CLINICAL VIGNETTE

Refractory Chylothorax in a Dialysis Patient after Fistula Placement

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A 50-year-old female has ESRD due to diabetes. She was diagnosed with diabetes at age 4 and chronic kidney disease (CKD) was first noted at age 32. CKD progressed to ESRD at age 37. Hemodialysis was initiated and was complicated by multiple failures to develop a suitable AV fistula. She underwent a living donor kidney transplant at age 40 and she enjoyed good allograft function for nearly 6 years before developing late severe acute rejection. She was treated with intense immunosuppression with stabilization of her kidney function at baseline creatinine 3-4. She developed a recurrent cough and shortness of breath and was admitted to various hospitals and received courses of antibiotics without improvement. Six years after her kidney transplant, her graft completely failed, and she was restarted on dialysis via a tunneled dialysis catheter in the left subclavian vein.

During initiation of hemodialysis, she was noted to have bilateral pleural effusions. These improved after aggressive ultrafiltration. A left brachial AV fistula was placed about one month after restarting dialysis. She then presented to the kidney transplant clinic complaining of cough, shortness of breath, and weight loss and was admitted. Initial vital signs included T 37.0 C, BP 116/68, pulse 106, weight 68 kg, and O2 sat of 100% on room air. She had bilateral pleural effusions, and on hospital day two underwent thoracentesis. Cloudy fluid was removed with WBC 441 per HPF with 60% lymphocytes, RBC 4000 per HPF, protein 2.4 mg/dL (serum 5.8), albumin 1.5 mg/dL (serum 2.9), LD 130 mg/dL (serum 313), glucose 187, triglycerides 500, pH 7.87, amylase 25, negative gram stain, and bacterial and fungal cultures were negative. She was diagnosed with chylothorax multifactorial in etiology.

Over the next few months she underwent an extensive diagnostic workup and therapeutic trails without success. A CT venogram shortly after admission demonstrated catheter-associated thrombosis in the left brachiocephalic vein, extending proximally to the SVC, and thrombosis of the right internal jugular, subclavian, and brachiocephalic veins. Multiple CT scans including PET-CT and MRI without contrast did not show any malignancy, and all infectious testing including for TB, was negative. She had bilateral chest tubes placed for recurrence of effusions. A fat restricted (chylous) diet was attempted, as was TPN. She underwent a lymphangiogram 1 month after admission. The lymphatics were accessed via bilateral inguinal approach and the contrast was injected to the level of the mid thoracic duct. Cannulation of the thoracic duct was unsuccessful, though the cysterna chyli was obliterated. This procedure was complicated by respiratory failure requiring intubation. A few weeks later, she underwent right video assisted thoracoscopic surgery and pleurodesis and thoracic duct ligation. The left subclavian dialysis catheter was removed and a new one placed in the femoral location.

After nearly three months of hospitalization, she continued to have the chylothorax and was essentially bed-bound due to multiple chest tubes and TPN. As a last resort, the left brachial AVF was ligated, despite the lack of other suitable fistula sites. After ligation, there was gradual reduction in chest tube output, enabling removal of the chest tubes over the next two months. As a precaution she underwent left sided pleurodesis about one month after ligation of the fistula. She transitioned off TPN and mobility gradually improved, although she still required a wheelchair when she was discharged from the hospital, nearly six months after admission. She continued with hemodialysis and gradually became stronger and resumed mobility. Six months after hospital discharge, a right brachiobasilic AV fistula was created without recurrence of the chylothorax.

Discussion

Central Venous Stenosis (CVS) occurs when the central veins (subclavian, brachiocephalic/innominate, superior vena cava, inferior vena cava) become narrowed with resultant increased venous pressure and reduced venous return. Symptoms most commonly include swelling, acute thrombosis, inadequate dialysis, end of dialysis fistula bleeding, loss of vascular access, and reduced patient survival. It most commonly a sequelae of using dialysis catheters, though can occur from other indwelling devices in the central veins including cardiac pacemakers and defibrillators, peripherally-inserted central catheters (PICC lines), other central venous catheters,[1] and even in the absence of catheters.[2] Left sided devices are much more likely to cause central venous stenosis.[3] CVS often begins without symptoms in dialysis patients, though increased venous pressure after creation of an ipsilateral arteriovenous shunt may trigger symptoms.[1] The prevalence depends on the study population. A recent single-center retrospective study found a prevalence of 10% in all patients referred for venous mapping, and 13% in those with a dialysis catheter already in place.[4] Given that roughly 70% of patients in the United States begin dialysis with a catheter,[5] most dialysis patients in the US are exposed to the risk for CVS.

