Chylothorax due to Blunt Torso Trauma: A Rare Etiology

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Abstract
Chylothorax most commonly occurs after thoracic surgery; blunt thoracic trauma is a rare cause of chylothorax. A 50 yr old female presented to our emergency department with history of road traffic injury. On primary assessment the vital parameters were normal and she had a laceration of nasal bridge and lip, with fractures of nasal and right forearm bones. CT scan confirmed fracture of nasal bone, spinous process of D4 vertebrae and bilateral radii. Repair of lip laceration along with open reduction and internal fixation (ORIF) for bilateral radii and nasal bone fracture were done emergently. Patient was allowed orally after 6 hours and recovery seemed to be uneventful. However, patient started complaining of chest heaviness with difficulty in breathing on second post-operative day. On Ultrasound Chest and CT evaluation a radiological diagnosis of traumatic hydrothorax with mediastinal & retroperitoneal lymphangiectasias was made. Intercostal drains placed bilaterally showed chylothorax. Patient was kept nil per oral and on parenteral nutrition, micronutrient supplementation and adequate analgesia. Empiric antibiotic therapy was started. Intercostal drain output and lipid levels of contents decreased with this regime, gradually enteral fat-restricted diet was started with medium chain triglycerides and patient was allowed full orally from day 6. Chest drain was removed on day 11 and patient discharged on day 12.

Keywords: Chylothorax; Torso; Trauma

Introduction
Chylothorax is accumulation of chyle in pleural cavity [1]. It is most commonly seen after thoracic surgery; blunt trauma is a rare cause [1,2]. We are reporting a case of chylothorax due to blunt torso trauma so as to contribute to the scarce body of literature on this rare condition.

Case Report
A 50 year female presented to the emergency department with history of road traffic injury (bicycle rider hit by a car). On presentation, primary survey and adjuncts (CXR and FAST) were normal. Laceration over nasal bridge and lip, with fractures of nasal bone and bilateral forearm bones were noted. CT scan confirmed fractures of nasal bone, spinous process D4 and bilateral radii. Repair of lip laceration along with ORIF for bilateral radii and nasal bone fracture were done emergently. Patient was kept nil per oral for 6 hours and the recovery seemed to be uneventful.

However, patient started complaining of chest heaviness with breathing difficulty on second post-operative day. Bedside ultrasonography of chest showed B/L moderate pleural effusion. Triple contrast enhanced CT scan of chest and abdomen was done which showed fluid hypodensities in the peri-renal areas and mediastinal area suggestive of retroperitoneal and thoracic lymphangiectasias (Figure 1).

Bilateral chest tubes were placed. Right ICD returned opalescent viscous milky content and left was serous (Figure 2). The suspicion of chylothorax was confirmed with biochemical analysis (Table 1).

A diagnosis of traumatic chylothorax with mediastinal & retroperitoneal lymphangiectasias was thus made. Patient was planned for non operative management and parenteral nutrition was started via central line, keeping the patient nil by mouth. Supportive intravenous fluid therapy was titrated according to urine output. Micronutrient supplementation and adequate analgesia was ensured. Empiric antibiotic therapy was started in view of risk factors (bilateral chest tubes, history of road traffic injury and central line in situ). Daily chest physiotherapy and incentive spirometry were ensured. As the ICD output and lipid levels of ICD contents decreased with this regime (Figure 3), enteral fat-restricted diet was started with medium chain triglycerides and patient was allowed full orally from day 6.

Pleural fluid and blood cultures were reviewed periodically. Parenteral supplementation was stopped from day 8. Left ICD was removed on day 10 and right on day 11 (Figure 4).

Patient was discharged to home care on day 12. Follow up at 4 and 12 weeks revealed no fresh complaints.

Discussion
Etiology and differentials
Chylothorax as a result of trauma is a rare report. Most common cause of chylothorax so far is thoracic surgery (esophageal), in which an incidence of 0.4% has been reported [3]. Thoracic duct obstruction due to malignancy is the most common cause of non-traumatic chylothorax [2]. Broadly speaking, etiologies of chylothorax are classified as in

Figure 1: CXR and CECT films.
Figure 2: Contents of bilateral ICDs: Right and left respectively.

<table>
<thead>
<tr>
<th>Color</th>
<th>Milky white</th>
<th>Albumin 1.5 g/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>1120 mg/dl</td>
<td>Chylomicrons ++</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>80 mg/dl</td>
<td>pH 7.4</td>
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</tbody>
</table>

Table 1: Biochemical analysis of pleural fluid.

Figure 3: Trends of ICD output.

Figure 4: Pre ICD removal CXR.

Figure 5. An entity called hepatic chylothorax has been described in which chylous ascites crosses the diaphragm and accumulates in the pleural space [4]. Pseudochylothorax is defined as exudative effusion remaining in the pleural space for a long period of time (often years) gradually becoming enriched with cholesterol, most common etiologies being tuberculosis, rheumatoid, poorly evacuated empyema and chronic haemothorax [5].

**Location**

Bilateral chylothoraces are commoner than unilateral; right (50%) being commoner than left (33.3%) [2,3]. The laterality of unilateral effusions are also dependent on the location of the leak [1]. Damage above the fifth thoracic vertebra leads to left sided effusion whereas damage below this level causes right sided effusion. The volume of effusion also depends upon rate of chyle loss and the concomitant effect of the etiology.

