Single Incision Technique for Tunneled Dialysis Catheter placement - viable alternative to the established technique

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Recent reports have introduced a new technique of tunneled hemodialysis catheter (TDC) insertion. This method of catheter placement uses only one incision and accomplishes placement without making an incision at the neck area. These reports, however, did not specify the use of central venous angiography. In this analysis, we report 11 cases of TDC insertion using single stick technique. Demographic characteristics included age=48±16 years, race (African American=7, Caucasians=3, Hispanic=1), male 73%, hypertension=5, diabetes=5, HIV=1. Four of the 11 patients had previous catheters. After the insertion of micro-puncture sheath into the internal jugular vein, an angiogram was performed to confirm the presence of the sheath in the central veins and assess the patency from the point of venous entry to the right atrium. Two patients with a history of a previous catheter demonstrated stenosis (≥50%) of the brachiocephalic vein. One patient demonstrated fibroepithelial sheath from a previous catheter. None of these patients needed any intervention before catheter insertion for stenosis or sheath. In one patient, navigation of the micro-puncture sheath and dilators was difficult due to dense scar tissue. In this patient catheter navigation proved unsuccessful. Angioplasty of the entire tract from the venotomy to the exit site resulted in an easy navigation of the catheter. All 11 patients successfully received a catheter using single incision technique. We believe that angiographic evaluation prior to catheter insertion is an integral component of the procedure. Because catheters have been known to be accidentally placed in the azygous vein, angiography should be strongly considered when placing a tunneled hemodialysis catheter.
Blood Flow Outcomes of External Jugular Hemodialysis Catheters: A Case Series

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The right internal jugular vein is widely accepted as the vessel of choice for placement of long-term central venous catheters (CVC) for hemodialysis (HD). The most common second choice for central venous catheter placement is the left internal jugular vein, but use of this vessel potentially puts the left arm’s vasculature at risk and is associated with poor blood flow rates (Qb) and high rates of subsequent vascular stenosis and thrombosis. Recent case reports have studied the external jugular (EJ) vein as an alternative vascular access site. However, long term blood flow outcomes from the EJ have not been reported. The purpose of this study is to report the blood flow outcomes in a series of percutaneously placed external jugular hemodialysis catheters.

Using a prospectively collected vascular access database, Qb outcomes and patient demographics were retrospectively collected for 11 catheters in 9 patients who were receiving hemodialysis via external jugular CVCs placed at our tertiary care institution. The 30-d and 90-d Qb were collected from regional HD centers for inclusion in the study.

The average age of the subjects was 52.4 years. Other demographic variables included 36.4% female, 36.4% African American race, 63.6% diabetics. Eighty-two percent of the EJ catheters were placed on the right side.

This report demonstrates comparable right EJ blood flow outcomes at 30 and 90 d to right IJ historical data. Further prospective investigation is required to rigorously define the role of EJ CVC placement as a potential long-term access modality.
A Novel Technique of Introducer Sheath “Reversal” Allowing Bi-Directional Intervention Without Performing a Second Cannulation

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Hemodialysis access failure represents a major cause of morbidity for the ESRD patient. It is estimated that over $1.5 billion is spent on HD access procedures annually. With recent changes in bundled procedure codes and CMS fee schedules, there is increased pressure to decrease these costs. Although previously inflow anastomotic lesions of AVF or AVG were thought to occur in a small percentage of access dysfunction, it has recently been reported to be as high as 40%. This will require re-cannulation of an introducer in the retrograde direction or cannulation of the artery. We describe a novel technique of reversing an introducer without re-cannulation to intervene on an inflow lesion. A 55-year old male presented with a left brachiocephalic AVF and poor dialysis. A 5Fr micropuncture was used to cannulate the AVF in the antegrade outflow tract. Fistulagram revealed a 90% 3cm stenotic segment in the cephalic vein. An occlusive retrograde arteriogram was then performed revealing a 4cm inflow lesion with 80% stenosis. The micropuncture was exchanged for a 6Fr introducer. After the outflow segment was intervened upon, attention was turned to the inflow segment. With the wire in place, a Fogarty balloon was inserted into the introducer. The balloon was inflated and locked with stopcock extension. The balloon was then retracted apposed to the end of the introducer simultaneously with the guidewire. With balloon in place, the introducer was manipulated retrograde without exiting the vessel proper. The wire was then fed into the inflow segment and balloon deflated and removed. This established a retrograde introducer without re-cannulation of the AVF. PTA on the inflow segment was then accomplished. This case describes a novel application of a standard HD access dilator/introducer combination and Fogarty to intervene on both outflow and inflow lesions without a 2nd cannulation. Further investigation is necessary to evaluate the safety and efficacy of this technique.
Percutaneous Placement of an Extra-Luminal Bypass in an Occluded Arteriovenous Fistula

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Percutaneous extra-luminal bypass using stent-grafts have been used to treat occlusive PVD of the extremity that is refractory to conventional percutaneous intervention. This technique is achieved by using a re-entry catheter that allows the operator to exit the occluded vessel and re-enter it distal to the occluded segment. A 51-year-old male presented with a hyperpulsatile radiocephalic AVF. Fistulogram revealed a 100% lesion in the cephalic vein of the forearm 4 cm from the arterial anastomosis and an aneurysmal dilatation of the vein distal to the occlusion. After unsuccessful attempts to cross the lesion, the following extra-luminal bypass was performed. Digital pressure was held at the arterial anastomosis to minimize blood loss into the extravascular space. A septal perforator needle was used to exit the lumen of the AVF at the outflow tract of the pseudoaneurysm and manipulated subcutaneously until it abutted the distal outflow vein. The needle was then used to perforate the cephalic vein distal to the occlusion and a .014 wire was passed through the needle into the proximal vein. The septal perforator needle was removed and serial dilation was performed over the wire with a quickcross catheter, 4 Fr dilator, and 6 Fr dilator while keeping digital pressure on the inflow vessel. A .035 wire was then exchanged for the .014 wire. A 9Fr introducer was then advanced over the wire into the AVF. An 8x60 mm stent-graft was then deployed between the aneurysm and cephalic outflow tract, thus bypassing the occlusion. An 8x40 mm angioplasty balloon was used to post-dilate the self-expanding stent after deployment. Post intervention fistulogram revealed free flow of contrast from the distal cephalic vein into the proximal cephalic vein via stent-graft. We describe successful recanalization of an occluded AVF using percutaneous placement of an extra-anatomic vascular bypass with a covered stent.
Once thought to be a minor player in hemodialysis access dysfunction relative to outflow stenosis, feeding artery (inflow) stenosis has recently come to be viewed as a major cause of access failure. Indeed, recent literature has shown that up to 40% of all accesses referred for dysfunction have an inflow lesion. Imaging of the inflow segment has been traditionally performed by interventional nephrologists via retrograde occlusive arteriography (ROA). Retrograde occlusive arteriography is a technique by which contrast is injected into an arteriovenous access and made to flow retrograde due to the application of occlusive pressure on the outflow tract by the operator. Recent advances in our understanding of ROA have cast the technique in a negative light, with the possibility of vascular complications and poor diagnostic yield coming to the fore. This is a retrospective analysis of hemodialysis patients referred for access dysfunction to our tertiary care referral center. Using a prospectively collected, vascular access database, we identified 13 consecutive patients who received imaging of inflow lesions by ROA and direct arteriogram. We measured mean percent luminal diameter as inflow lesion severity and compared both methods to determine if there were any significant differences. The mean percent luminal stenoses were found to be 54±18.2 and 86 ±8.9 (p=0.012) for the ROA vs. direct arteriography groups, respectively in the set of patients in whom a difference between the two modalities was radiographically noted. This small case series provides evidence on the theoretical concern that ROA does not adequately evaluate inflow lesions. Perhaps in certain individuals, injection of contrast against manual compression distorts vascular architecture to such an extent that the lesions are obscured. We may conclude that by relying solely on ROA, interventional nephrologists may be failing to detect a subset of hemodynamically significant inflow lesions.
A Novel Approach To Measure Hydrostatic Intraperitoneal Pressure In Continuous Ambulatory Peritoneal Dialysis Patients.

