by analyzing a single surgeons experience at an academic institution. We looked at several demographic and comorbidity-linked risk factors and their effect on complications seen within the first six months after creation.

Methods and Results:
Fistulas created between June 2005 to June 2015 were evaluated. Retrospective review of medical records obtained through EPIC, Clinical Looking Glass, operative and outpatient access center notes was done. Review of potential risk factors was done and evaluated for effect on complications within six months post fistula creation. Patients were identified who underwent a procedure in response to an access complication and were grouped based on whether they had the procedure within the first six months of access creation or after.

Conclusion and Discussion:
394 patients received a fistula during the study time period. Patients with hypertension were more likely to have a complication within six months than patients without (p = .0024). This was true for both males and females (p = .04 and .01 respectively). Males whose fistula was created using an end to side anastomoses (n=92) had better outcomes than females who received the same technique (n= 59) (p = .042). Patients with an intraoperative measured vein size of less than 3.0mm trended towards having more complications than individuals with a vein size 3.00mm and over (p = .078).
This study identified three factors that significantly affected outcomes of arteriovenous fistulas within the first six months of their creation. Future studies will attempt to provide an algorithm for patient selection.

Picture 1:

Significant Results

	Complications within six months	No complications	*Marginal Row Totals*
Vein size under 3.0mm	49 (41.8) [1.24]	37 (44.2) [1.17]	86
Vein size 3.0mm and over	142 (149.2) [0.35]	165 (157.8) [0.33]	307
Marginal Column Totals	191	202	393 (Grand Total)

P value = .078

	Complications within six months	No complications	*Marginal Row Totals*
Males end to side	39 (45.09) [0.82]	53 (46.91) [0.79]	92
Female end to side	35 (28.91) [1.28]	24 (30.09) [1.23]	59
Marginal Column Totals	74	77	151 (Grand Total)

P value = .0423

	Complications within six months	No complications	*Marginal Row Totals*
Males with htn	102 (96.33) [0.33]	106 (111.67) [0.29]	208
Males without htn	11 (16.67) [1.93]	25 (19.33) [1.66]	36
Marginal Column Totals	113	131	244 (Grand Total)

P value = .040

	Complications within six months	No complications	*Marginal Row Totals*
Females with htn	69 (63.56) [0.46]	54 (59.44) [0.5]	123
Females without htn	8 (13.44) [2.2]	18 (12.56) [2.35]	26
Marginal Column Totals	77	72	149 (Grand Total)

P value = .01

Table of Significant Results

103 Cumulative patency rate of forearm versus upper arm avf

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Introduction:
Both upper arm (UA) and forearm (FA) arteriovenous fistulas (AVF) are utilized as a permanent hemodialysis access. FA-AVFs are considered the first choice for creating dialysis access. However, accumulating evidence suggests that the access survival of FA-AVFs is lower than those of UA-AVFs. Hence, the aim of this study was to compare the cumulative patency rate of FA-AVFs and UA-AVFs and to explore the predictors of access survival.

Methods and Results:
We retrospectively analyzed 286 hemodialysis patients who underwent AVF creation at our institution between 2005 - 2015. Cumulative access patency was defined as the time from access creation to permanent failure, regardless of the number of interventions required to maintain long-term patency for dialysis. The cumulative patency rate was calculated in UA-AVF and FA-AVF groups using Kaplan- Meier survival methods and log-rank tests. This study included 121 and 165 cases in the UA-AVF and FA-AVF groups, respectively. Baseline characteristics included: 39% were females; 88% were blacks; 50% were diabetics; 96% and 28% of patients had hypertension and congestive heart failure, respectively. Cumulative patency rate of UA-AVF and FA-AVF during the follow up time was 74% and 59%, respectively (p=0.008). In multivariate analysis of AVF survival, we found that hemodialysis access failure was higher in FA-AVF than UA-AVF (HR: 1.97 [1.28-3.06]; p=0.002). Further, female gender was associated with increased AVF failure (HR: 1.58 [1.05-2.37]; p=0.03).

Conclusion and Discussion:
FA-AVFs have a lower cumulative patency rate as compared to UA-AVFs. Further, UA-AVFs and male gender are associated with a better hemodialysis access survival.

104 Radiocephalic arteriovenous fistula as first-choice vascular access in the elderly patients

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Introduction:
The aim of this study was to assess the patency and survival of the radiocephalic arterivenous fistula (RCAVF) in elderly patients older than 75 years with end-stage renal disease(ESRD) candidates for HD.

Methods and Results:
Unicenter retrospective study with two established cohorts, from january 2013 to december 2016. All patients with ESRD candidates for RCAFV were included. The preoperative study was performed by physical examination and ultrasound mapping. Two study groups were established according to age: under 75 years(<75) and older and equal to 75 years(≥ 75). A total of 54 patients were included(<75: n: 40;> 75 n: 14).79.6% men. Mean age <75: 59.3 ± 13.1 years and> 75: 79.7 ± 3.5 years. 83.3% left and 46.3% predialysis patients. Main etiology of the ESRD was high blood pressure(HBP) 29.6% and diabetes mellitus(DM) 30%. Main associated comorbidity: HBP 85.2%, DM 53.7%, dislipidemia 37%. No significant differences between study groups regarding associated comorbidities or etiology of ESRD.In relation to patency(<75 vs> 75), immediate patency rate was 75 vs 100% *(p, 0.035), early 92.5 vs 85.7 (p, 0.595), late at 6 62% vs. 71.4%(p, 0.747) and at 12 months 50% vs. 42.9% (p, 0.760%) respectively.

Conclusion and Discussion:
Routine preoperative ultrasound mapping increased the immediate patency of the RCAVF in elderly patients in our center. RCAVF patency was similar in the two study groups. In view of these results, the RCAVF is still the vascular access of choice for the elderly patient in our center, as it preserves the vascular territory and it is associated with a lower rate of comorbidities

105 Outcomes of vascular access in octogenarians: an analysis of cases

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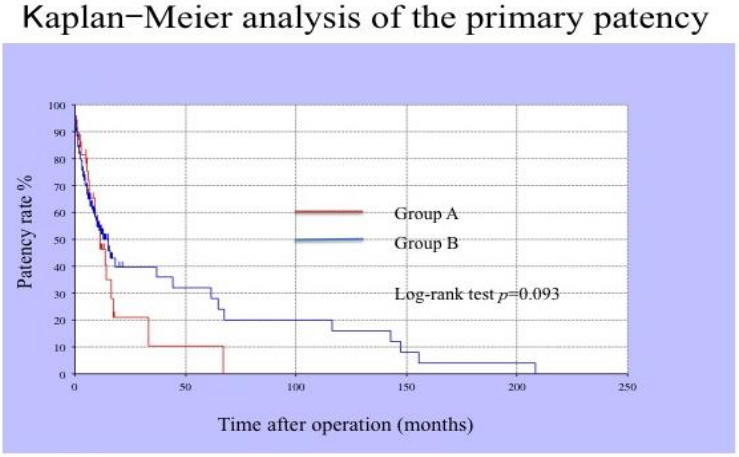
Introduction:
The number of elderly patients requiring hemodialysis has consistently increased over time, but outcomes of hemodialysis vascular access in octogenarians are poorly described. The aims of this study were to evaluate the outcome of vascular access in octogenarians and to compare this patient cohort with the outcome of patients aged <80 years.

Methods and Results:
This study was performed retrospectively on prospectively collected data.
We analyzed 262 vascular access treatments performed in 150 patients between August 2016 and December 2017 at a single center. Cases were divided into two groups based on age:≥80 years old (group A, n=62) and <80 years old (group B, n=200).The differences in baseline characteristics, procedural variables, and patency rates between the two groups were subsequently analyzed. Mean age was 85.3 ± 4.6 years and 66.5 ± 10.3 years in groups A and B, respectively (p<0.001). Height did not differ significantly between groups; however, weight and body mass index were significantly different . Nephrosclerosis as the cause of renal failure requiring hemodialysis was significantly more common in group A (29.0% vs. 16.0%; p=0.023). The older patient group had a significantly higher prevalence of chronic obstructive pulmonary disease (COPD; 11.3% vs. 0.5%, p<0.001). No significant intergroup differences were found with respect to primary, assisted primary, and secondary patency rates. Multivariable analysis did not identify variables significantly associated with the incidence of vascular access occlusion.

Conclusion and Discussion:
Elderly patients had lower weight and BMI and were more commonly diagnosed with COPD. Our results demonstrated that the primary, assisted primary, and secondary patency rates ofoctogenariansdid not differ from those of younger patients.

Picture 1:



Patient at risk				
A	39	1	0	0
B	147	8	5	2

106 Incremental hemodialysis regimen offers favorable results for vascular access. experience of a center for 10 years.

Esther Garcia, Jose Luis Merino, Sonia Mendoza, Blanca Bueno, Patricia Dominguez, Beatriz Martin, Veronica Sanchez, Beatriz Espejo, Laura Baena, Vicente Paraiso

Hospital del Henares Nephrology, Coslada, Spain

Introduction:
Incremental hemodialysis(IHD) regimen at the beginning of renal replacement therapy (RRT) (2HDper/week) presents a better survival rate in a selected group of patients. Lower number of punctures, the lack of high flows and the recovery times between each HD session can be protective factors.

Methods and Results:
We have analyzed the evolution of vascular access(VA) A of all IHD patients: need for angioplasty, functionality of VA and associated complications from 2007 to 2017.
Results: Of the 45 patients, 10 patients were excluded because they were less than 6 months in IHD and 2 because they recovered residual renal function. Mean time in IHD: 16 months±13 (range:6-81), mean time in total HD: 31 months±19 (range:11-96). The types of VA were: 25 autologous fistulae (AVF), 3 grafts (PTFE) and 5 tunneled catheters (TC). Of all the AVF in this period of follow-up, total of 29, a thrombosis event was observed in 4 (at 12, 11, 84 and 23 months) and 2 stenosis without thrombosis were also identified (at 12 and 18 months). The thrombosis rate was 12% throughout the follow-up and the percentage of stenosis was 20%. The primary patency of complicated AVF was 12 months. The final situation of the AVF was: functioning kidney transplant in 11 cases, 3HD a week in 10 patients, 2HD/week in 2 cases and in 6 deceased patients with functioning AVF.

Conclusion and Discussion:
IHD starting pattern can provide benefits to VA. The number of observed complications is low. A greater experience in this pattern could allow better long-term survival of VA.

