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Unilateral chylothorax in a renal transplant recipient: A case report

Bil'awal Ramadhan Amuda *, Gerhard Reinaldi Situmorang, Nur Rasyid

Department of Urology, Faculty of Medicine, University of Indonesia, Central Jakarta, Special Capital Region of Jakarta, Indonesia

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ABSTRACT

Chylothorax is accumulated lymphatic fluid in the pleural space. It rarely happens in end-stage renal illness patients, but possible causes are hospital-related. This case describes a 40-year-old man experiencing unilateral chylothorax after a kidney transplant. Left pleural cavity drainage shows a white, milky, cloudy, and odorless fluid. Fluid analysis findings were consistent with chylous. A chest tube was inserted, resulting in complete evacuation of fluid and total lungs expansion. No fluid accumulation was observed upon tube removal. Chylothorax is a rare complication of renal transplant. Conservative strategies with thoracostomy drainage and avoidance of oral intake and fluids are recommended.

1. Introduction

Chylothorax is defined as chyle accumulation located in the pleural cavity. Chyle is lymphatic fluid containing fat and its digestion products that intestinal epithelial cells have absorbed. Chylothorax may be diagnosed by a physical examination. The thoracic duct is responsible for collecting chyle and delivering it to the circulation. Chyle might escape into the pleural space if the thoracic duct or its tributaries sustained some damage. Moreover, a blockage in chyle flow can cause lymphatic rupture, potentially resulting in chylothorax if the obstruction is severe enough.[1]

The cisterna chyli, thoracic duct, and lymphatic glands and vessels are all components of the lymphatic system. Typically, the thoracic duct begins at the point of the cisterna chyli and ends at the intersection of the left subclavian vein and the internal jugular vein. The right lymphatic duct is utilized to drain the right side of the head and neck, the right upper limb, the right lung, the right side of the heart, and the convex surface of the liver. The thoracic duct length varies from 36 to 45 cm with a diameter ranging from 2 to 3 mm. This duct plays a key role in transporting chyle from the digestive system into the bloodstream and lymphatic system. Depending on the food, the amount of absorption in the intestines, and individual physical activity level, the volume of chyle in an average adult may range from as little as 10 to over 100 mL/kg of total body weight.[2] Chyle contains high amounts of lipids as well as fat-soluble vitamins. Central venous catheterization and related procedures are related to extensive venous thrombosis in individuals. This may lead to chylothorax by preventing the lymph fluid and chyle from draining into the subclavian veins in the chest.[1]

Thoracentesis and pleural fluid analysis are required to diagnose chylothorax. Chylothorax can be identified by the significant quantity of chylomicrons found in the pleural fluid's aspirate. Usually, pleural effusion related to chyle are exudative in nature. Nonetheless, although this condition is rare, a transudative form may also be obtained. The diagnosis of chylothorax may be established when the fluid triglyceride level exceeds 110 mg/dL and can be ruled out found to be under 50 mg/dL. Criteria for exudative pleural effusions are: (1) pleural fluid protein $>$2.9 g/dL, (2) pleural lactate dehydrogenase (LDH) exceeds two-thirds of the upper limit of the normal serum value, or (3) pleural fluid cholesterol level $>$45 mg/dL. Effusions are said to be transudative when either none of the criteria listed above are met, or if the following conditions apply: (1) cholesterol level in the pleural fluid $\leq$45 mg/dL, and (2) pleural LDH at or below two-thirds of the normal serum value (222 U/L).[3–6] Identifying chylothorax is important as it helps clarify the cause of fluid build-up, narrowing the possible etiologies and may cause a necessary shift in treatment choices.[6]

Chylothorax should be considered in individuals with milky effusions, as well as in patients with certain comorbidities or having experience trauma on the neck or thoracic region that may have ruptured the thoracic duct. The presence of cirrhosis, nephrosis, or heart failure has been associated with the development of transudative chylothorax. Even while lymphocytes make up the majority of white blood cells in chyle, it is possible for chylothoraces to be neutrophilic, particularly following surgical procedures. When abnormal fluid that does not align with regular transudative and exudative characteristics is detected, other

* Corresponding author. Department of Urology, Faculty of Medicine, Universitas Indonesia, Salemba Tengah Street No.29, Paseban, Senen, Central Jakarta, Special Capital Region of Jakarta, 10430, Indonesia.
E-mail address: ramadhanbil@gmail.com (B.R. Amuda).