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Introduction: In patient treated with Continuous Ambulatory Peritoneal Dialysis any increase of 1cm water in Intra Peritoneal Pressure causes a decrease of 70ml in net ultra filtration after 2hours. The aim of study is to make a device to routinely measure Intraperitoneal Pressure.

Methods: The study was conducted on 12 Patient of Continuous Ambulatory Peritoneal Dialysis. Intraperitoneal Pressure measurement was done on 3rd day & 14th day of Continuous Ambulatory Peritoneal Dialysis catheter insertion by Intraperitoneal Pressure measurement Scale (CG IPP Scale) made by us. Intraperitoneal Pressure Value is expressed in Centimeters of water with point zero along the mid axillary line in supine position. Normally Intraperitoneal Pressure during supine position, sitting, and upright position are 12 cm, 25cm and 27cm respectively with an intra peritoneal volume of 2 litres.

Results: • Male were 8 and female were 4. • All patient on 3rd day had Intraperitoneal Pressure >12cm of water with mean 17±4.5 cm of water. • On 14th day 10 Patient on Continuous Ambulatory Peritoneal Dialysis, had Intraperitoneal Pressure < 10cm water with mean 7.5±2.3 cm of water and 2 Patient had Intraperitoneal Pressure >12cm of water with mean 15±2.5 cm of water (P value<0.05).

Conclusion: • All male patients had raised Intraperitoneal Pressure on 3rd day of Continuous Ambulatory Peritoneal Dialysis catheter insertion probably due to abdominal pain secondary to surgery. •Most of the patient on 14th day of Continuous Ambulatory Peritoneal Dialysis catheter insertion had normal Intraperitoneal Pressure (<10cm of water). •Two patients had raised Intraperitoneal Pressure and had low ultra filtration. •Measurement of Intraperitoneal Pressure in Continuous Ambulatory Peritoneal Dialysis is a very useful tool to optimize ultra filtration, determine the tolerance of intra peritoneal volume and to improve clearance.
Pathogenetic Role for Early Focal Macrophage Infiltration in a Pig Model of Arteriovenous Fistula (AVF) Stenosis

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Arteriovenous fistula (AVF) maturation failure as a result of a peri-anastomotic stenosis is currently a huge clinical problem. Despite the magnitude of the clinical problem, however, there is minimal information about the pathogenesis of this condition. The aim of this study was to describe the cellular (macrophage) infiltrate at different time points following AVF creation in a pig model of AVF stenosis. Bilateral AVFs were placed in 8 pigs. Animals were sacrificed at 2d, 7d, 28d and 42d. Multiple formalin fixed paraffin embedded blocks were sequentially cut at 4 mm intervals for the first 2.5 cms of the venous segment beyond the anastomosis. Sections were stained for pig macrophages using a streptavidin biotin immunohistochemical technique and scored using a semi-quantitative scoring scale (Range 0-4+ with 0 = 0-10% macrophages; 1+ = 11-25%, 2+ = 26-50%, 3+ = 51-75%, 4+ = 76-100%). The adventitia (A), intima-media (IM) and endothelium (E) were separately scored at each of the time points and data from different blocks for a single AVF was averaged.

Maximal macrophage infiltration occurred at 2d (mean for all 3 layers combined =1.14+/-.02). The individual scores for macrophage infiltration within the different vessel wall layers at 2 days were similar (A = 1.29+/-.04; IM = 1+/-.0; E = 1.2+/-.5). In marked contrast there was minimal infiltration at 7d (0.06+/-.03; p < 0.001 for a comparison of 2d versus 7d), with a complete absence of macrophages at 28d and 42d. Interestingly, many regions of the venous segment at 2d had a very marked macrophage infiltration (> 75%) on one side of the vein only, with minimal infiltration of the opposite wall.

The early and transient infiltration of macrophages into the vessel wall (at 2d only) together with a selective infiltration to one side of the venous segment (perhaps due to differences in hemodynamic stress) suggest future novel therapeutic targets for AVF stenosis.

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Introduction: The National Kidney Foundation Kidney Dialysis Outcomes Quality Initiatives (KDOQI) Guidelines recommend that the rate of native AV fistulae and graft thrombosis should be less than 0.25 and 0.5 episodes per patient year at risk respectively. The aim of this study was to examine the effect of an access maintenance program on access thrombosis rates. More than 95% of accesses at our centre are autologous AV fistulae. Methods: The study population consisted of the entire 135 and 125 haemodialysis patients in 2008 and 2009 respectively. Of these 5 patients had grafts. At the end of 2008 an access maintenance program commenced. This consisted of regular physical examination by dedicated nursing staff and routine Transonic™ ultrasound dilution technique access flow (TQa) measurement every 3 months. By transonic measurement, inadequate access performance was considered when flow was <500 ml/ minute or if TQa decreased by >25% over 3 months. Identified accesses were subject to a fistulogram and fistuloplasty if required. Access thrombosis rates in the period 1 January 2008 to 31 December 2008 was used as a historical control and compared to the period 1 January 2009 to 31 December 2009. Results: In 2008 access thrombosis rates in AV fistulae were 0.069 episodes per patient year at risk. This reduced to 0.033 episodes per patient year at risk for 2009. Amongst grafts for the corresponding time periods the thrombosis rate was reduced from 0.4 to 0.2 episodes per patient year at risk. Conclusion: Implementation of an access surveillance program involving regular physical examination in combination with routine TQa measurement resulted in an approximately 50% reduction in overall access thrombosis rates. In the year since its introduction, overall access thrombosis rates at our centre were reduced from 0.081 to 0.04 episodes per patient year at risk. Access thrombosis rates will continue to be monitored to determine the ongoing effect of this program.
Differences in Anatomical Configuration Influence Flow and Diameter in a Pig Model.

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Arteriovenous fistula (AVF) failure due to venous segment stenosis is an important clinical problem, responsible for a significant clinical morbidity and economic cost. Studies have suggested that a rapid increase in flow and diameter after AVF creation could be a marker for successful AVF maturation. The aim of this study was to examine the effect of anatomical configuration on changes in flow and diameter in a pig model of AVF stenosis.

Curved (C) and straight (S) AVFs were placed bilaterally in 8 pigs. Blood flow was measured using duplex doppler ultrasound immediately after AVF creation (0d) and at 2d, 7d and 28d. Diameter was measured immediately after AVF creation (calipers) and at the 2d, 7d and 28d time points (64 slice CT scans) at 4 representative points (8 mm, 11 mm, 19 mm and 25 mm) proximal to the AV anastomosis.

The mean blood flow and diameter for the curved and straight AVF configurations at different time points are shown in Table 1. C-AVFs had a greater blood flow and diameter at all time points as compared to S-AVFs. The interval change in flow (ml/min/day or mmd) was greater in C-AVFs as compared to S-AVFs between 0-2d (C = 53 mmd, S = 27 mmd); 2d-7d (C = 148 mmd, S = 113 mmd) and 7d-28d (C = mmd, S = 61 mmd). Similarly the percentage change in diameter was greater in C-AVFs as compared to S-AVFs between 0-2d (C = +48%, S = +45%), 2d-7d (C = +38%, S = +16%) and 7d-28d (C = +34%, S = -7%).