107 Vascular access and patient survival: an underestimated contribution of comorbidity

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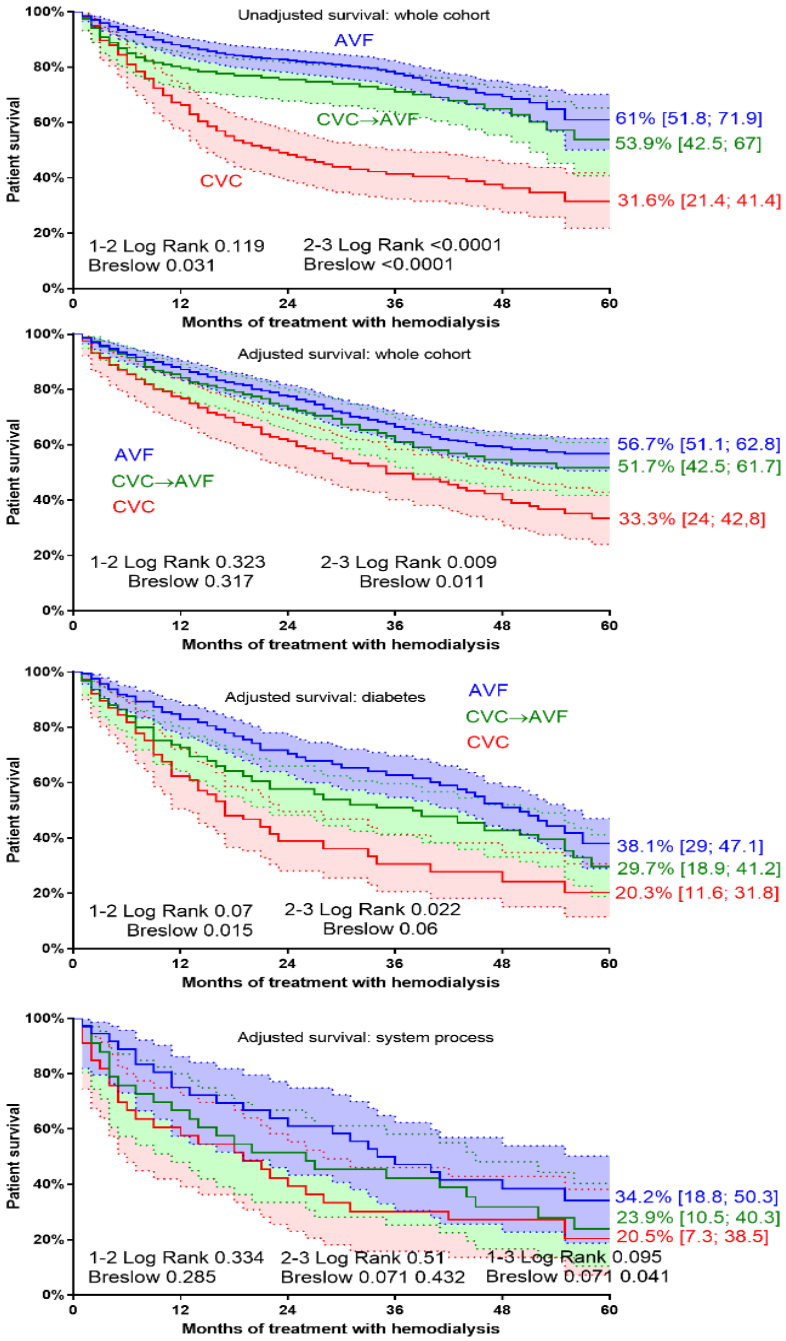
Introduction:
In the evaluation of vascular access and survival rates often do not take into account comorbidity and cause of CKD.

Methods and Results:
We analyzed the relationship between vascular access type and survival rates in 619 patients from the CKD registry of Moscow region. AVF – patients started and continued HD with AVF, CVC-AVF – patients started the HD using the CVC with the subsequent successful conversion of AVF, CVC – patients received HD only with CVC. Other types of the conversion were excluded. The type of vascular access has a significant impact on patient survival (unadjusted) (fig. 1). However, after adjusted the model for the cause of CKD, age and comorbidity, and also took into account the time-dependence of covariates, survival in the AVF and CVC-AVF groups did not differ in the total cohort (fig. 2). At the same time, in patients with diabetes (fig. 3) we noted a significant deterioration in adjusted survival if CVC was used. In patients with systemic diseases (lupus nephritis, HIV nephropathy, cancer, drug addiction, rheumatoid arthritis, etc.), we did not note a statistically significant dependence of the type of vascular access and adjusted survival: life expectancy in these patients was low in any case (fig.4).

Conclusion and Discussion:
Comorbidity and cause of CKD are important factors that have a strong impact on patient survival, regardless of the type of vascular access. In addition, there is a strong dependence on the time of such a factor as vascular access. This must be taken into account in the analysis of survival.

Picture 1:



Survival rates

108 Patency in arteriovenous grafts in elderly hemodialysis patients

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Introduction:
The number of elderly patients with end-stage renal disease is increasing rapidly in Japan. The average age of dialysis induction patients in Japan is 69.4 years old and an upward trend. We compared the arteriovenous graft (AVG) patency rate and complications between elderly patients and non-elderly patients.

Methods and Results:
A retrospective analysis was completed for all the patients who had an AVG during 2013 to 2018. We divided patients into two groups, elderly group (≧80 years) and non-elderly group (<80 years), to analyze. Patency of AVGs was evaluated by Kaplan-Meier analysis.93 patients were included in the study, 25 (26.9%) in the elderly group and 65 (73.1%) in the non-elderly group. In the elderly group, 52.0% were men, 36.0% were diabetic. The mean age was 84.6±3.1 years. The 1-year secondary patency rate was 68.3%, and 3-years secondary patency was 51.2%. In non-elderly group, 51.5% were men, 48.5% were diabetic. The mean age was 67.3±10.9 years. The 1-year secondary patency rate was 86.5%, and 3-years secondary patency was 46.0%. No patients in the elderly group experienced graft infection, while 4 (6.2%) patients experienced their graft infection in the non-elderly group.

Conclusion and Discussion:
AVG patency rates were not statistically different in the elderly and non-elderly groups. This result suggests that in patients with limited life expectancy an AVG may be an effective for the elderly patients that a vascular condition is difficult.

109 Smoking is associated with a higher complication and failure rate in arteriovenous grafts for haemodialysis: a multi-centre experience.

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Introduction:
Arteriovenous grafts (AVG) for haemodialysis access are recommended as a 2nd line modality due to higher morbidity and mortality rates than arteriovenous fistulae (AVF). Smoking is an already an established failure risk in synthetic grafts. We aimed to investigate smoking's relationship on AVG outcomes and investigate other factors related to complications and failure.

Methods and Results:
A 3 year (01/08/2015-01/08/2018) multi-centre retrospective study was carried out on patients receiving an AVG. Data included patient demographics, medical history, operation, type of graft and postoperative course. Statistical analyses performed were chi-squared, Fisher's exact test and logistic regression. 59 AVGs were performed (1,052 AVF performed) in this period (25:34 M:F; median age 61 (range 8-87). The most common procedure was brachioaxillary graft (52.3%). 64.4 % had complications with 52.5%

requiring post-operative intervention (Clavien-Dindo III). The most common complication was thrombosis (38.9%). Median time to intervention was 67 days and overall AVG failure rate was 44.1%. Mortality rate was 21.4%. Smoking was significantly associated with graft thrombosis (p=0.03) (OR 7.94 2.06-30.62 95% CI, p<0.01) and overall graft failure (p<0.01) (OR 0.03 0.06-1.55 95% CI, p<0.01).

Conclusion and Discussion:
Complication and reintervention rates are lower than previous reports, although graft failure rate is significantly higher. Smoking results in a greater risk of thrombosis and overall graft failure. This is already described in, but has not previously been demonstrated in AVGs. As smoking is a modifiable risk factor and AVGs are typically for end-stage vascular access patients, pre-operative strategies including patient education and pre-habilitation should be employed to improve outcomes.

110 Experience with arteriovenous access surgery in all hemodialysis patients aged 80 years and older at our hospital.

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Introduction:
The prevalence of CKD is 15.1%. In end stage disease, 52.4% of them get a kidney transplant, 42.2% hemodialysis and 5.45%, peritoneal dialysis. The arteriovenous fistula is the first choice for hemodialysis. Historically, the "Fistula First, catheter last" approach has been defended because of fistula's advantages. However, currently there are more studies that support a different vascular access in the elderly due to the high primary failure rate and low permeability rate. Therefore, it is necessary to know the percentage of arteriovenous fistula´s usefulness in the elderly.

Methods and Results:
We analyzed retrospectively 35 patients aged 80 years and older with their first native fistula created between January 2014 and October 2018. All the statistical analysis was performed using SPSS version 25. Charlson Comorbidity Index was 10.3. From the patients that were intervened, had a 25.7% radio-cephalic AVF, 71,5% had a humeral-cephalic AVF, and 2,8% had a humeral-median-basilic AVF. After 3 months fistula maturation rate was 55.88%. Only 31,4% of AFV made were utilized. The mortality rate was 25.7%. No death was related to AV complications.

Conclusion and Discussion:
The use of AVF in the elderly is limited. We must consider other types of vascular access different than AVF for hemodialysis. The comorbidities of this group of patients are modifying factors to the standard treatment of choice and they can interfere negatively in the use of AVF.

111 A study on treatment of vascular access (va) trouble in extreme elderly dialysis patients (over 80 years old)

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Introduction:
There are 320,000 dialysis patients in Japan, and about half of them are aged over 65 years. Characteristics of elderly patients may include skin thinning and poor nutritional status. We performs approximately 4,500 VA procedures per year.We compared treatment of VA-related complications aged over 80 years with past cases.

Methods and Results:
Of 120 initial creation of AVFs, 23 cases (19.1%) for over 80 years old; 25 cases (21.0%) for over 80 years old in 119 AVGs; and 696 cases for over 80 years old in 3,613 VAIVTs (19.3%). The time for AVG surgery for over 80 years old was 115 minutes and 114 minutes for under 79 years old. Extravascular leakage during VAIVT was identified in 50 cases in the patients aged under 79 years; 46% of them was diabetic, whereas 24 cases in the patients aged over 80 years; 25% of them was diabetic .

Conclusion and Discussion:
The time for operation was compared between AVF, AVG, and VAIVT for both over 80 years and under 79 years old, but no differences were detected. This seemed to be due to the establishment of the surgical technique and the thorough evaluation of the preoperative procedure. There were few extravascular leakages during VAIVT in over 80 years old and diabetic patients, however, this seemed to be due to that diabetic patients were short-lived resulting from cardiovascular complications and the proportion of other patients with primary disease increased.

112 The vascular access in elderly - a challenge or a damnation?

Biser Borisov[1], Gergana Todorova[1]

[1]Department of Nephrology and Dialysis, Medical University, Pleven, Bulgaria

Introduction:
The annual increase of the number of hemodialysis (HD)-treated patients is 8-16 % in the 75-plus group. The main aim of our study is recording the vascular access type in HD-patients treated for more than 90 days within a five-year period (from January 1th, 2012 to December 31th, 2016).

Methods and Results:
Eighty three (83) patients with a median age of 59.7 (+/- 13.98) years (28 females and 55 males) are divided in three groups: A (< 45 years) – 11, B (45-64 years) – 42 and C (> 65 years) – 30. The used vascular access types were arterio-venous anastomosis (AVA), cuffed catheter (CC) and temporary catheter (TC). The access type distribution at the start of HD treatment was: A: AVA-0, CC-0, TC-11; B: AVA-8, CC-9, TC-25 и C: AVA-8, CC-10, TC-12 and the differences between the patients from group A and those from groups B and C is significant ($p < 0.05$). After 90 days of HD-treatment, the vascular access type distribution was: A: AVA-10, CC-1, TC-0; B: AVA-36, CC-6, TC-0 и C: AVA-17, CC-13, TC-0 and the differences between the relative share of AVA between the groups A, B, and those from group C is statistically significant ($p < 0.05$).