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causes of pleural fluid buildup may need to be considered.[7]

2. Case report

A 40-year-old male patient with stage 5 chronic kidney disease caused by uncontrolled hypertension and diabetes mellitus. The patient had congestive heart failure with cardiomegaly present. The patient underwent hemodialysis twice weekly via Brescia-Cimino AV fistula two years prior to visiting our center, before undergoing a kidney transplantation surgery through a living donor scheme. Before going through the surgery, preoperative examinations showed no sign of pleural effusion [Fig. 1]. On postoperative day two, the patient has difficulty weaning from mechanical ventilation. Left pleural effusion appeared on chest radiography. Drainage revealed a white, milky, cloudy, odorless fluid matching a chylothorax (fluid analysis: cell count >100/μL; lymphocytes, 70 %; total protein, 7.42 mg/dL; lactate dehydrogenase, 223 U/L (normal). A chest tube was placed, and a serial chest X-ray was conducted.

The kidney transplantation was performed through a standard Rutherford-Morrison incision in the right hemiabdomen. The allograft renal artery and vein were joined to the right external iliac vessels with an end-to-side anastomosis technique. The graft's ureter was implanted into the bladder by utilizing the Lich-Gregoir technique. Intra-operative estimated blood loss was 200 mL. No additional negative occurrences or findings were identified during the procedure.

On postoperative day two, the patient showed difficulty weaning from mechanical ventilation. The initial setting on the ventilator is PC-BiPAP with FiO2 80 %, VT 0.400 PEEP 10. The patient was on sedation and adequate pain management with visible signs of breathing discomfort and cough. The patient also showed a decrease in urine output, from 2150 mL/day to 842 mL/day, and underwent hemodialysis, but the symptoms are still present. Ten hours after dialysis, cough and dyspnea worsened, while the O2 saturation stayed at 86–98 %. Subsequent physical examination revealed decreased breathing sounds in the left hemithorax. Chest x-ray helped identify a pleural effusion on the suspected thoracic region.

Using a standard technique, a 22 Fr chest tube was inserted. The tube initially drained 1600 mL of milky fluid. A subsequent chest radiograph confirmed complete clearance of the effusion and complete lung re-expansion. The pleural fluid collected was submitted for analysis. The results showed no bacterial growth, confirming the diagnosis of chylothorax. Initially, a diet low in fat was started upon admission, followed by total parenteral nutrition.

The patient's complete blood count, electrolytes, as well as intake and output of fluid and nutrition were monitored daily, with chest tube output documented every 8 hours. In the first 24 hours, the output of the chest tube stabilized at 300 mL, with fluid appearing clearer. By the next day, the output dropped to 35 mL and stayed under 50 mL over the next two days. On the fifth day, the patient was successfully extubated without weaning issues. After transitioning to a regular oral diet, chest tube output initially rose to 85 mL but subsequently decreased, remaining minimal throughout the follow-up period. The chest tube was taken out on the sixth day, with follow-up chest radiograph showing no signs of reaccumulation. The patient was discharged without further problem, and no proof of recurrence was observed during the latest outpatient visit to our clinic [Fig. 2].

3. Discussion

Chylothorax is an extremely uncommon condition that can manifest itself as a consequence of esophageal and thoracic surgery, as well as hematologic cancers. Its occurrence was not associated with a particular gender or age group. The prevalence of chylothorax ranges from 0.2 percent to 1 percent following various cardiothoracic surgical procedures. Mortality and morbidity rates in patients with chylothorax are around 10 percent.[8]

Chylothorax most frequently results from surgery (also known as postoperative chylothorax). The incidence of postoperative chylothorax is proportional to the type of operation performed. Esophagostomy poses the highest risk for postoperative chylothorax, with an incidence ranging from five to ten percent, followed by lung resection with mediastinal lymph node dissection, which carries a risk of three to seven percent. Other surgical procedures, such as the removal of a tumor from the mediastinum, the repair of a thoracic aneurysm, a sympathectomy, and any procedure involving the lower neck and the mediastinum, all carry the risk of developing chylothorax.

Chylothorax after abdominal surgery is rare; only a few studies reported this case. Griffo et al. showed only three incidences following abdominal operations done over five years. This study was conducted in general surgery units at a hospital in Italy.[8] Using a search of Google Scholar and PubMed, until now, only two cases of chylothorax following renal procedures. Shah et al. reported an incident of chylothorax after percutaneous nephrolithotomy (PCNL) surgery, and Gheith et al. reported an incident of chylothorax two months after a kidney transplant.[9,10] In contrast with our study, we reported the incident of chylothorax was two days after surgery.