The greater absolute values for flow and diameter in the C-AVFs, the continuing relative increase over defined time intervals in both these parameters for the C-AVFs and finally the relative reduction in diameter between 7d-28d for the S-AVFs as opposed to a continuing increase in the C-AVFs; all suggest that differences in anatomical configuration of an AVF could have a very significant impact on clinical outcomes. Studies to translate these findings into the clinical setting are currently in progress.

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Ultrasound and Fluoroscopy guided Balloon angioplasty in patients with nonmaturing arteriovenous fistulas not yet receiving hemodialysis may lead to poor results

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The current emphasis on timely referrals to the nephrologist and early referrals to surgeons for arteriovenous fistulas have lead to many patients receiving successful and functional fistulas. However, a number of patients still experience failing or nonmaturing arteriovenous fistulas. Their borderline renal function makes them especially challenging to treat percutaneously because of the interventionalist’s goal of minimizing the risk of further decreases in glomerular filtration rate secondary to radiocontrast-induced nephropathy. We have used the combination of duplex scanning and fluoroscopy for image guidance in treating nonmaturing arteriovenous fistulas with percutaneous transluminal balloon angioplasty during a 12 month period with mixed results.

8 PTA’s were performed on 5 patients during a 12 month period without radiocontrast. Of the 5 patients two successfully met criteria for cannulation as a result of the procedure. Three of the five did not and required surgical revision or a new dialysis access.

Prior to intervention, intra-access flow as measured by duplex methodology ranged from 157 ml/min to -441 ml per minute. (Median 230 ml/min). Pre intervention diameter ranged from 4.9 mm to 8.3 mm (median 5.3 mm).

Sheath insertion, guide wire passage, and balloon positioning were guided by ultrasound and fluoroscopy. Duplex ultrasound was utilized to localize the stenotic lesions and ultrasound was used to select the appropriate balloon size and assess the technical adequacy of the procedure.

Balloons used were 4mm-5mm for the arterial anastamosis and 5mm-7mm for the post-anastamotic portions of the fistula, including the swing point.

Full effacement of the balloon was achieved in each case without the use of cutting balloons. There was one episode of rupture treated by prolonged low pressure balloon inflation.

The post-PTA access flows ranged from 213ml/min to 558 ml/min. (median 384 ml/minute). The mean improvement was 153 ml/min. The median improvement in diameter was 0.6mm

Recoil was common in these patients: despite duplex monitored technical adequacy 3 of the 8 angioplasties had no significant improvement in access flow at one week.

Restenosis was common in this group of patients. Two of the five that had significant improvements in access flow (104ml/min to 334ml/min improvement) found flows regressed within 4-5 months to where they no longer met criteria for cannulation.

While duplex ultrasound fluoroscopic guidance can successfully guide PTA of nonmaturing fistulas, the high incidence of recoil and early restenosis make successful and durable results difficult to achieve with this method. More effective intraoperative duplex imaging protocols might be helpful in assessing the effects of immediate recoil. A completion angiogram might have led to improved outcomes. We conclude that relying exclusively on ultrasound guidance may lead to poor results.
Epicardial Leads: Might this be the Preferred Route for Chronic Renal Failure Patients?

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Cardiac rhythm devices (pacemaker, implantable cardioverter defibrillator, cardiac resynchronization therapy) provide support to many chronic hemodialysis patients. However, the transvenous leads of these devices are known to cause central venous stenosis and are prone to contamination during hemodialysis access-related bacteremia. Instead of the central veins epicardial leads use the subcutaneous route and are inserted into the epicardium. In this analysis, we report eight chronic hemodialysis patients with transvenous cardiac devices who eventually needed an epicardial system for a variety of reasons. Four patients with a tunneled hemodialysis catheter (TDC) and three cases of an arteriovenous graft experienced vascular access-related bacteremia that spread to the transvenous cardiac device. One case of a fistula had recurrence of central stenosis that required frequent angioplasty procedure (<3 months). Transvenous devices were removed and all of the patients received an epicardial system. One patient with TDC switched to peritoneal dialysis and did not experience infection of the epicardial system despite an episode of peritonitis. The remaining TDC (n=3) and graft patients (n=3) received a TDC after the resolution of bacteremia. While all 6 experienced on average 1.5 episodes of catheter-related bacteremia during the average follow-up period of 16.5 months, none developed infection of the epicardial system. The patient with central venous stenosis has required only one PTA procedure for the past eight months. Epicardial route of lead placement does not induce central venous stenosis and mitigates the risk of contamination during an arteriovenous graft or catheter-related bacteremia. These results suggest that epicardial approach might be the preferred route for chronic hemodialysis patients requiring cardiac rhythm devices.
Stent Thrombosis. An uncommon complication of stent placement in central venous stenosis.

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A 62 year old African American female with End Stage Renal Disease secondary to Hypertension came to our institution complaining of neck and facial edema. Her dialysis access was a right Internal Jugular tunneled catheter that was placed 1 week before admission. A CT angiogram of the chest was done. A diagnosis of early stent thrombosis was made.

Stent Thrombosis is an uncommon complication that may be difficult to treat. There are no reports on the literature of the incidence of stent thrombosis. Thrombi can propagate (which leads to vessel obstruction), embolize, dissolute or organize with recanalization. The risk increases when hypercoagulabity and stasis are present. This complication is more common in patients with oncologic problems due to their hypercoagulable state. Stents are used in Oncology to treat superior vena cava syndrome. Anticoagulation use has a role in the deployment of arterial stents but it is not clear for stents in the venous system. A study done in pigs by Wysokinski comparing the placement of bilateral iliac venous stents versus crush injury to the carotid artery showed that the thrombotic response in arteries and veins was different in each individual. Foreign bodies may produce turbulence and stasis with an increase risk of thrombosis. All patients with thrombosis of the central veins must receive anticoagulation therapy to reduce the risk of pulmonary embolus; this will help with re-canalization. Studies have showed the benefit of catheter-directed thrombolysis plus stent placement in the treatment of central vein thrombosis; this therapy requires ICU monitoring.

In conclusion if a patient presents with an acute stent thrombosis; catheter-directed thrombolysis plus stent placement is a safe option with anticoagulation. This procedure should be done in a center with experience and patients should be monitor in an ICU setting. Angioplasty and stent placement can be performed after organization of the thrombus.
Primary AVF failure remains a significant barrier in improving AVF use. With the significant emphasis from the Fistula First Initiative to increase AVF incidence and prevalence, more interventions have been required to promote AVF maturation. The objective of this study was to evaluate short and long-term survival in AVFs requiring interventions to promote maturation compared to those without interventions to promote maturation. A retrospective review of our hemodialysis patients who received AVFs from 2002 to 2006 was performed. 127 patients had AVFs placed during this period. 74.8% were male, 69.3% blacks, 53.5% diabetics, 70.1% had upper arm AVFs, and 42.5% required intervention before AVF maturation. Cumulative survival and post-dialysis primary (unassisted) patency were compared between those patients requiring interventions before maturation and those who did not. Kaplan-Meier survival analysis was used to model AVF patency. No demographic differences was found between patients who had an intervention before AVF maturation and those who did not. Patients with interventions prior to AVF maturation compared to those without interventions had worse cumulative survival (797 vs 970 days, p= 0.0044), worse post-dialysis primary (unassisted) patency (96 vs 605 days, p=0.004), and longer time to first AVF use (127 vs 85 days, p=0.0068). Patients with interventions prior to maturation required more interventions to maintain patency after use on dialysis (1.85 vs 1.65; p=0.560), but was not statistically significant. Patients requiring interventions (endovascular or surgical) prior to AVF maturation had worse short and long-term outcomes. Interventions before maturation may induce endothelial injury, inflammation, and oxidative stress, thus, reducing AVF survival.
Fistula Salvage Using the HeRO® vascular access graft in dialysis patients

