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Case Report

Traumatic chylothorax following blunt thoracic trauma

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ABSTRACT

Background: Chylothorax occurs when chyle from the thoracic duct leaks into the pleural space. While majority of cases are iatrogenic, traumatic chylothorax can occur when rib or vertebral fractures disrupt the thoracic duct. These occurrences are exceedingly rare, particularly following blunt traumatic insult.

Methods: We performed a retrospective review of a case of chylothorax following blunt trauma. Data was extracted from the electronic medical record.

Case: A 60-year-old female presented to the trauma bay after a motor vehicle crash as a restrained driver with bilateral chest pain. Of note, patient had three left rib fractures from fall five days prior. She was neurologically and hemodynamically normal on arrival. Physical exam was notable for chest wall tenderness. Computed tomography revealed the following: bilateral hemopneumothoraces, pneumomediastinum, manubrium fracture, retrosternal hematoma, left 2–10 and right 1–2 rib fractures along with multiple orthopedic injuries. Left tube thoracostomy yielded 150 mL of blood. She was admitted to the intensive care unit. Patient had a 48-h period of cardiogenic shock requiring vasopressors and aggressive fluid resuscitation. On post-injury day (PID) 2, the chest tube drained milky fluid. Pleural fluid sampling was significant for triglyceride levels of 1292 mg/dL. Hemodynamics then improved. Due to low output (<500 mL/day), patient was managed conservatively a fat-restricted diet supplemented with medium-chain fatty acids. Chest tube was removed PID-7 once chyle leak resolved. Repeat chest radiograph PID-10 was negative for effusion. She was discharged to rehabilitation PID-13. At one-week follow-up, repeat CXR showed a small, loculated left lateral pleural effusion. Patient had no complaints and was maintaining adequate oxygen saturations on room air.

Discussion: We present a case of delayed chylothorax after blunt trauma precipitated by increased central venous pressure secondary to right heart failure, aggressive fluid resuscitation and vasopressor use. Traumatic chylothorax should be considered in patients with pleural effusion in the setting of blunt chest trauma as sudden hyperextension of the spine can disrupt the thoracic duct. Delayed diagnosis is not uncommon due to an average latency period of 2–10 days. Pleural fluid with triglyceride level > 110 mg/dL and chylomicrons is diagnostic. Initial management consists of chyle reduction through diet modification (high protein/restricted fat diet). Octreotide can be used as a pharmacological adjunct. Refractory or high-output cases (>1000 mL/day) may require surgical ligation of the thoracic duct. Early identification and intervention are paramount as untreated chylothorax is associated with significant morbidity and mortality rates up to 50%.

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Introduction

Lymphatic flow from the lower extremities converges at the cisterna chyli at the level of L1-L2 to the right of the abdominal aorta. The cisterna chyli gives rise to the thoracic duct, which ascends alongside the aorta, crosses from right to left at the level of T5-T6, ascends above the left brachiocephalic vein, and terminates into the confluence of the subclavian and internal jugular veins [1]. The location of the thoracic duct leaves it vulnerable to disruption in the setting of thoracic trauma or surgery. Chylothorax occurs when chyle from the thoracic duct leaks into the pleural space. While most cases are iatrogenic, traumatic chylothorax can occur with rib or vertebral fracture secondary to blunt traumatic insult, though these occurrences are exceedingly rare [1–3]. We reviewed a single case of traumatic chylothorax following blunt trauma. Data was extracted from the electronic medical record. Institutional board review was waived.

Case

A 60-year-old female presented to the trauma bay as a restrained driver involved in a motor vehicle accident without airbag deployment. The patient had sustained three left rib fractures from a fall five days prior, but complained of bilateral chest pain on presentation. She was neurologically intact and hemodynamically normal on arrival. Physical exam was notable for bilateral chest wall tenderness. Computed tomography (CT) revealed bilateral hemopneumothoraces, pneumomediastinum, manubrium fracture, retrosternal hematoma, left 2–10 and right 1–2 rib fractures (Fig. 1). Orthopedic injuries included left scapular fracture, right pubic rami fracture, left proximal fibula fracture, and left ankle sprain. All orthopedic injuries were managed non-operatively with progression of weight-bearing as tolerated.

