Purpose: Chronic venous disease (CVD) occurs in 1-5% of adults. Iliocaval obstructive lesions play a significant role in the development of CVD. Iliocaval stenting is a mainstay treatment for CVD. However, in-stent restenosis (ISR) occurs in 5-23% and is related to recurrence of symptoms and possible decreased patency. We sought to evaluate risk factors associated with ISR.

Materials: Patients who underwent successful iliocaval stenting were compiled from a departmental database of all lower extremity venous stents from 1996-2018. In total, 760 iliocaval stents were placed in 160 patients (47.5% female, 52.5% male), mean age 48.7 years. Median follow-up was 332 days (range, 0-5627 days). ISR was defined as >50% reduction in luminal diameter. Risk factors examined for ISR included age, gender, type of stent (Wallstent, Boston Scientific, Natick MA) vs. SMART stent (Cordis, Santa Clara, CA), diameter and length of stent, and diameter of angioplasty balloon. Veins included were the inferior vena cava (IVC), bilateral common iliac veins (CIV), and bilateral external iliac veins (EIV).

Results: Median and mean time to ISR was 177 and 422 days respectively (range, 11-3985 days). Neither age nor gender were significantly associated with ISR. Location of stent was not associated with increased risk of ISR. ISR occurred in 15.1% of IVC stents, 15.2% of CIV stents, and 18.4% of EIV stents. In both the CIV and EIV, Wallstents had a decreased risk of restenosis when compared to SMART stents (CIV: HR -3.0, $P < 0.005$; EIV: HR -2.4, $P = 0.02$). Stent brand was not a risk factor for IVC ISR. Angioplasty balloon diameter following stent deployment was a significant risk factor for ISR as increased balloon diameter was associated with a decreased risk of IVC ISR (HR -2.7, $P = 0.01$). Balloon diameter did not affect ISR for CIV or EIV stents.

Conclusions: Our study had clinically acceptable and similar rates of ISR for the IVC, CIV and EIV. Wallstents may decrease ISR in iliac veins but are similar to SMART stents when placed in the IVC. Some literature suggests that over dilation of stents may help long-term patency (4); however, we found that use of larger balloons decrease ISR in IVC stents only.

3:45 PM **Abstract No. 87**

Prospective study of central venous stenosis and pressure gradients in patients with fistula access

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Purpose: To explore if pressure gradients (PG) correlate with degree of central venous stenosis (CVS) in dialysis patients and if PG could be a useful decision-making tool to treat CVS. Background: Dialysis patients are predisposed to CVS. Symptoms include congestion, pain, and fistula dysfunction. Percutaneous angioplasty is first-line treatment for CVS and is indicated when patients are symptomatic or when collaterals are present, regardless of symptoms. At present, it is unclear if asymptomatic CVS without collaterals affect the function of ipsilateral surgical dialysis access and if treatment of these lesions is necessary. The risk of treatment is rupture during treatment or accelerated restenosis.

Materials: This prospective study selected for subjects with AV fistulas referred to our institution for a fistulagram. The indication for subjects' fistulagram and fistula details were recorded. Venogram evaluated for stenosis percentage. PG were obtained with a Compass device measuring the difference between pre and post stenotic pressures. Caliber and PG were measured in the subclavian and innominate veins, and superior vena cava. Pre- and post-stenotic PG were correlated with degree of stenosis. The presence of collaterals was noted.

Results: 16 subjects (9 male and 7 female, age 24-86 years) of which 6 subjects with fistulas demonstrated 30-70% stenosis of the brachiocephalic vein. 10 subjects did not show stenosis. 3 subjects with 30-50% stenosis had higher PG than those with no stenosis (2.7 ± 1.2 (2-4) vs. 0.6 ± 0.7 (0-2) mm Hg, $P = 0.006$). 3 subjects with 50-70% stenosis had PG higher than those with no stenosis of (9.0 ± 4.4 (1-16) vs. 0.6 ± 0.7 (0-2) mm Hg, $P = 0.008$). PG were similar in those with 30-50% stenosis and 50-70% stenosis ($P = 0.22$), though PG and percent stenosis had a significant positive correlation ($\rho = 0.74$, $P = 0.001$).

Conclusions: This ongoing prospective study suggests subjects with dialysis access have elevated PG with severe CVS. PG in subjects with 30-50% or 50-70% CVS are similar. Both CVS groups had elevated PGs compared to subjects with no CVS. Across all subjects, PG was correlated with percent stenosis. Further investigation will help delineate these promising trends.

3:54 PM **Abstract No. 88**

Safety and efficacy of Gianturco tracheobronchial z-stent placement for recanalization in patients with inferior vena cava occlusion

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Purpose: To evaluate the technical success and safety of Gianturco Z-stent placement in patients with occlusion of the inferior vena cava (IVC).

Materials: Between January 2010 and July 2019, a retrospective review was performed including patients who underwent placement of Gianturco tracheobronchial Z-stents (Cook Medical, Bloomington, IN) in the IVC for treatment of IVC occlusion. Indication for placement, technical success, primary patency, and clinical success as measured by symptomatic improvement were recorded. Patients received clinical follow-up and computed tomographic (CT) imaging for patency evaluation initially at 1 to 4 months and yearly thereafter.