Chylous pleural and pericardial effusions are rare complications of central venous stenosis in dialysis patients.[6-8] The etiology is thought to be high venous pressure transmitted into the thoracic duct, leading to rupture.[9] The majority of cases of chylothorax complicated CVC placement are due to catheter-associated DVT of left sided catheters, rather than direct injury to the thoracic duct.[10] Chylothorax has been reported in a variety of causes of left-sided central venous hypertension and thrombosis, including the cases referenced above in dialysis patients and other patients without ESRD with central venous catheters for other indications.[10-12]

Patients have been managed via a variety of means, though treatment of the underlying cause of the venous hypertension was necessary to stop the chylous effusion. Bansal used TPN, gut rest, and then octreotide and VATS.[9] Saxena's patient developed chylorthorax after central line placement, which resolved with chest tubes and gut rest alone.[10] Taylor's patient had chylothorax after catheter-associated DVT, which resolved with anticoagulation even though the catheter was kept in place.[11] A kidney transplant recipient developed bilateral chylothorax after a second kidney transplant, which persisted despite chest tubes, gut rest, TPN, and octreotide, and eventually resolved with systemic anticoagulation. He was noted to have extensive acute and chronic DVTs in most of the central veins.[8] A dialysis patient with chylous pericardial effusion had DVTs in bilateral IJ, subclavian, and left innominate vein. The effusion persisted until he underwent surgical thrombectomy and anticoagulation, though he subsequently died from hemorrhagic pericardial effusion.[7]

Chylous pleural effusions have traumatic and nontraumatic causes. They are uncommon, comprising 2.5-4% in thoracentesis care series. The most common cause of nontraumatic chlylothorax is lymphoma, though there are many other causes including other malignancies, lupus, amyloidosis, sarcoidosis, and tuberculosis.[13] Typically they present as rapidly developing and recurring pleural effusions and are complicated by immunosuppression and malnutrition.[14] The gold standard for diagnosis is demonstration of chylomicrons in lipoprotein analysis of the pleural fluid, though this can be difficult to perform. Pleural fluid findings highly specific for chylothorax are lymphocyte predominance and triglyceride count > 110 mg/dL.[14] Additionally, most chylothoraces are milky white and are exudates by protein criteria (i.e. higher protein) but transudative by LDH criteria (low LD) though these are neither sensitive nor specific enough to be useful diagnostically.[14] Treatment consists of reducing small intestinal lymph production with a variety of measures, which include a diet of low fat medium chain triglycerides, total gut rest with TPN, and somatostatin or octreotide.[14] Additional methods successfully used include pleurodesis, thoracic duct embolization, and open thoracic duct ligation or removal.[14] Particularly in nontraumatic cases, treatment of the underlying cause is generally necessary as it was in this case. The success of thoracic duct intervention depends upon whether or not a leak can be identified.[15]

This patient had multiple risk factors for CVS including left sided CVC use with concomitant L sided AVF. In general, CVS is difficult to treat and often becomes a chronic condition requiring repeated interventions.[3] Mild cases can be managed conservatively with observation and arm elevation. Acute clots should be treated with a course of anticoagulation. Overtly symptomatic cases are usually treated with angioplasty and stenting. Initial success rates are high (70-90%) though long-term patency rates are low (20% at 1y), and stenting does little to improve patency rates. AVF ligation is commonly required for relief of CVS which has not improved with the above measures.

In summary, this patient had underlying central venous stenosis which became symptomatic with a chylothorax after an AVF was created ipsilateral to a left-sided central venous catheter. The presenting feature of CVS in this patient was chylothorax, which is an uncommon manifestation of CVS in dialysis patients. The effusion was refractory to all standard treatments and ultimately required reduction in central venous hypertension by ligation of the AV fistula for resolution. To our knowledge, this type of chylothorax, which was refractory to all standard treatments and only resolved after ligation of the AV fistula, has not previously been reported.

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