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Purpose: The purpose of this abstract is to report on an interesting technique to salvage an existing, failing fistula, utilizing the HeRO® vascular access device. The HeRO device is a subcutaneous hemodialysis graft that drains directly into central venous circulation, not requiring a venous anastomosis, thus bypassing both peripheral and central venous stenoses. When a fistula is failing due to venous outflow obstruction, a long-term catheter can possibly be avoided by suturing the HeRO device to the fistula. In our access center, we have begun routinely screening catheter-dependent patients for HeRO placement and have recently expanded our screening efforts by conducting vein mapping on patients with failing fistulas as possibly hybrid fistula/HeRO candidates to be referred to our vascular surgeon.

Methods: To date, in our access center, we have identified 13 patients for HeRO placement after reviewing their access history and conducting vessel mapping. We have successfully avoided placing long-term catheters in two patients with failing fistulas due to venous outflow obstruction. To accomplish this, the HeRO device arterial graft component is cut to the appropriate length for the anastomosis to the existing fistula. The existing fistula remains the cannulation location.

Results: To-date, both patients have continued to dialyze via their fistula/HeRO hybrid access with no thrombotic issues or other associated adverse events. Additional follow-up data is being collected.

Conclusions: These case reports demonstrated that the HeRO vascular access device can be utilized to salvage failing fistulas due to venous outflow stenosis with good short-term results. This technique may also be considered for failing hemodialysis grafts due to venous outflow stenosis. A benefit of this technique versus the standard implantation of a HeRO device is that a bridging catheter is avoided during the HeRO graft maturation period because the fistula (or conventional graft) can be immediately cannulated for dialysis. Additional long-term study of this technique and outcome should be undertaken to continue catheter reduction efforts.
Interventional Nephrology: An Academic Center Experience

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Interventional nephrology is a relatively young subspecialty that deals with one of the most important aspects of dialysis care: vascular and peritoneal access. Training of qualified interventional nephrologists has been difficult. Majority of interventionalists have been trained by peers in an outpatient setting with few being trained in an academic environment.

The departments of medicine and radiology at the University of Alabama at Birmingham decided in 2004 to create a combined interventional nephrology program. During the 5-year study period (July 2004 to June 2009), a total of 5961 procedures were performed. Of that total, 2834 were permanent catheter placement, 200 temporary catheter placement, 2200 fistulograms, 625 mechanical thrombectomies, 62 peritoneal catheter placements, and 40 upper extremity venograms for mapping. Interventional nephrology performed 42% of the procedures. There were no major complications accounted for in either group. Two new techniques were introduced to the service including: placement of femoral permanent catheters and placement of peritoneal catheters.

This article accounts for the 5-year collaboration between the medicine and radiology departments in the area of interventional nephrology. Nephrology-related procedures were done with the same quality, safety and effectiveness for both groups. A multi-disciplinary team approach to dialysis access is fundamental to provide proper medical care to the end stage renal disease (ESRD) population.
OUTPATIENT REAL-TIME ULTRASOUND PERCUTANEOUS RENAL BIOPSY WITH POST-BIOPSY COLOR DOPPLER IS A SAFE PROCEDURE.

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Percutaneous renal biopsy (PRB) is a safe and valuable procedure in the diagnosis of renal disease. The use of real-time ultrasonography along with color Doppler US has been advocated as a safer tool. We evaluated the safety and outcomes of outpatient PRB at our institution.

During a 36-month period 180 pts underwent PRB. The biopsies were performed by 8 am by Nephrology Fellows under direct faculty supervision. All biopsies were done under real-time ultrasound with a 16-gauge or 18-gauge spring-loaded biopsy gun, and followed immediately by color Doppler ultrasound to exclude active bleeding. Blood pressure and heart rate were monitored frequently. Hematocrits were measured pre-biopsy, 4, and 8 hours post-biopsy. All biopsies were performed as an outpatient procedure.

The patient demographics were as follow: 56% African Americans; 60% female; 21% diabetic; 66% HTN; mean BMI 29.8±5. The depth of the kidney from the skin was 6.8±2 cm. Tissue was obtained in 100% of the cases. No major complications were encountered. A small perinephric hematoma (<2x2 cm) was observed post-biopsy in 18 pts (10%). There was no need for vascular intervention and only two patients needed transfusion. No patient required subsequent hospitalization due to late biopsy-related complications for the 120 outpatient procedures.

In conclusion, real-time, ultrasound-guided percutaneous renal biopsy followed by color Doppler US is safe and effective, minimizes the risk of early or late complications, and the need for post-biopsy hospitalization. Outpatient PRB can result in significant cost savings without exposing the pts to increased risk of complications.
Ultrasound-assisted Placement of Peritoneal Dialysis Catheters

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Background: Peritoneal dialysis catheters are inserted into the abdominal cavity by interventional nephrologists, surgeons or radiologists. They may be inserted blindly, surgically, and either by laparoscopic, peritoneoscopic or fluoroscopic approach. A modified technique using ultrasound-assisted needle insertion followed by fluoroscopic guidance was performed. The present study evaluated the outcomes and complications by using this technique.

Methods: From March 2005 to June 2009, Fifty-two patients were referred for placement of a permanent peritoneal dialysis catheter. Pre-operative evaluation was performed on all patients one week before the procedure. An interventional nephrologist in one of the radiology interventional suites performed ultrasound-guided needle insertion followed by fluoroscopic assisted placement.

Results: Fifty-two patients were scheduled for a peritoneal dialysis catheter to be placed. Forty-four patients started peritoneal dialysis within 2 to 4 weeks of catheter placement. Three patients were started on acute peritoneal dialysis the same day of catheter placement without any complications. One patient had a bowel needle puncture that was diagnosed immediately; the procedure was cancelled and antibiotics started even though there were no signs of bowel perforation. Four patients started 3 to 6 months after placement.

Conclusions: Our experience shows that this technique is minimally invasive and safe. There is a reduced risk of bowel perforation with ultrasound guidance of needle insertion. Successful placement was achieved in 98% of the cases. Ultrasound is readily available and provides excellent and reliable imaging for needle guidance. Peritoneal catheters could be used immediately for acute dialysis with no patient discomfort.
Flow Interruption of the Distal Radial Artery is an Effective Treatment for Palmar Arch Steal Syndrome in Mature Radiocephalic Hemodialysis Fistulas

Gregg A. Miller, MD
Alexander Friedman

Purpose: To establish an effective approach for the treatment of finger ischemia in mature radiocephalic hemodialysis arteriovenous fistulas.