Conclusion and Discussion:
Based on our data, we conclude that the old age is not a contraindication for AVA creation but vascular access type must be decided individually.

113 Arteriovenous fistula creation in severely calcified arteries

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Introduction:
This study evaluated a procedure for arteriovenous fistula (AVF) creation in pulseless calcified arteries, which we named “ceramic-like arteriosclerosis (CAS).” unable to make incision and anastomosis by usual process.

Methods and Results:
Sixteen patients with observed CAS during AVF creation were enrolled in this study. A softening procedure was performed before clamping and making an incision in the artery. The calcified arterial wall was repeatedly and gently compressed with forceps until softened and capable of blood flow pulse. Complications and the patency rate were assessed prospectively. Anatomical changes in the wall were observed pathologically. There were no serious complications, including perioperative bleeding and ischemic events, just after the softening procedure. The 1-year patency rate was 86%. Calcification occurs in the media, which is covered with an intact intima and adventitia. The three layers were preserved after the procedure.

Conclusion and Discussion:
CAS is the end stage of Mönckeberg's arteriosclerosis; the calcification was observed in the media without severe arterial stenosis. This could imply the possibility of AVF if anastomosis is performed with CAS. The calcified intima was covered with an intact intima and adventitia, reducing the risk of disseminating calcified parts to distal regions and helping to control bleeding during surgery. AVF creation was enabled by applying a softening procedure to vessel walls with CAS. The short-term patency rate is not inferior to current AVF creation methods using non-calcified vessels.

114 Is age related to restenosis of vascular access in the patient in hemodialysis? a prospective observational study.

Manuela Moreno-Ramirez, Isabel Gonzalez Carmelo, Maria Teresa Mora-Mora, Laura Rico Fernández de Santella, Elisa Tarrio Herva, Manuel Benitez - Sanchez, Teresa Moreno - Sanchez

Hospital Juan Ramon Jimenez, Huelva, Spain

Introduction:
Problems with vascular access (VA) are an important cause of morbidity and mortality in haemodialysis patients. The major cause of VA dysfunction is stenosis. The pathogenesis of stenoses in VA are produced by the development of an aggressive intimal hyperplasia, mainly as a result of a proliferation of the smooth muscle associated to an increase in oxidative stress and the expression of inflammatory and cytokine mediators. Other factors also contribute, such as the surgery, haemodynamic stress, repeated puncturing and angioplasty procedures, and endothelial dysfunction caused by the uraemia [1-4]. Hemodialysis population is progressively aging, currently median age of patient in renal replacement therapy is 75 years. Elderly patients have an inhibited cell proliferation, which in the case of VA could be beneficial because it could delay the appearance of stenosis.

Methods and Results:
We perform an observational prospective study to relate relate age to time of survival of VA. From January 2016 to December 2018, we perform 168 angioplasties (72% men, mean age 77) and we follow-up patients 12 month. The main endpoint was time of survival of the VA until a new stenosis occurs. We divided patients in four groups by age and comparted mean survival: under-50 (243.9 days), 50-70 (226.7d), 70-80 (262.4d), over-80 (270d). We analyze data using ANOVA and find that this difference is almost stadistically significant with a p=0.3.

Conclusion and Discussion:
Elderly patients has its own characteristics about cell regeneration, proliferation factors and re-stenoses and they deserve a personalized treatment. These data could be useful in terms of future therapies.

116 The fate of autologous arterio-venous fistula

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Introduction:
Arteriovenous fistulas (AVFs) are the superior choice for vascular access. The European Society of Vascular Surgery highlights the lack of evidence regarding management of late complications. For occluded fistula, thrombectomy within 24 hours improves patency and 70% of fistula can be used again for dialysis. Our objective was to report the fate of thrombosed AVFs at a tertiary vascular unit.

Methods and Results:
From a prospectively maintained registry, late AVF thrombosis (>30 days post creation) between January 2015 and June 2018 were identified. Primary outcomes were: time from thrombosis to intervention; intervention strategy; and subsequent patency at 1, 6 and 12 months. Treatment of associated stenosis and further interventions performed were recorded. Thirty seven patients experienced 38 episodes of late thrombosis. In 16 cases (42%) no intervention was performed, typically owing to delayed presentation, a history of multiple previous interventions or serious concurrent illness. Time to intervention ranged from 0 to 3 days (median 0). Interventions were: surgical thrombectomy (77%); surgical thrombectomy with patch (9%); surgical thrombectomy with immediate fistuloplasty (9%); and fistuloplasty alone (5%). Patent fistula numbered 9 at 1 month, 6 at 6 months and 1 at 1 year.

Conclusion and Discussion:
Just under half of thrombosed fistulas were unsuitable for salvage. In the remainder, despite timely and appropriate intervention, only 1 fistula was functioning at 1 year. With increasing demand on vascular access services research is required to reduce fistula thrombosis rates. Even if thrombectomy is successful early creation of new access should be a priority.

117 Anastomotic angles and patency rates in side-to-end arteriovenous fistulas

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Introduction:
Various opinions have been stated regarding the relationship between the anastomotic angle of the artery and vein in autologous arteriovenous fistulas (AVFs) and the patency rate. In this study, we examined the influence of the anastomosis angle on the patency rate in side-to-end AVFs.

Methods and Results:
Fifty nine *de novo* AVFs at our hospital were retrospectively assessed. The anastomosis was of a side-to-end configuration and the anastomotic angle was ≤ 90°. The primary end point was percutaneous transluminal angioplasty, reconstruction, or abandonment of the AVF. The patency rate was calculated by the Kaplan-Meier method, the comparison of the two groups was conducted using the Log-rank test, and $P < 0.05$ was regarded as significant. The patient cohort consisted of 43 males and 16 females, and median age at surgery was 71 years. The median anastomotic angle of the AVFs was 60° (mean ± standard deviation: 63 ± 19°). The primary patency rate of the entire cohort was 78% at 6 months after AVF generation. The patients were categorized based on the anastomotic angle (Group 1: ≤ 45°, 11 cases; Group 2: ≥ 46°, 48 cases). The primary patency rate at 6 months of Group 1 and Group 2 was 43% and 87%, respectively. The primary patency rate of Group 2 was significantly higher than that of Group 1 ($P < 0.01$).

Conclusion and Discussion:
In cases of acute anastomotic angles, larger angles of > 45° are preferred for AVF in side-to-end anastomosis. We will clarify the optimal angle including obtuse angles in further studies.

118 Do flow rates in brachiocephalic arteriovenous fistulas predict development of cephalic arch stenosis?

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[2]Antrim Area Hospital, Antrim, United Kingdom

Introduction:
The development of cephalic arch stenosis is a leading cause of brachiocephalic arteriovenous fistula (BCAVF) failure. We hypothesised that a relationship exists between BCAVF flow rates and the development of cephalic arch stenosis.

Methods and Results:
Retrospective analysis of electronic records was performed for all patients with BCAVF creation from 2014 – 2016. Inclusion criteria: documentation of brachial artery flow rates after AVF creation and AVF use for a minimum of 3 months for haemodialysis. 67 patients were included from 2 centres. The average age was 68 years, 44 patients were male, and 53 had a left BCAVF. The median number of days to BCAVF outcome was 890 (range 101-1711) (see table). 19% of patients developed a cephalic arch stenosis. Median time to first fistula intervention for patients with stenosis was 633 days. Median follow-up for patients with no stenosis was 887 days. Median brachial artery flow in the stenosis group was 2117 ml/min and 2192 ml/min in the no stenosis group. 23% of patients with cephalic arch stenosis were unable to continue using their AVF compared with 7% AVF failure in the no stenosis group.

Conclusion and Discussion:
Brachial artery flow rates were very similar for BCAVF that developed cephalic arch stenosis and those that did not. In this small cohort of patients, brachial artery flow rates do not seem to predict the development of cephalic arch stenosis.

120 Vascular access then and now. 30 years time lapse

Iustinian Bengulescu[1], Gabriela Orosan[1], Simina Zarma[1], Cristiana Voinescu[2], Stelian Pantea[2], Victor Strambu[1]

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[2]Timisoara Emergency County Hospital, Timisoara, Romania

Introduction:
The arterio-venous fistula represents the first choice in creating the vascular access. The radio-cephalic fistula should be the preferred site for it. Our goal was to determine the preferred access sites for creating an arterio-venous fistula after a 30 years time lapse.

Methods and Results:
We performed a retrospective study, analysing the type of vascular access created by dividing the patients into two groups. Al fistulas were created in our 2 centers. The first group consisted of patients that had arterio-venous fistulas created between 1984-1995 and the second group was consisted of patients that had arterio-venous fistulas created between 2015-2017.The first group had a number of 485 patients and the second group had a number of 421 patients. The mean age in the first group was 42.95 years, and the mean age in the second group was 59.9 years. In the first group there were 69,48% radio-cephalic fistulas, 21.23%brahio-cephalic fistulas and 9,29%brahio-basilic fistulas. In the

second group there were 21% radio-cephalic fistulas, 48.29% brahio-cephalic fistulas and 28.91% brahio-basilic fistulas

Conclusion and Discussion:
Although the radio-cephalic fistula is and should be the first choice in creating a vascular access, there seems to have been a decrease in the percentage of radio-cephalic fistulas created in the second group. The mean age has increased over the years, and performing an arterio-venous fistula in the elderly nowadays is very common. Maintaining the vascular access's patency still seems to be a struggle, although endovascular procedures have proven to be more accessible and successful throughout the years.

121 Different vascular access for hemodialysis

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Introduction:
Repetitive venous punctures in forearms in patient on HD develop venous fibrosis, making impossible subsequent cannulation and creation of more AV fistula. The aim of the study was to describe the creation of unusual VA for HD in patients with limited options that may be a matter of choice to safe and prolong the patient's life.

Methods and Results:
We had performed 26690 VA in a period of 40 years: 9309 as permanent VA, 7968 AV fistula (85.6%) and 1341 (14,4%) tunnelled catheters (TC). Due to some complications, v.azygos (n=1) was enlarged which gave an opportunity to be used as unusual VA for HD; v. saphena magna and a. femoralis superficialis anastomosis (n=2); a.femoralis was cannulated until patients were prepared for continuous ambulatory peritoneal dialysis (n=4). We have cannulated v.azygos intentionally for a period of 45 days during cardiosurgery performed thrombectomy to right atrium and bypass from v. innominate to right atrium with Dacron graft 8mm and catheter Tesio insertion in v.innominate to right atrium. In 2 other patients we avoid using upper VA due to stenosis at innominate veins and performed v. saphena magna and a.femoralis superficialis anastomosis.

Conclusion and Discussion:
One patient was with occlusion of both axilar vein and occlusion of both femoral veins. We performed HD using catheters in a.femoralis 45 days until patients were prepared for peritoneal dialysis. Different VA for HD was used as a life saving procedure in CRF patients in whom conventional access failed. Such approach may be of choice as it provides sustainable VA for HD.