**Presentation**

Rapid loss of chyle leads to hypovolaemia and respiratory difficulty as the pleural space fills with fluid besides causing malnutrition due to loss of protein, fats and vitamins. Electrolyte loss leads to hypocalcaemia and hypoponatraemia. Opportunistic infections signify significant loss of immunoglobulins, T lymphocytes and proteins into the pleural space. However, they almost never occur in the effusion itself as chyle is bacteriostatic [6]. Persistent drainage via a chest drain in patients with post operative or post-traumatic effusions should be evaluated with a high degree of clinical suspicion, early diagnosis and management is life saving for patient [3].

**Diagnosis**

The nature of fluid is classically milky or white in 50% of cases; however, it may be clear in fasting patients and hemorrhagic in traumatic cases. Confirmation of the diagnosis is by fluid analysis. Lipoprotein analysis demonstrating chylomicrons is the gold standard. Other means of establishing diagnosis are measurement of fluid cholesterol and triglyceride levels. A fluid to serum cholesterol ratio <1 and triglyceride ratio >1 are highly suggestive. Staats et al. [7] have proposed the following criteria for the biochemical diagnosis of chylothorax:

- Pleural fluid triglyceride of >110 mg/dl: 1% chance of being non-chylous
- Triglyceride of <50 mg/dl: 5% chance of being chylous. Chylothorax can be easily confused with empyema due to obvious appearances. Its differentiation from empyema is done by centrifugation; after centrifugation chyle fluid remains uniform whereas a clear supernatant separates in empyema [8]. Differentiation from pseudo-chylothorax is by adding 1-2 ml of ethyl ether; the milky appearance disappears in pseudo-chylothorax [9].

Caution must however be exercised in interpretation of results and they must be interpreted in conjunction with the clinical scenario. Maldonado et al. [10] in a retrospective analysis of 74 patients with chylomicron positive pleural fluid demonstrated that 14% of the chylous effusions had triglyceride levels less than 110 mg/dl [10]. The low triglyceride level in all these cases was attributed to perioperative
fasting or malnutrition. Hence, care should be taken in relying solely on a single criteria for diagnosis.

CT abdomen and thorax should be performed given the strong association with malignancy in cases where pseudo-chylothorax is found [7]. Lymphangiography may be used to demonstrate the site of leakage or blockage.

Treatment
It can be classified under 3 categories:

- Treatment of the underlying condition
- Non-operative management
- Surgical management.

Nutritional management, empirical antibiotic coverage, adequate analgesia, chest physiotherapy and intensive monitoring are the cornerstones of successful non-operative management. Serial Chest X-rays come handy to look for lung inflation. Nil by mouth or the administration of low to medium chain triglycerides by mouth resolves approximately 50% of congenital or traumatic chylothoraces [11]. Medium chain triglycerides are directly absorbed into the portal system, bypassing the intestinal lymph system. This reduces the flow of chyle in the thoracic duct allowing it the opportunity to heal [12]. Thoracic duct chyle flow increases after meals especially after a high-fat meal [13]. The volume of chyle flow can be reduced by avoiding fat-containing enteral nutrition [14]. If the chyle leak does not stop following the use of medium chain triglycerides, then total parenteral feeding to reduce the chyle flow even further should be considered [11,12].

Draining large chylothoraces using chest drain insertion are required to ensure complete lung expansion. Monitoring of serum electrolytes, lymphocyte count, albumin and total protein as well as weight are pertinent to care of patients with loss of critical protein and immune cells in patients with chylothorax. Use of somatostatin and octreotide as adjuncts have proved to be useful in the non-operative management of chylothorax. These agents reduce intestinal chyle production, thereby reducing the volume flowing through the injured thoracic duct. Positive attributes of octreotide therapy include, shorter duration of intensive care treatment, reduction of recurrent thoracocentesis, fewer fluid and plasma infusions, reducing the risk of infection. Reported side effects of octreotide are transient changes in blood glucose levels and plasma infusions, reducing the risk of electrolyte disturbance, malnutrition and immunological deficits seen in chylothorax.

Urgent thoracic duct ligation is encouraged when duct has been damaged as a complication of surgery. There is a higher mortality in non-operatively managed patients (50%) as compared to thoracic duct ligation (10%) in chylothorax following esophageal surgery. It also reduces the risk of electrolyte disturbance, malnutrition and immunological deficiency [26] (Figure 6) summarizes the management protocol of traumatic chylothorax.

Prognosis
In the past, the mortality due to chylothorax was in excess of 50% [15]. Introduction of aggressive therapeutic measures to reverse the adverse effects of chyle loss has led to the lowering of mortality rates for post-traumatic chylothorax. The success of managing large chyle leaks involves aggressive nutritional support and early surgical intervention when indicated. Malignant chylothorax and bilateral chylothoraces have worse prognosis [26].

Conclusion
Traumatic chylothorax, though a rare entity, can be progressively debilitating and rapidly fatal if timely diagnosis and intervention are not done. Awareness of this rare entity and a high degree of suspicion for unusual pleural effusions are key to successful diagnosis. Non-operative management of traumatic chylothorax is a viable option provided the vital tenets of adequate nutritional support, restricted fatty diet and intensive supportive care are kept in mind.
References