Methods: 265 end-stage renal disease patients (4% of our practice) presented to our outpatient vascular access facility complaining of a range of symptoms including coldness, numbness and pain in the fingers indicative of ischemia due to steal syndrome. In 82 patients with Brescia-Cimino fistulas, the symptoms of steal syndrome were limited to the fingers, sparing the hand (Palmar Arch Steal Syndrome). Physical examination was indicative of steal syndrome caused by shunting of blood from the ulnar artery via the palmar arch, away from the fingers and into the fistula. To confirm the diagnosis, angiography was performed, demonstrating retrograde flow in the distal radial artery (DRA), a hypertrophied palmar arch, a patent hypertrophied ulnar artery and severe diminutive atherosclerotic disease of the digital arteries. Ischemia was treated with DRA flow interruption. Transcatheter coil embolizations of the DRA were performed 85 times in 77 patients. Whenever embolization was not possible, ligation of the DRA was performed in accordance with accepted surgical literature (n = 5). Pre- and post-procedure Transonic flow measurements were performed to determine total AVF flow reduction.

Results: DRA flow interruption was effectively accomplished by either ligation or coil embolization in all cases. All patients (77 / 77) had symptomatic improvement after the initial treatment, although 7 patients required two embolizations and 1 patient required three embolizations in order to achieve complete resolution of symptoms. There were no complications during the procedure. The average follow-up period was 18 months. During follow-up, the most common complaints were tenderness at the embolization site and reperfusion-induced tenderness of the tips of the digits. Both symptoms resolved within 2 weeks in all patients. Following DRA flow interruption (coil embolization or ligation) total fistula flow was reduced by an average of 19.6%.

Conclusion: Coil embolization or ligation of the distal radial artery is a safe and effective treatment for Palmar Arch Steal Syndrome. Elimination of the DRA flow significantly reduces total access flow.
Fig. 1a - Characteristic blood flow of a patient with Palmar Arch Steal Syndrome (PASS). Due to the high resistance of the digital arteries and the low resistance of the fistula, blood flows towards the fistula and away from the digital arteries.

Fig. 1b - Ligation of the radial artery, which blocks retrograde flow in the DRA, promoting perfusion to the digital arteries.
The HeRO® device versus conventional arteriovenous grafts in dialysis patients

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Purpose: Venous outflow stenosis is a major cause of dialysis graft dysfunction and access loss. The HeRO® device is a graft that drains directly into the central venous circulation, does not require a venous anastomosis, and bypasses both peripheral and central venous stenoses. Although the device is best suited for patients unable to support a fistula or conventional graft due to venous outflow stenosis, as part of a broad Food and Drug Administration evaluation, a clinical trial was conducted evaluating this technology in a graft-eligible patient population, regardless of outflow stenosis.

Methods: This United States multi-center, randomized (2:1) clinical trial evaluated the safety and efficacy of the HeRO device compared to conventional expanded polytetrafluoroethylene grafts collecting data on patency, interventions, adequacy of dialysis, and adverse events in 70 graft-eligible patients followed for a minimum of 12 months.

Results: Fifty patients received the HeRO device and 20 received a conventional graft. Patient cohorts were similar in baseline characteristics and included a large percentage of diabetics with many previous accesses. At 12 months, the HeRO device primary and secondary patency rates were 36% and 70%, respectively; the control primary and secondary patency rates were 35% and 60%, respectively. There were no statistical differences in primary or secondary patency between cohorts at 12-months (p>0.999 and p=0.574, respectively). There was a statistically significant difference in median time to loss of secondary patency for HeRO at 238.0 days versus 102.5 days for the control cohort (p = 0.032). The rate of intervention was 2.2/year for HeRO and 1.6/year for the control cohort; these intervention rates were not statistically different (p = 0.100). Adequacy of dialysis and adverse events were comparable between the two cohorts.

Conclusions: This study provides additional data on the HeRO device’s demonstrated ability to deliver graft-like outcomes while bypassing stenosis with the potential for a longer lifespan, possibly due to the lack of venous anastomosis. After appropriate vein mapping, HeRO should be considered as an access option when evaluating catheter-dependent patients or patients dialyzing with a failing graft or fistula due to outflow stenosis.
There is an ongoing effort to increase the prevalence of fistula use in the ESRD population. KDOQI Guideline 2.1.1 states that the preferred fistulae varieties are radio-cephalic, brachio-cephalic and transposed brachio-basilic. An interventional nephrologist created 462 consecutive arteriovenous fistulae from June 15, 2007 through December 15, 2009. Of these, only 30% were of the three preferred varieties suggested by KDOQI. The “unconventional” fistulae consisted of Brachial artery to: Retrograde Basilic flow into the Cephalic Vein (n=27), Basilic Vein with both Basilic and Cephalic outflow (n=6), Brachial Vein (n=1), Median Antebrachial Vein (n=41), and Perforating Vein (n=51); of Proximal Radial Artery to: Basilic Vein (n=1), Cephalic Vein (n=6), Median Antebrachial Vein (n=20), and Perforating Vein (n=10); of Mid-Radial Artery (as defined by need to reflect or split the flexor tendon for exposure) to: Median Antebrachial Vein (n=20) and Cephalic Vein (n=6); and of Radial Artery to Forearm Basilic Vein (n=1), and Median Antebrachial Vein (n=121). Of those patients available for analysis, 87.4 % of the KDOQI recommended AVF and 91.8 % of the “unconventional” AVF were patent at 2 weeks. Successful AVF creation as defined by satisfactory use for dialysis or ability to cannulate as determined by 2 independent experienced dialysis personnel was 83.3 % (n= 95 of 114) in the conventional group and 76.4 % (n=201 of 263) in the “unconventional” group indicative of comparable outcomes. Physicians creating AVF should consider multiple arterial and venous outflow options. Limiting fistula creation to the three preferred varieties suggested by KDOQI may limit the surgical opportunities.
QuikClot® InterventionalTM Hemostatic Bandage (QCI): A Kaolin-Based Hemostat for Diagnostic and Interventional Vascular Access.

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Introduction: Percutaneous interventional therapy is the treatment of choice to address clotting and restore adequate flow in vascular access for hemodialysis. Persistent bleeding at the access site following these interventional procedures is a common complication and may cause prolonged hospitalization. This study introduces a kaolin-based hemostatic device, QuikClot® InterventionalTM hemostatic bandage (QCI), which is designed to control bleeding at the vascular access site. QCI is directly derived from Combat GauzeTM, which is currently the hemostatic agent of choice for all branches of the US Military

Methods: Preclinical Swine Model. The femoral artery and vein, carotid artery, and jugular vein in a swine model were accessed percutaneously using the Seldinger technique. Tissue dilators and introducer sheaths were used to produce wound tracts (8 -12 F). After the removal of both dilators and sheaths, the QCI pad was placed over the bleeding site. Manual compression was held for 2 minutes and then a TegadermTM dressing was applied over the pad for an additional 3 minutes. At 5 minutes the TegadermTM and pad were both removed and the site was evaluated for bleeding and/or hematoma formation. Human Clinical Data: QCI was used as an adjunct to manual compression in a total of 243 human clinical procedures (Arterial =238 & Venous = 5, Dilator 4-8 F), some in the presence of anti-coagulation, in fifteen different institutions throughout the United States. Use Report Forms were collected from physicians and other health care providers to obtain details of QCI uses. Results: QCI successfully controlled surface bleeding within 5 minutes in all preclinical cases (N=25) using 8 and 12 F tissue dilators at the vascular access site and no hematoma formation was observed. QCI successfully controlled bleeding in 97.12 percent of the clinical procedures, even in the presence of anti-coagulation. Physicians and health care providers who filled out the evaluations stated that they were highly satisfied with the product and would use it again. Conclusions: This data suggests that QCI is very effective in controlling bleeding following vascular access in both experimental animals and for routine clinical use. Prospective clinical trials are currently underway to confirm these preliminary results.
Renal Angiography by Nephrologists: an Australian Experience.