122 Ageing and estrogens: could it affect vascular access for hemodialysis?

Manuela Moreno-Ramirez, Elisa Tarrio Herva, Laura Rico Fernández de Santella, Isabel Gonzalez Carmelo, Eva Rodriguez Gomez, Maria Teresa Mora-Mora, Manuel Benitez - Sanchez, Teresa Moreno - Sanchez

Hospital Juan Ramon Jimenez, Huelva, Spain

Introduction:
The major cause of vascular access (VA) dysfunction is stenosis. The pathogenesis of stenoses in VA are produced by the development of an aggressive intimal hyperplasia, mainly as a result of a proliferation of the smooth muscle associated to an increase in oxidative stress and the expression of inflammatory and cytokine mediators. Estrogens play a role in cellular ageing and cellular senescense by means of regulate the telomeres size. Some studies have described about how the ageing changes in women after menopause. We assay to relate this concept of decreased cell turnover with restenosis of VA.

Methods and Results:
We perform an observational prospective study. From January 2016 to December 2018, we perform 44 angioplasties in women (mean age 76.8) and followed-up them 12 month. We evaluated survival time in days until a new stenosis occurs. In women before menopause the mean time of survival was 184 days and after menopause 254.87 days. This difference was statistically significant (p=0.05).

Conclusion and Discussion:
In order for stenosis of VA to occur, it is necessary to endothelium to be metabolically active. It has been described that thanks to ageing cell turnover is diminished or inhibited and this could be a "protective factor" of VA stenoses in our patients after menopause.

Vascular access surgery / Maturation

123 Effect of inflow arterial calcification on arteriovenous fistula maturation

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Introduction:
The aim of this study was to investigate the effect of preexisting calcification in the inflow artery on maturation and flow volume of an arteriovenous fistula (AVF).

Methods and Results:
Patients who underwent AVF creation for hemodialysis were prospectively recruited between March and November 2017. On preoperative duplex ultrasound, calcification in the arterial media within 5cm of the planned anastomosis area was assessed. Clinical maturation was defined as the successful use of the fistula for ≥75% of the dialysis sessions during a month within 6 months after surgery. Radiological maturation was defined as a venous diameter of ≥0.4cm and a flow volume of ≥500mL/min. Flow volumes of the inflow artery and the cephalic vein were measured at 6 and 12 weeks after AVF creation. Eighteen patients with calcification and 29 patients without calcification were enrolled in this study. There was no significant difference in the clinical and radiological maturation between the groups. The flow volume of the inflow artery, measured at 6 weeks postoperatively, was significantly higher in the non-calcification group than in the calcification group (P=0.042). The flow volume of the inflow artery in the non-calcification group was increased at 12 weeks postoperatively (P=0.056). Flow volume of the vein was higher in the non-calcification group than in the calcification group, although it did not reach statistical significance.

Conclusion and Discussion:
In conclusions, preexisting arterial calcification did not adversely affect the AVF maturation. However, arterial calcification correlated with the increase in flow volume of the inflow artery of AVF.

124 Medial transposition of the accessory cephalic vein at elbow - option in occluded conventional brachiocephalic fistula, in sclerotic, absent cephalic vein at elbow

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[2]Great eastern medical school, Srikakulam, India

Introduction:
Our study aims to evaluate clinical outcome and patency of fistula in medial transposition of Accessory Cephalic vein at elbow in patients with occluded conventional Brachio-cephalic fistula or in sclerotic / absent Cephalic vein.

Methods and Results:
Data of 12 patients(median age,57 years; males,58%) at our center who underwent medial transposition of Accessory Cephalic vein at elbow due to sclerotic Cephalic vein(n=4) ,occluded conventional Brachio-Cephalic fistula at elbow(n=5) and absent Cephalic vein(n=3) between January 2015 and june 2018 were retrospectively reviewed. Surgery was performed under local anesthesia in all cases. There was no technical failure. During follow-up (1 to 36months, median 19 months), Two patients had symptomatic stenosis of AVF and received percutaneous balloon angioplasty. Another 2 patients experienced AVF occlusion, were treated with AV graft in the arm. Overall primary and assisted primary patency rates were 83.3% and 92.3% at 6 months and 66.6% and 83.3% at 1 year, respectively.

Conclusion and Discussion:
Technical success and access patency rates for medial transposition of Accessory Cephalic vein at elbow are favorable. Hence, medial transposition of Accessory Cephalic vein at elbow can be considered as an option in patients with occluded conventional Brachio-cephalic fistula or in sclerotic or absent Cephalic vein at Elbow.

Picture 1:

Picture 2:

125 Utility of the novel arteriovenous ratio index on radiocephalic arteriovenous fistula maturation in our center

Lucia Martinez, Joan Sancho, Pere Altes, Gino Zamora, Secundino Llagostera

Hospital Germans Trias i Pujol, Premià de mar, Spain

Introduction:
The aim of this study was to assess the utility of the recently published arteriovenous ratio index on the maturation of radiocephalic arteriovenous fistula(RCAVF) in our center.

Methods and Results:
Unicenter retrospective study, from january 2015 to december 2016.All patients with end stage renal disease(ESRD) candidates for RCAFV were included.Data were collected on patients' demographics(age,sex), preoperative ultrasound mapping (cephalic vein and radial artery diameter) laterality and principal comorbidities. Arteriovenous ratio(AVR) was obtained by dividing the diameter of the radial artery by the diameter of the vein(both in millimeters). Ultrasound maturation (UM) was assesed at 6 weeks after RCAVF formation defined by: a depth of not more than 0.6 cm from the skin, a vein diameter of 6 mm with a flow rate of 600 mL/min, and a length of 6 cm for successful two-needle cannulation. Association between UM and AVR subgroups (<1.06-≥1.06) was analized.
A total of 37 patients were included.79.6% men.Mean age 67.9 ± 14.3 years. 83.3% left and 46.3% predialysis patients.Main etiology of the ESRD was high blood pressure(HBP)

29.6% and diabetes mellitus(DM) 30%. Main associated comorbidities: HBP 85.2%, DM 53.7%, dislipidemia 37%.In relation to AVR subgroups(<1.06-≥1.06), maturation was observed in 81.8% vs 76.9%(p,0.741), no statistical significant difference was obteined.

Conclusion and Discussion:
The arteriovenous ratio index is a novel measurement defined for their authors as an independent predictor of RCAVF maturation. In our center, the aforementioned index has not shown to be associated with the RCAVF maturation. Further studies with larger samples are needed to evaluate its external validity and clinical application.

126 Basilic vein from the forearm used for distal arteriovenous fistula

Claudiu Helgiu

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Introduction:
Whenever the cephalic vein from the level of the forearm is not suitable for the realization of the AVF *(arteriovenous fistula)*, the basilic vein from the same level may be taken into consideration for the realization of a distal AVF.

Methods and Results:
The retrospective study at 24 patients whose basilic vein from the level of the forearm was used for the realisation of the AVF, using its anastomosis with the cubital or radial artery. In the first 30 postoperative days, 3 cases of thrombosis that led to loss of access were observed. After initiating the puncture procedure for CHD (Chronic Hemodialysis), there occurred the thrombosis of the vein to which transposition was not carried out. The mortality rate was zero. Out of the 24 cases, vein transposition was performed on the anterior part of the forearm in 11 cases. There were no cases of distal ischemia.

Conclusion and Discussion:
The 3 cases of thrombosis occurred in the first 30 postoperative days appeared when the vein transposition was carried out at the same operative time, the diameter of the vein being less than 3 mm, one patient suffering from diabetes and being overweight.
Basilic vein represents a good solution for a distal AVF. The transposition performed at the same time as the realisation of the arteriovenous anastomosis being indicated when the vein diameter is greater than 3 mm.

128 Potential usefulness of a new vascular access method using a skin-great saphenous vein fistula potential usefulness of a new vascular access method using a skin-great saphenous vein fistula

Masanori Wakabayashi

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Introduction:
We aimed to clarify the usefulness of the blood removal/return method with a skin-great saphenous vein fistula. Principle: We devised a method that enables blood removal/return by creating a fistula between the skin and the great saphenous vein to insert the dialysis needle sheath in the femoral vein under ultrasonography guidance with respect to each dialysis. A skin-great saphenous vein fistula is created under local anesthesia. It is used for blood removal/return during maintenance hemodialysis performed immediately after creating the fistula.

Methods and Results:
Subjects: Fifteen limbs of 13 patients (3 men and 10 women; mean age, 78.0±4.9 years; dialysis history, 9.6±12.6 years), where skin-great saphenous vein fistulas were created in our hospital between May 2017 and November 2018, were included. In all the cases, an AVF or AVG was difficult to create because of the general condition and/or vascular fitness of the patients. Methods : The usefulness of this method was investigated based on the treatment results from the fistula-creating surgery and dialysis with the fistula. Results : During or after the fistula-creating surgery, no serious complications were found. No complications such as blood removal failure, infection, or hemorrhage were found during the follow-up period. The primary patency rates by the Kaplan-Meier method were 100% at 3 months and 67.5% at 6 months.

Conclusion and Discussion:
This method is considered a valuable substitute method for cases with difficulty in creating a vascular access.

129 Natural vascular remodeling after arteriovenous fistula creation in dialysis patients with and without previous ipsilateral vascular access

Niek Zonnebeld, Wouter Huberts, Magda van Loon, Tammo Delhaas, Jan Tordoir

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Introduction:
The aim of the study was to observe the natural hemodynamical changes after arteriovenous fistula (AVF) creation in hemodialysis patients with and without a previous ipsilateral vascular access.

Methods and Results:
Retrospective, single center cohort study. Patient demographics were registered and pre- and postoperative vessel ultrasonography examinations were performed at regular follow up intervals. Arteriovenous fistula outcome in terms of vessel diameter and access flow enhancement were determined in radiocephalic, brachiocephalic and brachiobasilic AVFs. 331 patients (median age 66 yr, 60% male) with 366 new autologous AVFs were studied, of which 112 patients had a previous ipsilateral VA. Patients with a previous ipsilateral VA had significantly greater preoperative brachial artery diameter (4.4mm) and flow (105 mL/min), and basilic vein diameter (4.9mm), in comparison to patients without a previous ipsilateral VA (4.0mm, 54 mL/min, and 4.3mm respectively). For all AVF configurations these differences gradually disappeared after AVF creation over the course of three months. The hemodynamical changes reached a plateau at three months, and were significantly accelerated in patients with a previous ipsilateral VA. There were no differences in occurrence of primary failure or high flow complications between both groups.

Conclusion and Discussion:
Arteriovenous fistulae show hemodynamical and remodeling changes up to three months postoperatively. Previous ipsilateral VAs may initiate vessel preconditioning, and accelerate the observed hemodynamical changes after AVF creation. This preconditioning, however, does not result in a beneficial or detrimental effect on VA functioning.

130 Forearm native avf complicated by outflow long occlusion: conservative treatment by across the elbow bypass.

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[3]Endovascular Surgery for Hemodialysis Angioaccess, CdC Nuova ITOR, Rome, Italy

Introduction:
Outflow stenosis is a frequent complication of vascular access for hemodialysis, electively treated by PTA. When a long occlusion (>2cm) occurs, success and mid-term patency of endovascular treatment are uncertain. We therefore describe a case series of patients treated by a by-pass across the elbow.