Results: Z-stent placement was performed in the IVC of 20 patients (median, age, 47 years; range, 21-88 years; percent female, 50%). Indications for IVC stent placement consisted of non-malignant occlusions in 13 patients and malignant occlusions in 7 patients. Technical success was achieved in all patients; no procedure-related major adverse events were observed. Data on clinical success was available in 11 of 13 patients treated for non-malignant IVC occlusions at initial follow-up (mean follow-up length, 1.4 months; range, 1-2 months) demonstrating symptomatic improvement in 100% (11/11) of patients. Patency of IVC stents was maintained in 92.3% (12/13) of patients treated for non-

malignant occlusions (mean follow-up length, 1.5 months; range, 1-4 months). Longer-term follow-up was available in 5 patients with non-malignant occlusions and all (5/5) demonstrated maintained patency of IVC stents (mean follow-up length, 21.8 months; range, 12-45 months). Of the patients treated for malignant IVC occlusion for whom data was available, symptomatic improvement was achieved in 100% (4/4 patients; median follow-up length, 3.5 months; range, 2-17 months) and patency of the IVC stent was maintained in 100% (5/5 patients; median follow-up length, 5 months; range, 2 weeks-19 months).

Conclusions: Through available follow-up, off-label placement of Gianturco tracheobronchial Z-stents in the IVC appears safe for patients with both non-malignant and malignant occlusions. Long-term follow-up will be necessary in evaluating the efficacy and durability of the intervention.

4:03 PM Abstract No. 89

Single-center experience in hepatic vein stenting for hepatic venous outflow obstruction in transplanted livers: a retrospective analysis

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Purpose: Hepatic venous outflow obstruction is a feared complication of liver transplantation that can lead to failure of the graft and development of posthepatic portal hypertension and associated complications, such as ascites. This complication is seen from 5.3 to 12.9% of patients post liver transplantation. We aim to retrospectively evaluate the efficacy and patency of hepatic vein stenting for hepatic venous outflow obstruction post liver transplantation.

Materials: We retrospectively reviewed the medical records of 16 posthepatic transplant patients who underwent hepatic vein stent (HVS) placement from December 2005 to September 2019 for hepatic venous outflow obstruction (HVOO). Patient demographics, hepatic venous to systemic venous pressure gradients pre and post sent placement, and duration of radiologic stent patency were reviewed.

Results: A total of 16 patients with primary stent placement for HVOO after liver transplantation were identified (mean age, 51.7 ± 12.9, 7 males, 9 females). Stent placement was technically successful in 15/16 patients (93.75%) on first attempt, as one patient required a second procedure for proper stent placement. Hepatic vein stenting was performed on average 150 days ± 113 after liver transplantation. There were no deaths within 30 days post stent placement. The hepatic vein-systemic venous gradient prior to intervention was 12 mm Hg ± 6.33, which decreased to 1.45 mm Hg ± 1.19 following the interventions, a statistically significant decrease ($P < 0.0001$). To date, all stents appear patent on follow-up imaging (range, 61 to 3312 days).

Conclusions: Hepatic venous outflow obstruction is a serious complication post liver transplantation. Hepatic vein stent placement appears to be a safe and effective treatment and can significantly decrease hepatic vein-systemic gradients while maintaining long-term patency.

4:12 PM Abstract No. 90

Transmediastinal dissection with radiofrequency wire reentry for bypass of long-segment thoracic central venous occlusions refractory to recanalization

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Purpose: In patients with severe chronic central venous occlusions that cannot be recanalized with routine methods, several tools and techniques for sharp recanalization have been reported as well as radiofrequency (RF) wire cautery. While effective, these devices can easily traverse adjacent ascending aorta and enter the pleural space and pericardium, all of which can have lethal consequences. The purpose of this study is to report outcomes of a novel technique to intentionally perforate out of the venous system to allow blunt dissection with a soft-tip guidewire through the mediastinal fat alongside the occluded venous segment(s), then regain entry into the central venous system using the RF powerwire.

Materials: Retrospective review of our procedural database over a 3-year period revealed 6 patients (3 females, mean age 56 years) with a long-segment central venous occlusion who failed attempted conventional blunt, sharp, or RF recanalization techniques and then underwent this bypass technique. A detailed review of preprocedural CT venogram was always first performed. After intentional perforation into the mediastinal fat, a soft-tipped guidewire and catheter were manipulated parallel to the occluded segment towards the patent target vein. Once adjacent to target vein wall, the RF power wire was then used solely to traverse vein wall into patent lumen, thus effectively bypassing the occlusion.

Results: Indications for this bypass technique included establishment of central venous access to allow HeRO insertion ($n = 5$) or port implantation for daily iron infusions ($n = 1$). The mean occlusion length was 5.3 cm (range, 4.0-8.4 cm). All 6 procedures were technically successful, allowing insertion of the desired catheter. No major complications were encountered within 30 days of the procedure.

Conclusions: Transmediastinal dissection with RF wire reentry is a safe and effective technique to allow complete bypass of a long-segment venous occlusion to allow central venous access. The passage of a soft-tipped guidewire along fat planes may be less likely to enter pericardium, pleura, and arterial structures than needle and RF wire recanalization of long-segment occlusions.