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Digital subtraction angiography of the renal arteries is an investigation for patients with suspected renovascular disease. St George Hospital is the first public hospital in Australia where this procedure is performed by Nephrologists. We present our first year's experience. Angiography is performed as a day-procedure except for patients who undergo percutaneous interventions, who are admitted overnight for observation. We begin with a flush aortogram followed by oblique views. Selective renal artery angiograms are performed only when deemed necessary. 23 angiograms were performed between Feb and Dec 2009. Average age was 56 years with almost twice as many females as males. The majority were outpatients. Indications for angiography were: hypertension (43%); hypertension with evidence of renovascular disease (39%); hypertension with renal impairment (17%). Renal impairment was common with average pre-procedure creatinine of 130 micromol/L (1.47 mg/dL). The average volume of contrast used was 85mL. Average screening time was 3.5min for diagnostic angiography and 26min for interventions. Renal artery stenosis was present in the majority of cases (57%). In most cases this was atherosclerotic disease (77%). 2 patients had fibromuscular dysplasia and one had bilateral renal artery occlusion due to antiphospholipid syndrome. Renovascular disease was bilateral in one third of patients. An isolated renal artery aneurysm was found in one patient. Interventions were performed on 4 patients (angioplasty alone 2, angioplasty with stent 2). One patient developed cholesterol embolisation in the left foot and one patient developed a small haematoma. No episodes of contrast nephropathy were seen. Renal angiography may be safely performed on outpatients by nephrologists working in a public hospital in Australia. The rate of significant, abnormal findings is high when this test is performed on carefully selected patients with high pre-test probability of renovascular disease.
Arteriovenous Fistula (AVF) Creation Using the Optiflow VascularAnastomosis Device

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Although Arteriovenous Fistulae (AVFs) are the preferred form of dialysis vascular access, over 50% are unsuitable for dialysis (“maturation failure”) at 5 months, primarily due to a peri-anastomotic stenosis. The “Optiflow” is a novel anastomotic device which shields the perianastomotic region. We herein describe the technical feasibility, safety and clinical success of the First in Man (FIM) studies of the Optiflow connector. 3 and 4 mm Optiflow devices were placed in 10 patients requiring a new AVF. The primary safety endpoint was freedom from SAEs and unanticipated adverse device events (UADE) at 42d. The primary efficacy end point was technical success (patent AVF without complications) at the end of surgery. Secondary efficacy was defined as technical success and primary patency at 42d.

The mean age of the patients was 45 +/- 12.2 years (6M, 4F; 6 forearm, 4 upper arm; 1 diabetic, 8 hypertensive). There were no SAEs/UADEs related to the immediate placement of the Optiflow. One patient had a pseudoaneurysm at 21d. All patients achieved technical success and 9/10 patients reached the secondary effectiveness end point. The mean venous diameter of the proximal vein at 42d was 8.8 mm (7.2-11.5 mm) as compared to current guidelines of 6 mm. A subjective assessment by the surgeon suggested excellent immediate dilatation and a reduction of operating time as compared to historical controls. These data confirm the technical feasibility and safety of the Optiflow device and also describe initial efficacy data. We believe that the Optiflow device could be an important adjunct for AVF maturation in the dialysis population; resulting in reduced costs and an improvement in patient care.
Perivascular Endothelial Cell Matrices (Vascugel) Enhance Dialysis Vascular Access Survival in Diabetic Patients

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Dialysis access graft (AVG) and fistula (AVF) failure as a result of venous stenosis is an important clinical problem which is thought to be more severe in diabetic patients with CKD and ESRD; and for which there are no effective therapies. Vascugel is comprised of allogeneic aortic endothelial cells embedded in a gelatin matrix, which inhibits stenosis and promotes dilatation in experimental models of arteriovenous stenosis. We have previously described the feasibility and safety of Vascugel when placed around the anastomotic and venous outflow sites of AVGs and AVFs (V-HEALTH clinical study). In this sub-study, we describe the impact of Vascugel on dialysis access survival in diabetic patients from the V-HEALTH study. 39 of the 65 V-HEALTH patients were diabetic, of which 28 received Vascugel and 11 received placebo (matrix without endothelial cells). The composite safety end point was defined as the occurrence of local wound infection, thrombosis or intervention at 4 weeks. Primary and assisted primary patency, were used as efficacy end points at 24 weeks. There was a significant improvement in both the primary and assisted primary patency in the Vascugel group (48% for Vascugel vs. 20% for placebo (p=0.00543) and 88% for Vascugel vs. 52% for placebo (p=0.0089), respectively). There was also an improvement in the safety end point in Vascugel patients with a 27% incidence of local wound infection, thrombosis or intervention at 4 weeks for placebo, compared to 8% for Vascugel patients, p=0.156.

Our results suggest that Vascugel may be particularly effective in preventing access failure in high-risk diabetic patients, perhaps through its beneficial effects on endothelial function.

Impact of Balloon Inflation on Pacemaker Leads

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Pacemaker lead fracture and stress have been previously reported. While percutaneous balloon angioplasty (PTA) has been employed to manage lead-induced central stenosis, potential damage to the leads from balloon inflation resulting in electrical and conduction abnormalities is a concern. We evaluated the impact of balloon inflations on the integrity of pacemaker leads. Three different experimental models were created to simulate resistant stenosis (RS), elastic recoil (ER) stenosis and regular stenosis (Reg S). RS was prepared by 6 mm rigid plastic tube. ER was created by employing a rubber band in the middle of a 12x4 stent graft in such way that the rubber band induced at least a 50% stenosis and that balloon inflation would easily result in complete effacement at nominal pressure but deflation would cause recoil due to the rubber band. Finally, Reg S model was designed using a piece of synthetic graft 6 mm. A pacemaker lead was passed through the lumen of each model and PTA performed. Balloon inflation and deflation was performed for 50 times for Reg S (9 mm balloon) and ER model (12 mm balloon) and four times for RS (9 mm balloon) up to 24 ATM pressure. Minor deformation were noted on gross and microscopic analysis, however, insulation of the leads was not penetrated. The direct current resistance (DCR) i.e. the continuity of the conductor coil was within normal value of 150 Ω for the three models. Dry and wet insulation dielectric integrity (HIPOT) test that are designed to assess short circuit and false conduction path within the leads were also within normal range (Dry HIPOT=64-65 μA, wet HIPOT=0-0.43 mA) for the three models. Internal lumen of the leads for the three models was intact as assessed by the stylet passage test. This study finds that employment of PTA for pacemaker lead-induced stenosis does not result in any functional abnormality of the leads for up to 50 balloon inflations.
Rerouting Procedure for Arteriovenous Accesses: Is it Worth Using the Side Branches?

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Institution: 1) Section of Interventional Nephrology, Kidney and Hypertension Vascular Access Center, Cincinnati, Ohio. 2) Interventional Nephrology University of Miami Miller School of Medicine. Miami, FL. 3) Interventional Cardiology University of Miami Miller School of Medicine, Miami, FL.