Methods and Results:
6 patients have been treated between 2015 and 2018 [age: 58y old; HD vintage: 9-84 month (1 pts transplanted for 19y); numbers of previous access: 1-3; access vintage: 7-84month]. All patients where referred because of either low flow, increased venous pressure, excessive bleeding time or recirculation. Because of the long occlusion of the superficial outflow, observed at the duplex examination, endovascular treatment was excluded. The new outflow was obtained through either cubital vein transposition and anastomosis to the cephalic vein (see photo 1) or by PTFE VV bypass. Pre-op blood flow was 316ml/min (range 0-900ml/min). Immediate success was obtained in all but 1 cubital vein transposition pts, which was turned into a PTFE VV cephalo-humeral by pass. Post-operative blood flow was 878ml/min (range 150-1800ml/min). 1 patient was treated directly by PTFE VV by pass. All patients dialyzed trough the forearm access immediately the day after surgery. Primary and secondary patency at 6 and 12 month were: 50%-50% and 83-83% respectively.

Conclusion and Discussion:
Outflow reconstruction trough elbow by pass is a valuable rescue surgical treatment for such forearm AVF, avoiding the use of interim CVC. Expanding the series and follow up would help in better define these preliminary results.

Picture 1:

131 Novel technique for vascular access creation: brachial artery and basilic vein superficialization without fistula formation

Masaaki Murakami[1], Kiyoshi Mori[1], Takao Okawa[1], You Soma[1], Ryo Yamada[1], Satoshi Tanaka[1], Noriko Mori[1], Masashi Mukoyama[2]

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[2]Kumamoto University Graduate School of Medical Sciences, Kumamoto, Japan

Introduction:
Introduction: Arteriovenous (AV) fistula creation was legendarily started fifty years ago and has been the first-line recommendation for hemodialysis vascular access (VA). Still, juxta-anastomosis stenosis and maturation failure have been unresolved problems. We created novel VA using superficialization of deep vessels. Arterial and vein flows are almost physiological except during hemodialysis sessions. Since the diameters of vessels are already large, maturation time is not required.

Methods and Results:
Methods: Twenty-five consecutive patients who underwent brachial artery and basilic vein superficialization without fistula formation were included in this single-center retrospective study. The indications were as follows: (1) brachial artery and basilic vein diameters larger than or almost 4 mm, and (2) inadequate for creating a standard AV access due to central vein stenosis/occlusion (n=8), hand ischemia (n=6) or severe heart failure (n=11).
The procedure was considered successful when the cannula could be routinely placed and could deliver an adequate blood flow. The Kaplan-Meier method was used to assess the primary patency. 92% (22/24) of surgeries were successful. One patient died of cardiac infarction before cannulation. In another patient, first cannulation was unsuccessful because of hematoma. After removal of hematoma, cannulation was successful. The first successful cannulation was achieved at a median of 23 days after creation. The primary patency was 91% after 1 year.

Conclusion and Discussion:
Conclusion and Discussion: Brachial artery and basilic vein superficialization without fistula formation was safe and effective, with a high rate of primary patency. This new method can be considered as an alternative way when conventional techniques are difficult.

132 Effect of preoperative arm exercise in patients with end stage kidney disese

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Introduction:
The KDOQI guideline states exercise may increase arteriovenous fistula (AVF) blood flow, but its effect is not clear. In this study, we investigated the influence of exercise before AVF procedure in patients with end stage kidney disease.

Methods and Results:
Between April 2016 and September 2017, we included patients with end stage kidney disease who were candidates for the creation of AVF in our hospital. Patients between October 2016 and September 2017 exercised with balls (exercise group; n=63) and other period did not undergo exercise (control group; n=35). We investigate patency rates, change in vessel diameters and maturation by ultrasound examination (flow volume at 3 months after procedure), retrospectively. The Kaplan-Meier method was used to assess patency in the two groups. In control group and exercise group, primary patency rates at 1 year were 69% and 80% (p=0.153), secondary patency rates at 1 year 89% and 97% (p=

0.0487), respectively. The econdary patency rates have significant difference. In change of vessel diameter, significant difference was shown in cephalic vein of dominant hand and brachial artery of non-dominant hand (p=0.010, p=0.032). Flow volume of brachial artery at 3 months after procedure were 854±377 ml/min and 946±369 ml/min (p=0.319) and successful ultrasound maturation (FV>600ml/min) rates were 76% and 79%.

Conclusion and Discussion:
Exercise before AVF creation significantly improved secondary patency rates and increased some vessel diameter. Although there is no significant difference, exercise may promote maturation. This study suggests exercise before AVF creation may be clinically useful.

133 The arterio-venous anastomosis in present days

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Introduction:
The arterio-venous anastomosis (AVA) continues to be the "gold standard" for vascular access in patients with chronic kidney disease (CKD) undergoing hemodialysis. The purpose of this retrospective study is to analyze the causes that led to CKD, the type of native AVA and its localization as well as their patency.

Methods and Results:
The study included the last 100 consecutive and random AVAs constructed in our clinic. 68 men of average age 62.3 (+/- 10.8) years and 32 women of average age 59.9 (+/- 15.8) years were operated. The main causes that led to CKD are: Glomerulonephritis - 33%, Hypertensiion- 24% and Diabet- 20%. The overweight patients are 33% and the smokers are 30%. AVA has been successfully constructed in 82% of the patients on left hand and in 18% on the right hand. A distal, latero-terminal (LT), radio-cephalic fistula was onstructed on only 8% of the patients. The most common type of anastomosis was a LT radio-cephalic in the forearm - 58%, followed by a LT brachio-cephalic fistula - 19% and latero-lateral, radio-cephalic in the forearm - 14% of the patients. The early fistula patency was - 80%, one-year cumulative patency was 94%.

Conclusion and Discussion:
The analysis of our results shows that the relative share of the overweight and diabetes population is increasing today. In practice, solutions for the construction of primary forearm anastomosis are increasingly common

134 Axillary arteriovenous grafts using 'axillary venous plexus' as the better hemodialysis access in upper limb: clinical results from single-center experience.

Manabu Asano[1], Kenichi Oguchi, Hitoshi Iwabuchi, Machiko Okamoto, Chihiro Kimikawa

[1]Bousei Hospital, Saitama, Japan

Introduction:
Almost surgeons are suffering badly from graft-venous stenosis after creation of arteriovenous graft (AVG). As a contrivance to prevent early graft obstruction, graft-venous anastomosis with multiple venous outflow using "axillary venous plexus" may be a better way.

Methods and Results:
Hemodialysis patients who received axillary AVG in our hospital in last 3 years were included. We have used tapered (4-6 or 4-7 mm in diameter) polytetrafluoroethylene

grafts. Venous branches from the expecting anastomotic site were carefully prepared as many as possible to reserve multidirectional outflow. Primary VA patency was defined as the time to first VA intervention, and secondary patency was noted as the time to creation of a subsequent VA. The Kaplan-Meier method was used to determine VA survival. Forty-six grafts were implanted in 39 patients. They received already undergone multiple VA operation (mean 4.3 times). As a result, we had two early (<30 days) access thrombosis. Twenty-nine of the 46 grafts developed late (>30 days) complications: postanastomotic stenosis on the outflow vein in 19 grafts, graft occlusion in 7 grafts, central vein stenosis in 2 grafts, infection in one graft. There were radiological intervention in 26 grafts and surgical intervention in 3 grafts for VA salvage. The primary/secondary patency rate at 3, 6, 12 months were 48.9/87.2%, 23.0/82.8%, and 18.4/73.5% respectively.

Conclusion and Discussion:
Because over 70% of our axillary AVGs were accessible to hemodialysis at 1 year, this method might be preferable as VA in upper limb for the desperate hemodialysis patients.

135 Vascular ultrasound calcification and patency rates in radiocephalic fistula

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Introduction:
Radio-cephalic fistula(RCAVF) is the gold standard vascular access for end-stage chronic kidney disease patients. Pre-existing radial artery(RA) calcification is a relevant factor in RCAVF survival. RA calcification measurement in preoperative Doppler Ultrasound(DUS) mapping has not been widely used. Our objective is to analyse the effect of RA calcification in RCAVF patency rates using a home-made vascular ultrasound calcification score(VUCS)

Methods and Results:
RCAVF performed using preoperative mapping DUS were enrolled in a 3 years single-centre retrospective study. Presence of calcification (0/1) in each quadrant of the RA diameter was estimated using the VUCS (0-4). Main demographic data, DUS parameters, RCAVF complications, primary and secondary patency rates were analysed. 36 patient. 72.2% men. Mean age 67.2±14.4 years. 86.1% RCAVF left sided. 55.6% diabetics. DUS parameters: RA diameter (RAD): 2.6±0.4 mm, RA velocity (RAV) 66.2±13.2 cm/s. Resistance Index (RI):0.74±0.1. Mean VUCS 1.4±1.1 (50% lower left quadrant). 8 re-anastomosis (22.2%) and 2 percutaneous angioplasty (5.6%). Patients were divided according VUCS (<2 or ≥2). A slightly higher primary patency rate was observed for VUCS <2 (290.5±272.2 vs 245.3±204.2 days, p 0.547). No relevant differences for VUCS <2 or ≥2 in primary (X^2 log-rank 0.005, p 0.944) or secondary patency rates (X^2 log-rank 0.518, p 0.472) respectively were observed after statistical survival analysis.

Conclusion and Discussion:
VUCS is a useful tool to assess RA calcification. With our results, VUCS could have a particularly role in RCAVF primary patency rate. Nevertheless, well designed further studies are required to validate and evaluate the potential effect of this score in RCAVF survival.