A left tube thoracostomy was placed with immediate output of 150 mL of blood. CT angiography exhibited left-sided pneumothorax



Fig. 1. Figures 1 and 2. T5/T6 axial CT angiogram demonstrating subcutaneous and intramuscular emphysema, left hemopneumothorax, bilateral rib fractures, and retrosternal hematoma.

with right tracheal deviation, multiple lung parenchymal contusions, and extensive bilateral rib fractures. The patient was admitted to the intensive care unit (ICU) for close hemodynamic monitoring. The patient initially had hypotension which became refractory to fluid resuscitation and required vasopressor support with norepinephrine. During the initial 48-h period, the patient exhibited signs of cardiogenic shock with a low cardiac index and hypotension. Echocardiography exhibited global biventricular functional hypokinesia with a left ventricular ejection fraction of 45–50 %, supporting a diagnosis of cardiac contusion. These clinical and imaging findings make blunt thoracic trauma and cardiac contusion the likely etiology of cardiogenic shock. The patient in our study rapidly improved and was hemodynamically normal within 48 h of cardiac contusion.

On post-injury day (PID) 2, the left chest tube drained milky fluid. The patient was diagnosed with chylothorax after pleural fluid analysis demonstrated triglyceride levels of 1292 mg/dL. Due to low output (<500 mL/day), the patient was managed conservatively with a fat-restricted diet supplemented with medium-chain fatty acids. The chest tube was removed PID-7 once the chyle leak resolved. A repeat chest radiograph (CXR) PID-10 was negative for effusion. She was discharged to rehabilitation PID-13. At one-week follow-up, repeat CXR demonstrated a small, loculated left lateral pleural effusion. The patient was asymptomatic and maintaining adequate oxygen saturation on room air, and no further interventions were taken at this time. Repeat CT scan of the chest two months later showed complete resolution of pleural effusion.

A high index of suspicion for chylothorax should be maintained in patients with pleural effusion in the setting of profound blunt chest trauma. Sudden hyperextension of the spine can cause disruption to the thoracic duct leading to leakage of chyle into the pleural space. Blunt thoracic trauma as the primary etiology of chylothorax is very rare. A review of 203 cases of chylothorax performed by the Mayo Clinic revealed only one caused by blunt thoracic trauma. According to the same study, traumatic causes of chylothorax, both iatrogenic and non-iatrogenic, account for <49 % of cases. Iatrogenic causes are much more common than non-iatrogenic causes, with injury during cardiothoracic surgery among the most common etiologies [3]. Non-iatrogenic causes of chylothorax can be seen in 0.2 % to 3 % of blunt thoracic trauma as well as 0.9 % to 1.3 % of penetrating trauma [2].

Confirmatory testing for chylothorax can be performed with pleural fluid sampling. A triglyceride concentration > 110 mg/dL or presence of chylomicrons is diagnostic, while a triglyceride concentration < 55 mg/dL is sufficient to rule out the diagnosis [1]. Diagnosis is often delayed due to variability in symptom onset or presentation, especially in the traumatic setting. In a review of 39 patients who suffered blunt chest trauma, Kakamad et al. found an average latency period of presentation between 2 and 7 days [4]. Once a diagnosis is made, chylothoraces are classified as high-output or low-output. Treatment modalities are largely dependent on the rate of chyle flow into the pleural space. Low output chylothoraces (<500 mg/day) are often successfully treated with conservative management with dietary modifications as first line therapy [1,5]. Chyle is comprised of chylomicrons, or aggregates of long-chain triglycerides, phospholipids, and cholesterol esters [2]. The primary goal is to decrease chyle production by reducing absorption of fat and prevent malnutrition. Nutritional interventions include total parenteral nutrition or enteral diets comprised of low-fat, high medium triglyceride content. Medium chain triglycerides circumnavigate the lymphatics through direct absorption into the portal venous system. Somatostatin, or an analogue such as octreotide, can also be used as a pharmacological adjunct to reduce overall chyle flow through splanchnic vasoconstriction and decreased lymph production [1,5]. High-output (>1000 mL/day) or refractory cases often require more invasive treatment [5]. Thoracentesis may improve pulmonary mechanics by mitigating mass effect from accumulating pleural fluid. Refractory cases can be treated with surgical ligation of the thoracic duct or thoracic duct embolization (TDE), which carry a success rate of 80 % and 90 %, respectively [2,5].

The loss of protein, triglyceride and lymphocyte-rich chyle from the lymphatic circulation can have profound systemic effects, including interstitial fluid loss, muscle wasting, electrolyte derangements, and immunosuppression [2]. Therefore, early detection and intervention in these patients as the sequelae from delayed or untreated chylothorax carries a morbidity and mortality rate of up to 50 % [2].

CRedit authorship contribution statement

Christopher Harvey: Writing – review & editing, Writing – original draft, Data curation. **Hannah Shin:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Sarah Martin:** Writing – review & editing, Methodology, Formal analysis, Conceptualization. **Lindsey Perea:** Writing – review & editing, Supervision, Project administration, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

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