At times the outflow track of an arteriovenous access ends abruptly in a stump or is unsuitable to serve as an adequate conduit for optimal blood flow. In many cases, the drainage of blood to the right atrium finds its way through one or more collaterals. In this analysis, we present an approach to divert the drainage through a suitable side branch by augmenting its size using the percutaneous balloon angioplasty (PTA) procedure. Fifteen patients with an inadequate main outflow tract and drainage through existing collaterals were included in this study. Demographic characteristics revealed: age = 60±14 years, male = 10, Caucasian = 8, Hispanic = 5, Black = 3, hypertensive = 10, diabetics = 6. There were eight brachiocephalic and five radiocephalic fistulae and three arteriovenous loop grafts. A suitable outflow side branch was chosen based on angiography and treated with PTA. Blood flow was successfully diverted to the right atrium through the side branch in all but two cases. In these cases, the side branch ruptured and the accesses were lost. In three cases, two PTA procedures were required at two to three weeks interval to establish adequate outflow. None of the three patients needed a tunneled dialysis catheter during the augmentation phase. All accesses are working with an average follow-up of 19.5±8 months. Patients have required on average 2.1 procedures/year. We suggest that simple PTA can assist in augmenting the size of an existing side branch to adequately reroute blood flow to the right atrium. This minimally invasive approach is a suitable alternative to a more invasive surgical intervention.
Transjugular renal biopsy performed by an Interventional nephrology program- A retrospective observational study

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Kevin Martin, Saint Louis University
Rizwan Qazi, Saint Louis University
Alejandro Alvarez, Saint Louis University
Paul Schmitz, Saint Louis University
Division of Nephrology, Saint Louis University School of Medicine, St. Louis, MO

Background: Obtaining renal tissue is critical in the diagnosis and management of patients with unclear cause of renal disease. Bleeding diathesis, liver disease and obesity are some of the contraindications for percutaneous renal biopsy. In such high-risk patients, transjugular renal biopsy is a safe and effective procedure. Our experience with transjugular renal biopsy performed by academic interventional nephrologists is reported.

Study design: A retrospective observational cohort study.

Settings and Participants: 23 patients with either acute or chronic kidney disease with contraindications for percutaneous renal biopsy, who underwent transjugular renal biopsy performed by interventional nephrologists at our university.

Predictor: Transjugular renal biopsy.

Outcomes: Efficacy and safety of transjugular renal biopsy.

Results: 23 TJRBs were reviewed. 17 out of 23 were male, the patients’ age ranged between 19 and 82 with a mean and standard deviation of 52.8 ± 14.4. 20 out of 23 (87%) of the procedures yielded adequate tissue for pathologic diagnosis. 3 (13%) patients required blood transfusions, none required coil embolization or nephrectomy and there were no deaths because of the procedure. Patients who had adequate tissue for diagnosis and follow up information was available (n=18), performing TJRB had clinical impact to a varying degree (7 were initiated on immunosuppression, 1 had discontinuation of immunosuppression, in 7 it provided prognostic information, and in 3 appropriate recommendation was made for kidney transplantation).

Limitations: Performing transjugular renal biopsy requires high technical expertise, and an interventional radiology suite. Our study lacks control groups to compare efficacy and safety to other available options (open, laparoscopic or percutaneous renal biopsy).
Impact of Missing Hemodialysis sessions on Arteriovenous Access Thrombosis

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Vascular access (VA) failure is a major complication in patients with end stage renal disease (ESRD) receiving hemodialysis (HD) 1, 2. Arteriovenous fistulae (AVF) and grafts (AVG) remain the preferred VA for HD. Thrombosis is the most common cause of VA dysfunction. The risk factors for VA thrombosis are not well-established. While missing HD sessions are associated with increased morbidity and mortality, its impact on VA thrombosis is unknown. We evaluated the impact of missing HD sessions on VA thrombosis in ESRD patients.

Methods: Retrospective chart review of prevalent HD patients was done in two outpatient HD centers at The Ohio State University from July 2008 to June 2009. A total of 142 patients underwent a total of 15692 HD sessions. We excluded the patients with dialysis catheter use, short stay (<3months) at HD unit, missing treatments within 5 days before the thrombectomy and excused absence (rescheduled or HD done during the hospitalization). Data regarding unexcused missed HD sessions and VA thrombosis episodes was collected and analyzed in the remaining 69 patients.

Results: Of the 69 patients, 39 (56.5%) missed a total of 422 HD sessions over the study period. Ten of the 39 patients missing HD sessions and 14 of the 30 not missing HD sessions experienced a total of 66 episodes of VA thrombosis. There were 48 episodes of thrombosis in 10 patients missing HD and 18 episodes in 14 patients not missing HD. No thrombosis episodes were noted in the remaining 45 patients.

Conclusion: A significant number of ESRD patients missed HD sessions. The number of individuals experiencing VA thrombosis was not different between those missing or not missing HD sessions. However, the number of VA thrombosis episodes was significantly higher in those missing HD sessions as compared to those not missing HD sessions.

References:
2. USRDS. 2008 Annual Data Report
Catheter Last or Fistula First- Role of PU-PTFE Composite Graft -A Paradigm Shift In Access Placement.

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Objectives: Per 2006 DOQI guidelines autogenous radio-cephalic or brachio-cephalic fistulas are the preferred access modalities followed by brachio-basilic and prosthetic arteriovenous (AV) graft. In patients who present with primary fistula/graft failure or incidental patients with no vascular access, hemodialysis is often performed using temporary catheter. Approximately 250,000 temporary and long term hemodialysis catheters are inserted annually in United States. Catheters for vascular access are consistently associated with complications such as infections, bleeding and thrombosis leading to increased morbidity and mortality in ESRD patients. In this case series, we used composite PU-PTFE graft (define e.g. combined Polyurethane (Vectra)/PTFE graft, (PU-PTFE) graft to obtain dialysis access. The Purpose of this case series is to a) establish vascular access, b) decrease catheter rate in incidental patients and c) create secondary fistula.

Methods: Review of literature shows PTFE and PU grafts have been frequently used to establish HD access in patients with no suitable AV fistulas, but neither of them could be considered ideal. PTFE requires a period of 2-4 weeks time after implantation prior to use. Although Vectra PU grafts (also known as TPVA, Thoratec polyurethane vascular access) have excellent properties of self sealing and quick hemostasis at the anastomotic suture line but graft elasticity has been reported to cause kinks in the native vein and graft failure. In this case series, we used PU-PTFE composite graft to establish vascular access for hemodialysis. The arterial and venous anastomosis end of the graft were made of PU material (Vectra Graft) and main channel for cannulation was made of PTFE material.

Results: A total of 10 PU-PTFE composite grafts were placed into 2 cohorts of patients to obtain emergent HD access.
1. 610 were patients with no established access. 83.66% of the composite accesses were successful and supported HD in these patients.
2. 4/10 elderly patients (>74 years) who were not candidates for AV fistula after vein mapping, composite grafts were placed and 100% success was achieved in early cannulation for HD in these patients. None of these patients were had catheter placement. 1/10 patients had primary graft failure due to early graft thrombosis. He needed catheter.

Conclusions: Composite PU-PTFE graft provides early hemodialysis access which can be cannulated within 24-36 hours of graft placement. We were successful in decreasing the catheter rate and at the same time were able to establish dialysis access in these patients. One primary failure may reflect the the learning curve in dealing with this access. We tried to minimize the operator variability by using same surgeon and same facility. We are not able to meet our objective of creation of secondary fistula yet. Long term controlled studies are required to follow cohort of patients to monitor time to early cannulation, graft survival, establish secondary fistula and follow it’s long term complications.

Reference:
The Infiltration and Perforation Technique: A novel approach for the treatment of resistant stenotic lesions.

Noam Spinowitz, M.D.*, American Access Care

Background: The endovascular treatment of resistant stenotic lesions is notoriously fraught with complications. Even with the advent of high pressure balloons and cutting balloon technology, recalcitrant lesions frequently remain. The aim of this study is to describe our experience using a novel technique for the treatment of these lesions.