136 Clinical use of avf.sim system for surgical planning of arteriovenous fistula for hemodialysis

Michela Bozzetto[1], Stefano Rota[2], Carmela Giuseppina Condemi[2], Martina Gatti[1], Sofia Poloni[1], Giuseppe Remuzzi[3], Andrea Remuzzi[1]

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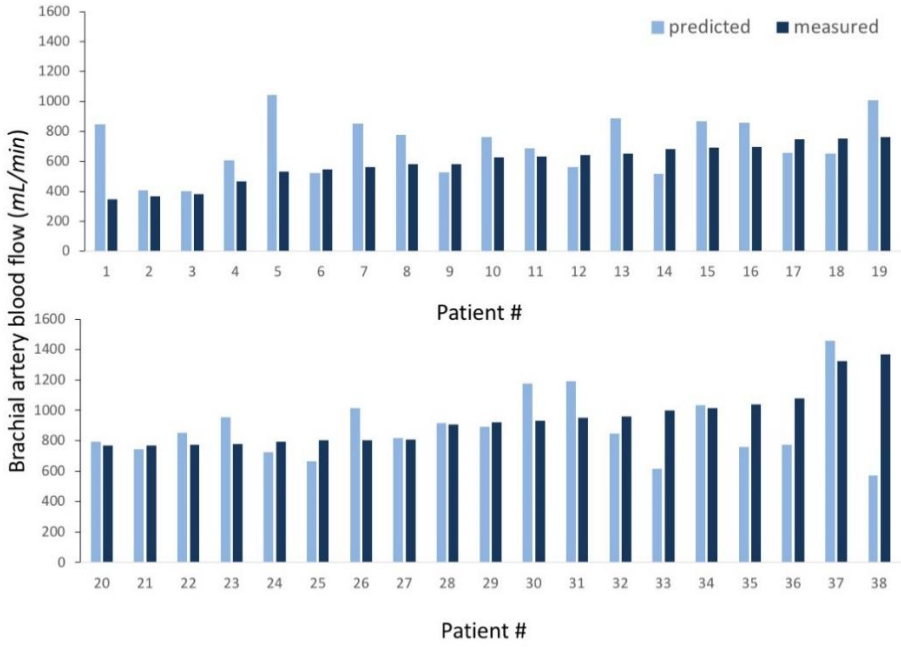
[2]ASST Papa Giovanni XXIII, Bergamo, Italy
[3]IRCCS Istituto di Ricerche Farmacologiche „Mario Negri„, Bergamo, Italy

Introduction:
Native arteriovenous fistula (AVF) is the preferred vascular access for hemodialysis, but its creation remains challenging. We previously developed and validated in a controlled clinical trial a patient-specific computational model to pre-operatively predict the blood flow volume (BFV) in AVF. We then included the model in a web-based system (AVF.SIM) and demonstrated its usability in 6 Italian nephrology units. In the present investigation we introduced AVF.SIM in AVF planning procedure of our hospital and we tested its power of prediction in routine clinical setting.

Methods and Results:
We used AVF.SIM for data collection and transfer, simulation management and data storage. Out of 52 created distal AVF, 9 of them did not reach maturation, 38 AVF successfully matured and received US examination at 40 days after surgery and 5 were lost to follow-up. AVF.SIM provided brachial BFV prediction inferior to 600 mL/min in 6 patients whose AVF failed to mature and needed reintervention, successfully predicting the non-maturationin 6 out of 9 cases. Predicted brachial BFV at 40 days after surgery showed a good agreement with measured values (*Figure 1*). The mean difference (±standard deviation) between predicted vs. measured BFV was −10.0±35.1%, with 50% of predicted values in the range of 88–126% of measured BFV.

Conclusion and Discussion:
Clinical use of AVF.SIM in surgical planning provides an additional information that can help the surgeon to select the best surgical strategy, reducing AVF non-maturations and complications. This approach allows individualization of VA care, with the aim to reduce the costs associated with VA dysfunction and improve AVF clinical outcome.

Picture 1:



Comparison between predicted and measured brachial artery BFV at 40 days after AVF surgery

137 Is really the radio-cephalic fistula still the first choice?

Gabriela Orosan[1], Iustinian Bengulescu[1], Simina Zarma[1], Cristiana Voinescu[2], Stelian Pantea[2], Victor Strambu[1]

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[2]Timisoara Emergency County Hospital, Timisoara, Romania

Introduction:
Vascular access represents the life line for patients with end stage kidney disease that require hemodialysis. The arterio-venous fistula is the preferred type of access, and amongst the fistulas the radio-cephalic fistula is recommended as the first choice. Our goal was to determine whether or not the radio-cephalic fistula remains the actual first choice.

Methods and Results:
We performed a retrospective study, by comparing the types of vascular accesses created in the Timisoara, and Bucharest center.The data was divided into two groups of patients:the first group consists of fistulas created between 1990-2000 and the second group contained fistulas created between 2015-2017.In the first group there were 613 patients, 54%men and 46 % women.The mean age was 44.7. The second group consisted of 421 patients with an mean age of 59.9.In the first group 71% of the fistulas created were radio-cephalic fistulas.In the second group 21% of fistulas were radio-cephalic fistulas.

Conclusion and Discussion:
The radio-cephalic fistula is, and should still be the first choice in creating the vascular access, however we observed an increase in the patient's age, and comorbidities, especially diabetes, atherosclerosis and dislipidemia. Furthermore there is an increase in the length of these comorbidities, allowing them the time to determine complications that can alter the patient's vascular capital. Therefore we believe that the radio-cephalic fistula is still the first choice, but further studies are required to determine whether or not it is still the actual first choice for our patients.

138 A comparison of clinical assessment and duplex ultrasound assessment using the 'rule of 6s' for determining arteriovenous fistula readiness for dialysis

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Introduction:
NKF KDOQI guidelines suggest AVF's are ready for dialysis if they meet the ultrasound (US) 'rule of 6s'[1], but these criteria require validation. Clinical assessment by experienced nurses has been validated for determining AVF maturity[2]. We compared these methods for assessing AVF's for dialysis readiness.

Methods and Results:
AVF were assessed 6 weeks postoperatively. US categorised AVF as mature if they met the 'rule of 6s'. Clinical assessment categorised AVF as ready for dialysis, maturing but needs more time to develop, or failing/failed. 82 AVF's were assessed. The assessment methods agreed upon readiness for dialysis in 78% of cases with a statistically moderate agreement (κ=0.57). In forearm AVF, the mean fistula flow and vein diameter respectively were: 1383 ml/min and 6.1 mm in the ready for dialysis category, 1003 ml/min and 5.1 mm in needs more time to develop, and 303 ml/min and 4.2 mm in failing/failed. In upperarm AVF, the mean fistula flow and vein diameter respectively were: 2218 ml/min and 7.1 mm in the ready for dialysis category, and 1200 ml/min and 5.9 mm in needs more time to develop. No upperarm AVF's in this study failed.

Conclusion and Discussion:
The results of this study suggest that a 6 week post-operative diameter of <5 mm in forearm AVF is indicative of a failing AVF. Fistula flow of 600 ml/min may not be sufficient to consider an AVF ready for dialysis use. Larger studies are required to further investigate the validity of the 'rule of 6s'.

139 Validation of the ultrasound 'rule of 6s' with functional dialysis use of arteriovenous fistulas

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Introduction:
NKF KDOQI guidelines suggest that an AVF can be considered ready for dialysis if it meets the ultrasound 'rule of 6s' characteristics: fistula flow >600 ml/min, vein diameter ≥6 mm and vein depth ≤6 mm[1]. However, these characteristics require validation. We studied the accuracy of the 'rule of 6s' to predict functional dialysis use (FDU) of AVF.

Methods and Results:
Ultrasound assessment was performed 6 weeks postoperatively. An AVF was categorised as ready for dialysis use if it met the 'rule of 6s'. FDU was defined as continuing AVF viability following 6 consecutive dialysis sessions using 2 needle cannulation[2]. 82 AVF's were assessed. 22 (27%) were excluded for unknown outcome. 60 were analysed: 47 (78%) achieved FDU and 13 (22%) failed. The 'rule of 6s' were 51% sensitive and 92% specific for predicting FDU. The mean vein diameters of functional and failed AVF's were 6.1 mm and 4.7 mm respectively. The mean fistula flow of functional and failed AVF's was 1524 ml/min and 722 ml/min respectively. A reduction in the diameter criterion to ≥5 mm increased sensitivity of FDU prediction to 83% but reduced specificity to 85%.

Conclusion and Discussion:
This study indicates that a diameter of 5 mm and a flow of 700 ml/min may be a better threshold to discriminate between a maturing AVF which will achieve FDU, and a failing AVF.

140 The handgrip device: a new option for the maturation process in upper limb arteriovenous fistulas.

Irati Tapia[1], Vicent Esteve[1], Sara Ibañez[2], Montserrat Yeste[2], Manel Ramirez de Arellano[1]

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[2]Funtional Unit Vascular Access.Vascular Surgery Department, Terrassa, Spain

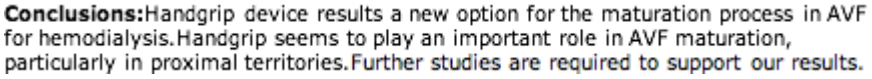
Introduction:
Arteriovenous fistula (AVF) is the best vascular access (VA) for hemodialysis.Postoperative exercises may help to improve maturation**.**However, scarce studies have been reported about the role of handgrip device on maturation process*.* To evaluate the efficacy of postoperative handgrip device protocolled training programme on native VA maturation in end-stage renal patients.

Methods and Results:
A 15 months prospective study. Patients were randomized to handgrip (HG) or control group (CG) postoperatively. HG performed a protocolled training programme with HG device. CG received conventional care*.*Muscle strength (handgrip), main Doppler ultrasound (DUS) measurements, clinical and DUS maturation in AVF were assessed at 4

and 8 weeks postoperatively. 57patients. 27HG. 63,2%men. 72±10,8years. 50,9% Radiocephalic AVF. Both groups were similar at baseline. As expected, DUS measurements statistically increased for both groups at the end of study. A significant increase was observed in muscle strength only in HG at the end of study (17,7±6,1 vs 21,1±6,7Kg, p=0,001). HG obtained highest clinical maturation at 4 (CG 23,3% vs HG 61,5%;p=0,004) and 8 weeks (CG 26,7% vs HG 65,4%;p=0,004). Similarly, DUS maturation was higher in HG at 4 (CG 46,7% vs HG 84%;p=0,004) and 8 weeks respectively (CG 50% vs HG 88,5%;p=0,002).Nevertheless, only clinical maturation of proximal territories in HG achieved statistical significance(4weeks: CG 20% vs HG 76,5% and 8weeks: CG 20% vs HG 76,5%; p=0,007).

Conclusion and Discussion:
Handgrip device results a new option for the maturation process in AVF for hemodialysis.Handgrip seems to play an important role in AVF maturation, particularly in proximal territories.Further studies are required to support our results.

Picture 1:



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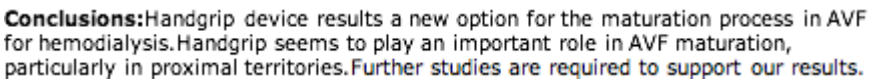

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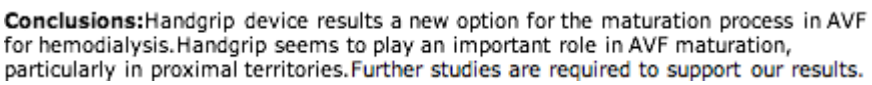

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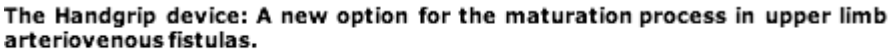

141 Graft-to-vein suturless anastomosis for recurrent stenosis

Marco Franchin[1], Alessandro Angrisano[2], Maria Cristina Cervarolo[2], Gaddiel Mozzetta[2], Gabriele Piffaretti[2], Matteo Tozzi[2]

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[2]Varese Insubria University, Varese, Italy

Introduction:
Identification and treatment of the underlying stenosis are integral parts of any declotting procedure. Stenoses, at the venous outflow or at the graft-to-vein anastomosis, are the main complications of arteriovenous grafts (AVG). Recurring stenoses or underlying stenoses found after surgical declotting are challenging problems. We report our experience with sutureless technique of graft-to-vein anastomosis using a heparin-bonded ePTFE stentgraft.

