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P538

Single-Session Direct Intrahepatic Portocaval Shunt and Portosplenomesenteric Thrombectomy Using Inari Flowtriever Large Bore Aspiration Catheter System: A Case Report

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Background: A 50-year-old male presented with a history of alcoholic and hepatitis C cirrhosis, complicated by esophageal varices, hepatic encephalopathy, and refractory ascites. The patient is status post-direct intrahepatic portocaval shunt (DIPS) for refractory ascites approximately 4 years prior, with resolution of symptoms until 1 month before current presentation. The patient was admitted for gradually worsening abdominal pain, distention, and shortness of breath. Abdominal ultrasound demonstrated occlusion of his DIPS which was patent at least 8 months prior. A computed tomography (CT) of the abdomen revealed complete DIPS thrombosis with thrombus extension into the portosplenomesenteric veins and associated portal enteropathy. Diagnostic paracentesis ruled out spontaneous bacterial peritonitis. Decision was made to pursue endovascular mechanical thrombectomy to restore patency of the DIPS and portosplenomesenteric veins. **Methods:** Single-session mechanical thrombectomy was chosen to avoid hemorrhagic risks associated with thrombolysis and escalation of care to the intensive care unit status. The DIPS was accessed via a right internal jugular vein approach. Initial digital subtraction portal venogram demonstrated thrombosis of the DIPS, portal confluence, superior mesenteric vein, and splenic vein with retrograde venous drainage into the inferior mesenteric vein and portal collaterals. Initial portosystemic pressure gradient was 20 mmHg. Initially, an 8 French Walk Vascular JETi aspiration thrombectomy catheter was deployed and multiple passes were made through the DIPS and portal venous vasculature with intermittent balloon angioplasty. Follow-up portal venogram demonstrated ineffective thrombus removal without change in portosystemic pressure gradient. Access was then upsized to a 22 French sheath, followed by passage of the 20 French Inari Triever20 aspiration catheter through the DIPS. Multiple aspiration passes were performed in the DIPS, main portal vein, and superior mesenteric vein. The DIPS and main portal vein were then angioplastied with 12 and 14 mm balloons, respectively. Completion digital subtraction portal venogram demonstrated restored patency of the DIPS and portosplenomesenteric veins with minimal residual intra-DIPS and portal vein thrombus. The portosystemic pressure gradient improved to 7 mmHg. Catheter and sheath were removed, venotomy closed, and procedure ended without immediate complication. **Results:** Postprocedure, the patient remained in clinically stable condition. A CT of the abdomen performed 2 days postprocedure confirmed wide patency of the DIPS and portosplenomesenteric veins. The patient was started on therapeutic enoxaparin and discharged on the postoperative day 3. **Conclusion:** Transjugular intrahepatic portosystemic shunt (TIPS) is a well-established procedure indicated in the patients with cirrhosis and refractory ascites requiring frequent paracentesis. A modified procedure the DIPS was described as an alternative in patients with vascular anatomy not amenable to TIPS. Our patient was not a candidate for TIPS secondary to anatomically small and inaccessible hepatic veins. Therefore, a DIPS was placed for management of his refractory ascites with resolution of symptoms for nearly 4 years before gradual recurrence over 1 month before presenting with DIPS thrombosis. TIPS thrombosis is a well-described complication that can occur in the acute or chronic setting, with an incidence of 8% within the first 2 years reported by Tripathi *et al*. in their institutional experience. Literature on DIPS complications is relatively limited. In 2008, Petersen and Clark reported a primary patency of 100% over a follow-up period ranging from 2 days to 30 months in a consecutive cohort of 19 patients. A recent retrospective review of six patients that underwent DIPS was reported by Hatzidakis *et al*., where two patients suffered acute thrombosis of their DIPS at 3 and 4 days postprocedure. Patency was restored in both instances, one by balloon angioplasty alone and the other by balloon angioplasty and mechanical thrombectomy with Angiojet combined with aspiration with a standard 8 French catheter. To our knowledge, our case report is the first demonstrating the use of a large bore aspiration thrombectomy system, the Inari FlowTriever, for the removal of large volume subacute to chronic thrombus from an occluded DIPS and portosplenomesenteric venous system. The Inari FlowTriever has recently been shown to be a safe and efficacious device for mechanical aspiration thrombectomy of acute central pulmonary embolism. Our case presentation proposes the potential for expanding the use of this device for the management of TIPS/DIPS and portosplenomesenteric thromboses.

P539

A Case of a Right Renal Artery Aneurysm Treated with a Stent Graft through a Stent Migrated into the Aneurysmal Sac: A Case Report

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We report a case of a right renal artery aneurysm treated with a stent graft through a previously placed stent. The patient was 30-year-old male presented with a renal artery aneurysm located in the right main renal artery. The saccular aneurysm was 2 cm in diameter and with a wide neck. Although coil embolization using a stent-assisted technique was performed in a previous hospital, proximal edge of the stent was migrated into the aneurysmal sac and the procedure was abandoned. The patient was referred to our institute to receive additional endovascular treatment. Exclusion of the aneurysm placing a balloon-expandable stentgraft on the parent artery through a stent cell was planned. A 7-French guiding sheath was introduced via the right femoral artery and advanced to the proximal right renal artery. A flexible guidewire was advanced to the distal renal artery through a stent cell, and it was exchanged for a stiffed guidewire using a catheter. A delivery system of the stent graft was inserted under the stiffed guidewire; however, a tip of the delivery system was caught in the edge of a stent strut and was not passed through the stent cell, even after

dilation of the stent cell using a balloon catheter. After changing the guidewire to a thin, flexible guidewire, the delivery system passed successfully through the stent cell and exclusion of the aneurysm was achieved.