Methods: A retrospective review was conducted at three outpatient vascular access centers, during the period of July 2007 and November 2009. All patients with resistant stenotic lesions treated with the infiltration and perforation technique after failure of conventional methods were included. The infiltration and perforation technique is the method whereby an angioplasty balloon is used as a guide to percutaneously create microperforations in the perivascular fibrous tissue to aid in the effacement of resistant stenotic lesions. Variables assessed included demographic information, location of stenosis, previous treatment, access type, lesion obliteration, and secondary patency results.

Results: 15 patients (8 male, 7 female, aged 22-69) met the inclusion criteria. The average follow up time was 10.5 months (range. 0.5-23). 4/15 had grafts (3 forearm loop, 1 upper arm C-shaped), and 11/15 had fistulas (1 brachial artery to transposed basilic vein, 6 radial artery to forearm native vein, 4 brachial artery to cephalic vein). The location of resistant stenoses included basilic vein (2/15), cephalic vein (8/15), arterial anastamosis (3/15), intragraft (1/15), and venous anastamosis (1/15). Failed treatment modalities included high pressure balloon (15/15), cutting balloon technology (2/15), and buddy wire (2/15). 11/15 (73%) patients had immediate lesion obliteration, and the secondary patency was 100% at 12 months. There were no complications.

Conclusion: The infiltration and perforation technique appears to be a safe and effective modality for the treatment of resistant stenotic lesions.
Aris Urbanes, M.D.*, RMS Lifeline Vascular Access/DaVita

We report on our endovascular experience with the HeRO™ access device during a sixteen-month period between July 2008 and December 2009. The HeRO™ (Hemodialysis Reliable Outflow) device is a hybrid graft-catheter access indicated for the dialysis patient with exhausted sites or compromised central venous circulation or is catheter-dependent. During this period, we saw 25 patients who underwent 14 diagnostic angiograms with negative findings, 2 PTAs and 41 circuit thrombectomies. Of the non-thrombectomy procedures, the most common presenting complaints were "pulling clots" and "difficult cannulation." Among the 41 thrombectomies, mean primary patency was 91.96 days ± 91.51 days. There were five patients in the thrombectomy group who had undergone thrombectomy ≥ three times during the study period and in all cases, there was no associated culprit anatomic lesion. It was felt that in these cases, the circuit thrombosis was due to recurrent hypotension and low flow state. Standard endovascular techniques were applied in all instances and there were no reported complications in any of these cases.
The acceptance of Interventional Nephrology (IN) in University Medical Centers (UMC) has faced concerns such as smaller dialysis population, limited financial resources and real or perceived political turf issues. Despite these hurdles several UMCs have successfully established an IN program. We report successful models implemented by UMCs across the United States (Table). These included collaboration with interventional radiologists and cardiologists and centers run by interventional nephrologists. The dialysis (ESRD) referral base, year of establishment, hemodialysis vascular access (HVA) and peritoneal dialysis catheter (PD) procedures, kidney biopsy and average total procedures performed by each center is depicted in the table.

<table>
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<th>Model</th>
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NOTE. Dialysis Access Group-Wake Forest University(DAG-WFU), UW (University of Wisconsin), Ohio State University(OSU), Massachusetts General Hospital-Harvard Medical School(MGH-HMS), University of Alabama(UAB), University of Miami(UM). Free standing access center(FSAC), collaboration with cardiac catheterization laboratory(CCL), collaboration with Interventional radiology(CIR), Office extension(OE), § unpredictable referral base from private practice

The collaboration offers an opportunity to perform advanced procedures using excimer laser, endovascular ultrasound, and endoluminal atherectomy devices. The current report demonstrates that an IN program can be successfully established at UMCs by consolidating available resources irrespective of the size of the dialysis population. As more UMCs establish IN programs, opportunities for developing standardized training centers will improve, leading to better quality and availability of nephrology-related procedures and an impetus for research activities.
Tailored Approach to Superficialize Deeply Located Arteriovenous Fistula Veins

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Obesity presents extra challenge to creating functioning fistulae in hemodialysis patients. Obesity often becomes an excuse for choosing an arteriovenous graft instead of an arteriovenous fistula. Some patients experience difficulty fistula cannulation for the fistula vein is located too deep to be easily palpable. Various surgical approaches have been described to superficialize fistula veins. These approaches, however, may not have been widely applied by individual practices. It is imperative to recognize the advantages and limitations of each of these approaches and tailor their applications to individual patient’s clinical needs. 1). When a deeply located fistula vein is associated with a feeding arterial lesion or restrictive anastamosis lesion that is not easily correctable endovascularly, fistula vein transposition with a new arteriovenous anastamosis becomes necessary. 2). When a deeply located fistula vein has sufficient arterial inflow, transposition of fistula vein through a superficial tunnel and venovenous anastamosis is an option if there is enough vein length. It is also a choice for upper arm basilic vein transposition when the vein is entangled with nerves. 3). Various lipectomies have also been used to remove the overlying fatty tissue atop of fistula veins. 4). A two-stage vein elevation procedure is apparently suitable for both upper arm and forearm fistulae needing superficialization when arterial inflow is adequate. The author will present cases to illustrate the applications of these surgical approaches to individual patients. Even though superficializing fistula vein involves extra surgical procedure, creating fistulae in obese patients still should be considered first, given the long-term advantage of arteriovenous fistulae over arteriovenous grafts. In summary, various effective surgical approaches can be reliably applied on an individualized basis to solve issues associated with deeply located fistula vein.
Hemodynamically Significant Arterial Inflow Stenosis in Dysfunctional Hemodialysis Arteriovenous Fistula and Grafts

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BACKGROUND: This prospective study was to investigate incidence and treatment outcomes of hemodynamically significant arterial inflow stenosis in dysfunctional ateriovenous (AV) fistula and grafts.

METHODS: From 5/1/2006 to 6/30/2007, 204 patients were referred to our institute for fistulograms or graftograms due to dysfunction of their existing hemodialysis AV access. All the 204 patients were prospectively screened for hemodynamically significant arterial inflow stenoses beyond the arteriovenous anastomosis (2cm upstream from the AV anastomosis). A hemodynamically significant arterial inflow stenosis was suspected when at least one of the following clinical findings existed despite adequate angioplasty +/- stenting of stenoses identified in the fistula body, the venous outflow, and the juxta-anastomotic or anastomotic areas: 1) suboptimal tension and weak thrill of the fistula body on physical examination and/or sluggish blood flow on the post-angioplasty/stenting angiogram; 2) intra-arterial mean arterial blood pressure (MAP) of the hemodialysis access side was less than the MAP of the non-access upper arm (cuffed); 3) inadequate blood flow with elevated negative arterial pressure at the 1st hemodialysis following the angioplasty and/or stenting. A hemodynamically significant arterial inflow stenosis was defined by >= 50% stenosis of the arterial lumen along with resolution of the abnormal clinical findings post angioplasty and/or stenting.

RESULTS: 11 arterial stenoses were found in 11 patients out of 204 patients (5.4 %). Of the 11 patients, 3 patients (27%) had severe stenosis of subclavian artery (2 patients had ostial stenosis), 1 patient (9%) had axillary artery stenosis; 5 patients (46%) had brachial artery stenosis and 2 patients (18%) had radial artery stenosis. All the subclavian artery stenoses underwent angioplasty and stenting, and rest of the arterial stenoses was treated with angioplasty alone. All the stenoses did not require second interventions with evidence of adequate inflow after 2-3 year follow-up.

CONCLUSION: hemodynamically significant arterial inflow stenoses are not uncommon and can be effectively detected clinically with high index of suspicion. The outcomes of angioplasty +/- stenting to the arterial inflow stenoses are very favorable.