Methods and Results:
We considered patients with recurrent stenosis treated at least twice in the previous 6 months with angioplasty and thight stenosis found after surgical declotting. Between Jan 2016 and Oct 2018 we performed 75 treatments. 25 totally percutaneous procedures and 50 cases of intraoperative treatment. After surgical thrombectomy, over-the-wire (.018 mm) stent graft placement was perfomed through a service access on the graft under direct visual control. In our experience overlap between stent and graft should be at least 2cm. Two intraoperative thrombosis occurred. In 70 (93.3%) cases haemodialysis CVC was not required, and patients were regularly discharged within 24hrs after intervention. In 18 (24.0%) proximal edge stenosis was documented during follow-up and treated with percutaneous angioplasty. In 4 cases additional stenting was necessary for restenosis.

Primary assisted patency was 90.6%, 81.3% and 70.6% at 6, 12 and 24 months respectively. Functional patency was 92.7%, 91.2% and 88.4% at 6, 12 and 24 months respectively.

Conclusion and Discussion:
In difficult accesses to veins and in rescue AVG surgical and percutaneous revisions, sutureless vein-to-graft anastomosis is a simple and effective procedure to treat stenosis concurrently creating an anastomosis that permits a valid hemodynamical vein terminalisation.

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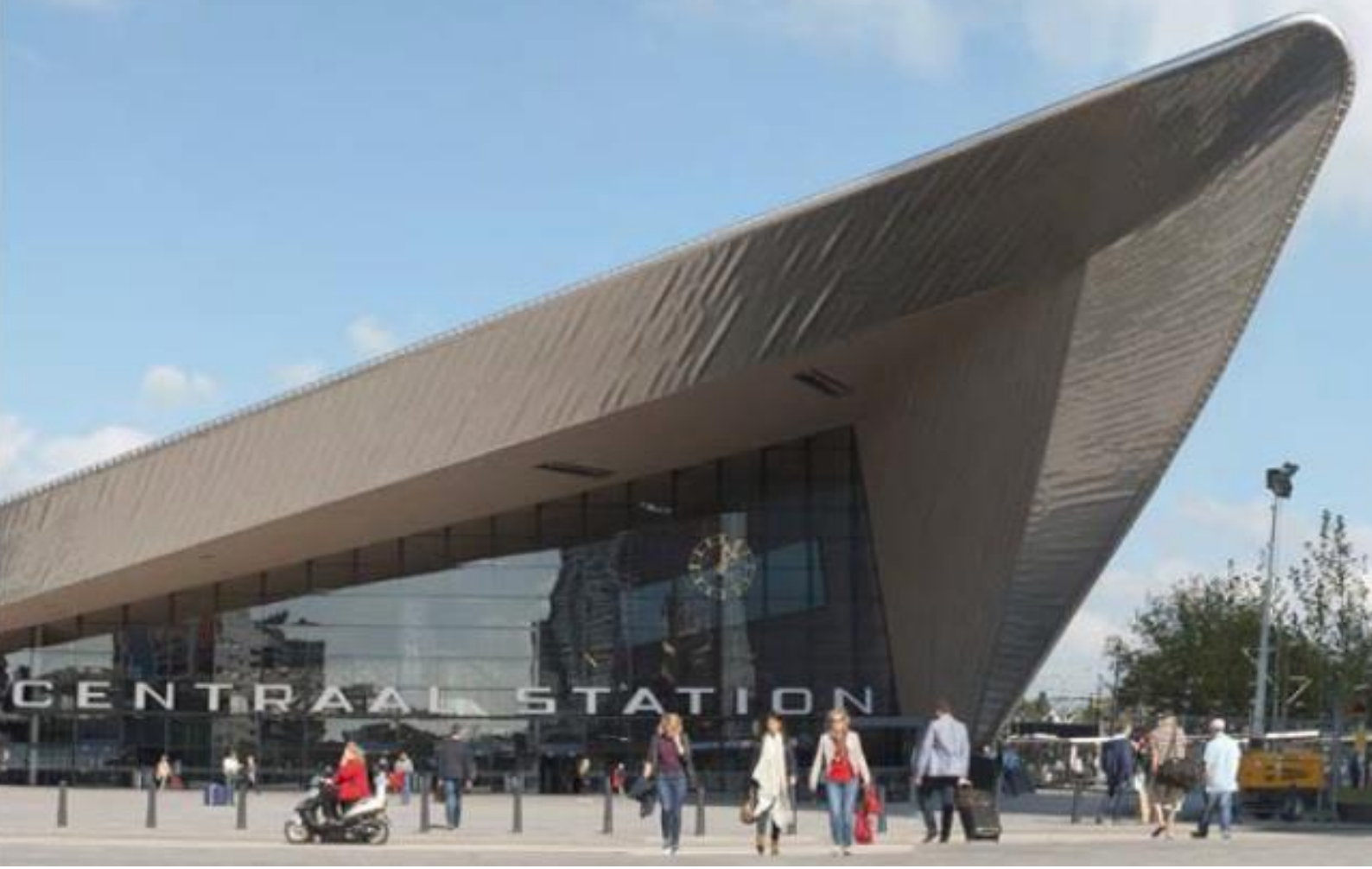

VAS 2019

PROGRAMME

Programme 11 April

Willem Burger Zaal

09.00-09.15 **Opening Ceremony** | *J. Rotmans*

Vascular access overview | *Chairs: S. Lawman & J. Malik*
09.15-09.35 **Epidemiology of renal replacement therapy and vascular access** | *W. Meichelboeck*
09.35-09.55 **The natural history of AVFs and consequences for planning of access** | *T. Wilmink*
09.55-10.15 **How to manage vascular access in crashlanders** | *T. Lee*
10:15-10.35 **Past, present and future of vascular access** | *N. Inston*

10.35-11.00 **Coffee break** | *Jurriaanse Foyer*

From evidence-based medicine towards patient-orientated vascular access care | *Chairs: J. Rotmans & V. Mickley*
11.00-11.15 **Nephrologist perspective** | *S. Lawman*
11.15-11.30 **Surgeon perspective** | *M. Lazarides*
11.30-11.45 **Radiologist perspective** | *C. Hohl*
11.45-12.00 **Patient perspective** | *P. West*

12.00-13.00 **Moderated poster session** | *Willem Burger Foyer*

12.00-13.30 **Lunch** | *Jurriaanse Foyer*

Endovascular Interventions | *Chairs: J. Ibeas & C. Hohl*
13.30-13.50 **Drug-eluting balloons and stents for access failure** | *M. de Haan*
13.50-14.10 **Vascular access thrombosis: surgical or endovascular intervention?** | *U. Hedin*
14.10-14.20 **Using Radial approach in the treatment of early occlusion of distal accesses** | *L. Novelli*

14.20-14.30 **Endovascular salvage of non-maturing autologous arteriovenous fistulas by using angioplasty and competitive vein embolization** | *L. Nauta*
14.30-14.40 **Initial Experience with the Covera Covered Stent for the Treatment of Dysfunctional or Thrombosed Arterio-Venous Grafts. A Retrospective Analysis of 43 patients** | *P. Kitrou*
14.40-14.50 **De-novo and recurrent vascular access stenosis: timing and appropriate treatment** | *M. Franchin*
14.50-15.00 **Stent-grafting As First Intervention For Venous Stenosis Impoves Outcomes In Incident Arteriovenous Grafts** | *A. Isaak*

15.00-15.30 **Coffee break** | *Jurriaanse Foyer*

Cardiovascular effects of hemodialysis access | *Chairs: S. Lemson & T. Jemcov*
15.30-15.50 **Arteriovenous cardiotoxicity** | *J. Malik*
15.50-16.10 **Vascular access management in patients with heart failure** | *R. Roca-Tey*
16.10-16.30 **Management of vascular access after kidney transplantation** | *K. van der Bogt*
16.30-16.40 **Vascular access blood flow suppression surgery improves brain perfusion** | *K. Hashimoto*
16.40-16.50 **Early results using pro-B-Type Natriuretic Peptide (pro-BNP) as a biomarker for the efficacy of secondary extension technique (SET) in improving myocardial function in dialysis patients with high flow fistulas** | *R. Goel*
16.50-17.00 **Echocardiographic changes in patients with high-flow arteriovenous fistula after flow reducing surgery** | *A. Valerianova*

Vascular access training | *Chairs: J. Tordoir & V. Mickley*
17.00-17.20 **Models and cadavers to train vascular access** | *M. Widmer*
17.20-17.40 **How to setup a vascular access education program?** | *K. El Sakka*
17.40-18.00 **Online dialysis access training** | *I. Davidson*

Jurriaanse Zaal

Outcome of AVF and AVG | *Chairs: S. Shenoy & S. Baktiroglu*
11.00-11.20 **Alternative autologous access options** | *M. Kusztal*
11.20-11.40 **The pros and cons of shunt surveillance** | *G. Welander*
11.40-12.00 **Pro/con debate: Are AVFs really superior to AVGs?**
Pro: AVFs are superior to AVG | *P. Gibbs*
Con: AVFs are not superior to AVG | *D. Kingsmore*

12.00-13.00 **Moderated poster session** | *Willem Burger Foyer*

12.00-13.30 **Lunch** | *Jurriaanse Foyer*

Tailoring vascular access | *Chairs: P. Gibbs & M. Tozzi*
13.30-13.50 **Vascular access in the elderly** | *C. Sessa*
13.50-14.10 **Vascular access cannulation and compression techniques** | *H. Kawanishi*
14.10-14.30 **Optimal timing of vascular access creation** | *T. Jemcov*
14.30-14.50 **Vascular access for home hemodialysis** | *T. Goovaerts*
14.50-15.00 **Contemporary outcomes of alternative forearm cephalic vein fistulas (RADAR and Jennings)** *G. Sharma*

15.00-15.30 **Coffee break |** *Jurriaanse Foyer*

Vascular access maturation | *Chairs M. Weijmer & N. Inston*
15.30-15.50 **Pathophysiology of AVF non-maturation** | *T. Lee*
15.50-16.10 **Clinical benefit of ultrasonography to monitor AVF maturation** | *J. Pajek*
16.10-16.30 **The role of sidebranches and valves in non-matured AVF** | *S. Shenoy*
16.30-16.50 **Pre-existing vascular pathology and AVF maturation** | *R. Vazquez-Padron*
16.50-17.00 **Pre-operative Duplex Ultrasonography in Arteriovenous Fistula Creation: Intra- and Inter-observer Agreement** | *N. Zonnebeld*

Basic research in access failure | *Chairs: T. Lee & S. Lawman*

17.00-17.20 **Underlying mechanisms of AV access failure** | *J. Rotmans*

17.20-17.40 **Hemodynamic factors involved in vascular remodeling of AVFs: what can we learn from physics?** | *A. Remuzzi*

17.40-17.50 **Pretreatment with a phosphodiesterase type 5A inhibitor improves adaptive wall remodeling in rat arteriovenous fistula** | *M. Somarathna*

17.50-18.00 **Towards the identification of the major hemodynamic determinant in inducing endothelial cell quiescence in arteriovenous fistulae** | *M. Franzoni*