P540

Life-Threatening Iatrogenic Pulmonary Arterial Hemorrhage after Percutaneous Lung Biopsy, Successfully Treated with Endovascular Embolization: A Case Report

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Background: A 71-year-old female with a medical history of hypertension, congestive heart failure, pulmonary arterial hypertension, end-stage renal disease on hemodialysis, and colorectal adenocarcinoma status postsigmoid colectomy. The patient underwent a computed tomography (CT) of the chest, which identified multiple bilateral pulmonary nodules measuring up to 1.9 cm, which were FDG avid on PET-CT and concerning for pulmonary metastases. Therefore, she was referred for and underwent CT-guided percutaneous biopsy of the dominant pulmonary nodule in the right upper lobe, without immediate complication. There was expected minimal postbiopsy regional hemorrhage in the lung parenchyma. Postprocedure, follow-up chest radiographs obtained at 1 and 3 h demonstrated rapidly enlarging confluent opacity in the right lung, with poor aeration and leftward mediastinal shift, concerning for hemorrhage secondary to the biopsy. Clinically, the patient was becoming increasingly tachypneic, with respiratory rate in 20 s. She was also having increasing O_2 demand, requiring up to 8 l/min to maintain normal oxygen saturations. A CT angiogram of the chest was urgently performed, which demonstrated a large right hemothorax secondary to active hemorrhage from a suspected segmental pulmonary arterial branch in the region of biopsy in the anterior segment of the right upper lobe. Her respiratory status continued to decline, requiring urgent intubation. A right chest tube was also placed, which drained 1300 mL of sanguineous fluid. The patient was transferred to interventional radiology for emergent embolization of presumed active pulmonary hemorrhage. **Methods:** After appropriate informed consent was obtained and procedural time-out was performed, the patient was placed in supine position and right groin was prepped and draped in usual sterile fashion. The right common femoral vein was accessed under ultrasound guidance and a 7 French vascular sheath was placed. A 6 French pigtail catheter was positioned in the right pulmonary artery, and pulmonary arterial pressures were obtained, measuring 82/32 mmHg (mean arterial pressure 51). A right pulmonary angiogram was then performed, demonstrating contrast extravasation from a right upper lobe segmental pulmonary artery, consistent with active hemorrhage. A 2.4 French microcatheter was then coaxially advanced into the right upper lobe for selective segmental pulmonary angiograms, which confirmed active pulmonary arterial hemorrhage likely from a branch of the anterior segment of the right upper lobe. Gel foam slurry was then administered transcatheter into the anterior segmental pulmonary arterial branch until stasis was achieved. Following that, three Medtronic Concerto detachable coils were deployed. Completion right pulmonary angiogram demonstrated resolution of previously noted contrast extravasation, consistent with effective cessation of hemorrhage. Catheter and sheath were then removed, and adequate hemostasis was achieved at the right common femoral venotomy without complication. **Results:** Right upper lobe anterior segmental pulmonary arterial hemorrhage related to recent percutaneous lung biopsy was effectively controlled with gel foam and coil embolization. Postprocedure, the patient required intensive care for several days, where her right hemothorax was drained via a large bore chest tube and her respiratory status markedly improved. She remained hospitalized for approximately 5 weeks due to her multiple other comorbidities. Of note, her biopsied lung nodule was positive for metastatic colorectal adenocarcinoma. She was discharged in stable condition without any recurrence of pulmonary hemorrhage during the remainder of her hospital stay. **Conclusion:** In this case report, we present a very uncommon massive hemothorax from pulmonary artery hemorrhagic complication of a relatively common procedure, percutaneous lung biopsy. There are several known risks of percutaneous lung biopsy, the most common being pneumothorax and pulmonary hemorrhage. Several institutions have reported their experiences with pulmonary hemorrhage related to percutaneous lung biopsy. Incidence of hemorrhage is reported between 20% and 41%, the vast majority of which do not result in any clinical complication. Incidence of hemothorax has been reported as 0.1%–1.3%, with massive hemothorax requiring surgical intervention only described in two cases across several reports including thousands of patients. The etiology of our patient's rapidly enlarging hemothorax was active hemorrhage from the pulmonary arterial vasculature, which was suspected on CT angiogram and confirmed on digital subtraction pulmonary angiography. The patient's history of pulmonary arterial hypertension is classically thought to be a contributing risk factor. However, a recent study by Digumarthy *et al*. found no significantly increased risk of hemorrhage in patients with pulmonary arterial hypertension. To our knowledge, this is the first case of life-threatening massive hemothorax from postlung biopsy pulmonary artery hemorrhage in our institutional experience.

P541

Thoracic Endovascular Repair as a Lifesaving Bridge to Definitive Repair in a Recurrent Aorto-Esophageal Fistula: A Case Report

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We present a case of a 57-year-old male who presented with an acute onset of massive hematemesis and hypovolemic shock evidenced by a blood pressure of 90/60, heart rate of 128, hemoglobin of 63 g/dl, and metabolic acidosis with a pH of 6. He was otherwise well prior, except that he had a transhiatal esophagectomy and gastric pull-up for an adenocarcinoma for lower esophagus 15 years prior. He was fluid resuscitated and brought to the endoscopy suite to have an esophago-gastro-