Chest radiographs performed frequently to evaluate dyspnea, particularly in patients who have recently undergone surgery or been injured, can identify unilateral pleural effusion. A homogeneous density in place of the costophrenic and cardiophrenic angles represents the chylothorax. Chylothorax and other causes of pleural effusion cannot be distinguished from one another using a standard chest x-ray. The origin of the condition must be determined before treating chylothorax. Additionally, a diet supplemented with medium-chain triglycerides that are high in protein and low in fat is advantageous.[11]

The patient was a male with stage 5 renal disease caused by uncontrolled hypertension, obesity, and diabetes mellitus. In addition, the patient also has congestive heart failure with cardiomegaly present. The patient was undergoing kidney transplantation surgery through a living donor scheme. For our patient, the likelihood of traumatic chylothorax was minimal. Given the abdominal incision, the dissection site was distant from the thoracic duct. From pleural analysis, a transudate figure

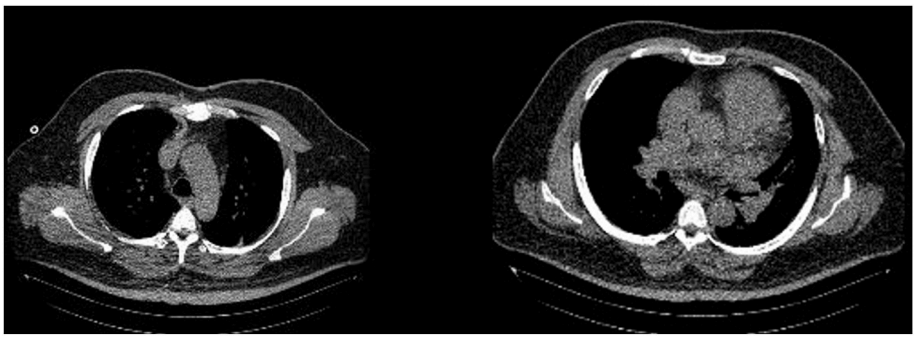

Fig. 1. Pre-operative CT imaging of patient's thorax.

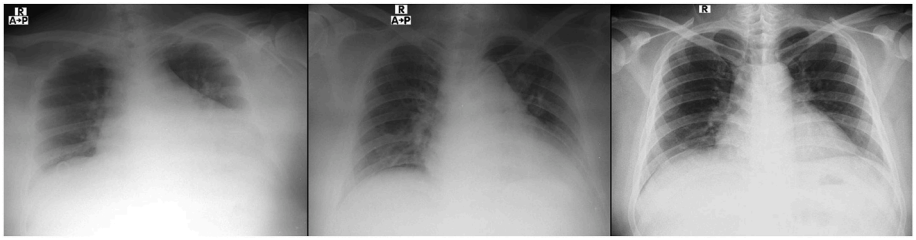

Fig. 2. Thorax radiography of patient on 2nd, 3rd, and 21st of May (hospital day 5).

was found on the effusion chyle. Twenty percent of transudative chylothorax has been linked to heart failure. Proposed mechanisms of chylothorax in heart failure include the lymphatic-venous collaterals leaking into the pleural cavity and increased lymphatic fluid production due to high pressure in the pulmonary veins.[5] Cardiomyopathy and congestive heart failure may respond to medical treatment for transudative chylothorax.[7] Patients have been treated using a wide array of approaches. Therapy aimed at treating the underlying cause of the patient's venous hypertension was essential to end the chylous effusion. The most effective treatment for chylothorax is dependent on the underlying cause of the condition. It may involve one or more of a wide variety of procedures, such as dietary change, pleurodesis, or thoracic duct ligation. Nonoperative treatment may be adequate for individuals with mild chylothorax. However, thoracentesis remains the primary approach for severe chylothorax. Most institutions prefer intercostal tube drainage when performing thoracentesis.[9–12] In our case, the patient showed good results after the placement of the chest tube.

Because long-chain fatty acids are responsible for forming chylous fluid, reducing or removing these acids from one's diet will result in reduced chyle drainage and spontaneous closure of any leaks. The utilization of a diet that contains less than 5 kcal of fat in every meal is required for this method. This has the potential to successfully limit the creation of chyle, but over extended periods, it will lead to a lack of fat and malnutrition. Venous fat hemorrhage has the potential to make up for some of the deficiencies of this treatment. Fatty acids of short and medium-chain lengths can be obtained by food, and long-chain fatty acids can be obtained through intravenous supplementation.[11–14]

4. Conclusion

In conclusion, chylothorax is a rare disorder that may develop as a direct or indirect result of thoracic surgery, or in this case, a renal transplant surgery. In most cases, conservative management can be applied, involving thoracostomy drainage alongside withholding oral intake and fluids. As far as we are aware, this is the first paper made to report on and discuss such a case.

CRediT authorship contribution statement

Bil'awal Ramadhan Amuda: Conceptualization, Writing – original draft. **Gerhard Reinaldi Situmorang:** Supervision, Writing – review & editing. **Nur Rasyid:** Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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