Programme 12 April

Willem Burger Zaal

Central venous catheters for hemodialysis access | *Chairs: R. Roca-Tey & M. Lazarides*
08.30-08.50 **CVC infections: when and how to salvage the catheter?** | *J. Ibeas*
08.50-09.10 **Are CVC really that bad?** | *M. Weijmer*
09.10-09.30 **What is the ideal catheter for hemodialysis access?** | *M. Tal*
09.30-09.40 **Outcomes of Translumbar and Transhepatic Dialysis Catheters: A Single Center Experience** | A. Almehmi
09.40-09.50 **Dialysis catheter insertion with substernal ultrasound guidance** | *K. Letachowicz*
09.50-10.00 **Reasons for dialysis catheter insertion – real-time data from REDUCCTION project** | *D. Knagge*
10.00-10.10 **Central Venous Catheters - Long Term Experiences of a major Vascular Access Center** | *C. Schröders*
10.10-10.20 **Outcome of MRSA catheter-related bacteraemia (CRB)-can we solve the problem?** | *V. Gerasimovska*
10.20-10.30 **Precurved non-tunnelled catheters for haemodialysis are comparable in terms of infections and malfunction as compared to tunnelled catheters - a retrospective cohort study** | *S. Meijvis*

10.30-11.00 **Coffee break** | *Jurriaanse Foyer*

Tissue engineering | *Chairs: J. Rotmans & J. Malik*
11.00-11.30 **Tissue engineered vascular access grafts** | *J. Lawson*
11.30-12.00 **Bio-engineered kidneys: a future alternative for hemodialysis?** | *T. Rabelink*

12.00-13.00 **Moderated poster session** | *Willem Burger Foyer*

12.00-13.30 **Lunch** | *Jurriaanse Foyer*

Late-breaking clinical trials | *Chairs: R. Jones & K. van der Bogt*
13.30-13.45 **Vonapanitase to increase fistula use for hemodialysis and secondary patency - pivotal trial results** | *K. Ozaki*
13.45-14.00 **Preoperative patient-specific flow predictions to improve hemodialysis arteriovenous fistula maturation (Shunt Simulation Study): a randomized controlled trial** | *N. Zonnebeld*
14.00-14.15 **The Lutonix® Global AV Registry. Final 6-month Results and Subgroup Analysis** | *P. Kitrou*
14.15-14.30 **Isometric exercise and arteriovenous fistula for haemodialysis: The impact on maturation process** | *I. Tapla*
14.30-14.45 **Liposomal prednisolone to improve radiocephalic fistula maturation: results from the LIPMAT study – a randomized controlled trial** | *B. Voorzaat*
14.45-15.00 **AV Fistula outcomes using an intra-operative perivascular sirolimus eluting collagen membrane** | *S. Iyer*

15.00-15.30 **Coffee break** | *Jurriaanse Foyer*

Endo AVF and last resort options | *Chairs: S. Lawman & M. Kusztal*
15.30-15.50 **The Ellipsys endovascular AVF creation** | *A. Mallios*
15.50-16.10 **The WavelinQ endovascular AVF creation** | *R. Jones*
16.10-16.30 **Current status of last-resort options for hemodialysis access** | *A. Norton de Matos*
16.30-16.40 **Risk of iodinated contrast use in predialysis patients undergoing percutaneous endovascular arteriovenous fistula formation** | *A.Z. Khawaja*
16.40-16.50 **Single Centre analysis of Arteriovenous Grafts in the Lower Limb** | *T. Sabah*
16.50-17.50 **Screening and suitability for the endovascular creation of an ulno-ulnar arteriovenous fistula** | *A.Z. Khawaja*

17.00-18.00 **VAS General Assembly**

19:00-23:00 **Dinner and Party** | *Paddle Steamer 'The Majesty'*

Jurriaanse Zaal

Management of VA related complications | *Chairs: M. Gallieni & U. Hedin*
08.30-08.50 **Management of AVF and AVG infections** | *S. Baktiroglu*
08.50-09.10 **Diagnosis and treatment of access-induced ischemia** | *V. Mickley*
09.10-09.30 **Management of cephalic arch obstruction** | *M. Suboi*
09.30-09.50 **Surgical management of high-flow access** | *H. Kawanishi*
09.50-10.10 **Medical interventions for promoting AV fistula maturation** | *E. Nagler*
10.10-10.20 **Reconstruction of giant aneurysms: the multicenter experience** | *A. Zulkarnaev*
10.20-10.30 **Long-term Outcomes of the 'Primary Extension Technique' for the prevention of Dialysis Access Steal Syndrome (DASS)** | *R. Goel*

10.30-11.00 **Coffee break** | *Jurriaanse Foyer*

Emerging topics on PD catheters | *Chairs: M. Weijmer & T. Lee*
11.00-11.20 **Treatment of PD catheter-related complications** | *J. van Laanen*
11.20-11.40 **Peritoneal dialysis access: which catheter to implant and how?** | *M. Gallieni*
11.40-11.50 **Outcomes of Percutaneous Peritoneal catheters: Elective versus Urgent Start Dialysis** | *A. Almehmi*
11.50-12.00 **Percutaneous image-guided peritoneal dialysis catheter placement by interventional radiologist – our units experience** | *D. Knagge*

12.00-13.00 **Moderated poster session** | *Willem Burger Foyer*

12.00-13.30 **Lunch** | *Jurriaanse Foyer*

Devices to promote dialysis access function | *Chairs: J. Malik & S. Shenoy*
13.30-13.50 **Stent-grafts for hemodialysis access salvage** | *M. Tozzi*
13.50-14.10 **Early cannulation grafts for dialysis access, when and how to use?** | *J. Gilbert*
14.10-14.20 **A Computational Fluid Dynamics (CFD) approach to optimize Autogenous Arterial-Venous Access (AVF) Anastomotic Hemodynamics with an External Support Device (VasQ™)** | *D. Hentschel*
14.20-14.30 **Long-term outcomes of Flixene and standard ePTFE arteriovenous grafts for hemodialysis** | *L. van Vliet*
14.30-14.40 **Results from a single center experience with the VasQ™ Device for Radiocephalic arteriovenous fistulae** | *R. Shahverdyan*
14.40-14.50 **A new technique to repair high flow arteriovenous fistula using a novel external support device** | *V. Matoussevitch*

15.00-15.30 **Coffee break** | *Jurriaanse Foyer*

Video session on access techniques | *Chairs: J. Tordoir & C. Sessa*
15.30-15.50 **AVG leg** | *D. Kingsmore*
15.50-16.10 **Salvage aneurysmatic AVF** | *S. Shenoy*
16.10-16.30 **Femoral Vein transposition for hemodialysis access** | *D. Shemesh*
16.30-16.40 **Deduplication of arm veins: a new surgical procedure for the treatment of non-maturing dialysis AV-fistulas** | *S. Nauwelaers*
16.40-16.50 **Endoscopic superficialisation of arteriovenous fistulae** | *A. Isaak*
16.50-17.00 **Bone-anchored Port for hemodialysis** | *M. Widmer*

17.00-18.00 **VAS General Assembly** | *Willem Burger Zaal*

19:00-23:00 **Dinner and Party** | *Paddle Steamer 'The Majesty'*

Programme 13 April

Jurriaanse Zaal

Best selected oral abstracts | *Chairs: J. Rotmans & P. Gibbs*
08.30-08.40 **Nitric oxide releasing bionanomatrix gel to promote arteriovenous fistula maturation** | *M. Somarathna*
08.40-08.50 **Impact of arterio-venous fistula flow on left ventricular contractility in hemodialysis patients – a cardiac magnetic resonance study** | *S. Bhagirath*
08.50-09.00 **Vascular access and survival rates in older adults: peculiarities of the cause-effect relation** | *A. Zulkarnaev*
09.00-09.10 **An autologous cellularized in vivo engineered vascular graft capable of remodeling to a non-thrombogenic blood vessel upon arteriovenous grafting in adult goats** | *W.J. Geelhoed*
09.10-09.20 **Repair of aneurysmal arteriovenous access fistulae: a systematic review and meta-analysis** | *P. Balaz*

Outcome of vascular access | *Chairs: J. Ibeas & D. Shemesh*
09.30-09.40 **Clinical outcomes for hemodialysis access by using Flixene vascular graft** | *B. He*
09.40-09.50 **The UK Vascular Access Graft Registry** - 3 Years of Data Collection | *J. Gilbert*
09.50-10.00 **Preliminary results of physical fav trial** | *I. Aragoncillo Sauco*
10.00-10.10 **Incidence and survival of arteriovenous fistulae through 38 years. A national Danish cohort study** | *K. Lindhard*
10.10-10.20 **Long-term outcomes of hemodialysis vascular access in the Dutch Vascular Access Study** | *B. Voorzaat*
10.20-10.30 **Arteriovenous Fistula in Diabetic Patients** | *L. Murray*

10.30-11.00 **Coffee break** | *Jurriaanse Foyer*

Voting session: clinical cases | *Chairs: M. Widmer*
11.00-11.15 **Clinical case 1** | *M. Snoeijs*
11.15-11.30 **Clinical case 2** | *K. van der Bogt*

11.30-11.45 **Clinical case 3** | *H. Hamid*
11.45-12.00 **Clinical case 4** | *F. Dengu*

12.00-12.15 **Announcement VAS 2021 congress**

12.15-12.30 **Closing Ceremony**

Nurse Symposium 12 April

Willem Burger Zaal

Central venous catheters for hemodialysis access | *Chairs: R. Roca-Tey & M. Lazarides*
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10.30-11.00 **Coffee break** | *Jurriaanse Foyer*

Van der Vorm Zaal

Current and novel options for vascular access | *Chairs: M. van Loon & T. Goovaerts*
11.00-11.20 **Arteriovenous fistula configurations** | *S. Lemson*

11.20-11.40 **Arteriovenous graft configurations** | *J. Tordoir*
11.40-12.10 **Novel options for arteriovenous access** | *N. Inston*
12.10-12.30 **Central venous catheters** | *M. Weijmer*

12.30-13.30 **Lunch** | *Jurriaanse Foyer*

Surveillance and complications | *Chairs: S. Lemson & G. Welander*
13.30-13.50 **Vascular access and home hemodialysis** | *T. Goovaerts*
13.50-14.10 **The pros and cons of shunt surveillance** | *G. Welander*
14.10-14.30 **Nurses training program to improve vascular access outcome** | *K. Paule*
14.30-14.50 **Organization of vascular access care** | *T. Stevenson*

15.00-15.30 **Coffee break** | *Jurriaanse Foyer*

Cannulation issue | *Chairs: M. van Loon & J. Pajek*
15.30-15.50 **Ultrasound-guided vascular access cannulation** | *J. PajeK*
15.50-16.10 **Patient lecture on cannulation** | *P. West*
16.10-16.30 **State of the button hole technique** | *M. van Loon*
16.30-16.50 **Prevention of needle dislocation in HD patients** | *K. Rickert*

17.00-18.00 **VAS General Assembly** | *Willem Burger Zaal*

19:00-23:00 **Dinner and Party** | *Paddle Steamer 'The Majesty'*