

Thoracoscopic treatment of Isolated thoracic duct injury after a penetrating chest trauma: A case report

Masoud Haghghi Kian, Hosein Najd Sepas, Fereshteh Vosough, Behnood Farazmand*

Iran University of Medical Sciences, Tehran, Iran.

Correspondence: Behnood Farazmand, Shazad Avenue, Eghlimi street, Tehran, Iran; National postal code: 1566765419; Email: Farazmand.b@tak.iuums.ac.ir.

ABSTRACT

Chylothorax is one of the side effects of thoracic trauma, which presents 2-7 days' post-injury. The probability of mortality due to complications of thoracic duct injury is approximately 30%. Chylothorax should be considered as a diagnostic option in patients developing pleural effusion after penetrating chest trauma. The lack of essential proteins, immunoglobins, adipose cells, vita-mins, electrolytes, and water as well as drastic consequences may occur due to loss of chyle and lymph into pleural space. Persistent chylothorax can impair immunity by loss of circulating lym-phocytes, which may be corrected by dietary management. Conservative management should be considered as a useful and non-invasive approach for the management of patients with chylotho-rax. Timely intervention is highly critical in patients with thoracic duct injures given the 50% mortality associated with this problem if it remains unmanaged. Here, we presented a case of isolated thoracic duct injury following penetrating chest trauma which was treated successfully via thoracopic approach.

Keywords: Chylothorax, Isolated thoracic duct injury, Thoracic trauma, Thoracoscopy

Introduction

The anatomic relations of the thoracic duct are constant in only 65% of the population. However, there are two more common variants of the thoracic duct: the first is where the thoracic duct enters the right thoracic cavity, and the second is within the left chest cavity in Poirier's triangle ^[1]. The thoracic duct plays an important role in transferring lymphatic fluid from the peritoneal cavity and lower limbs ^[2].

The flow rate of chyle is within the range of 10-100 ml/kg of body weight per day ^[3]. The lymphatic system transports 2.4 l of chyle daily. This flow is strengthened due to changes in intra-abdominal and intra-thoracic pressures and intra-luminal hydrostatic forces. The use of some drugs, the rate of physical movement, intestinal absorption, dietary fat content, and starvation are the influential factors on the changes in the rate of thoracic duct flow.

A large collection of fluids in the pleural space may occur due to damage to the thoracic duct ^[2]. One of the rare complications of thoracic trauma or surgery is chylothorax, which upon the insertion of an intercostal chest drain, presents as a pleural effusion from the thoracic cavity ^[4]. Usually, chylothorax presents 2-7 days post-injury. The incidence of chylothorax ranges between 0.5% and 3% ^[5]. Its incidence in blunt thoracic trauma is estimated between 0.2% and 3%, while it is between 0.9% and 1.3% in penetrating neck trauma ^[6]. The probability of mortality due to complications of thoracic duct injury is approximately 30% ^[7].

The lack of essential proteins, immunoglobins, adipose cells, vitamins, electrolytes, and water as well as drastic consequences may occur due to loss of chyle and lymph into pleural space. Timely intervention is highly critical in patients with thoracic duct injures given the 50% mortality associated with this problem if it remains unmanaged ^[7]. Also, persistent chylothorax can lead to impaired immunity by loss of circulating lymphocytes, which may be corrected by dietary management ^[1]. Here, we presented a case of isolated thoracic duct injury after penetrating chest trauma.

Case Report

A 27-year-old male patient presented to our clinic with isolated thoracic duct injury due to knife stabs. He had no history of previous illnesses, and the vital signs were normal; however, he complained of dyspnea. Three stab wounds were completely exposed: a 4-cm wide wound in left paraspinal region in the sixth

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intercostal space and two more on the posterior axillary line in the ninth and third intercostal spaces.

The patient was examined for other penetrating or blunt trauma due to the severity of injury. No other trauma was reported, and there was no evidence of hematoma and ecchymosis. Peritoneal fluid was not observed based on Focused assessment with sonography for trauma (FAST). Pelvic examination was normal. A decrease in breath sound was noted in the left lung auscultation. Other examinations were normal. Moreover, he was examined for dyspnea, which showed a large pleural effusion based on chest X-ray (CXR); therefore, chest tube was implemented with the suspicion of hemothorax (Figure 1).

The lungs were re-expanded and 300 cc exudate was drained. The pleural fluid was turbid, and the exudate did not decrease after two days (i.e., 600 cc per day). Due to the turbidity of discharge and the patient's condition, the diagnosis of chylothorax was suggested. According to triglyceride level of higher than 150 mg/dl, chylothorax was diagnosed. The patient underwent total parenteral nutrition (TPN) for two weeks; meanwhile, the volume of discharge decreased to 350 cc and TPN was continued for one more week. Thoracoscopic drainage was performed due to persistent pleural effusion (Figure 2). The left hemithorax was examined as much as possible. Chylous leakage was observed during operation and after washing in the paraspinal muscle in the sixth space. Other areas, especially the other stab wounds, were investigated, which showed no wound exudate.

Mass ligation was performed on the entrance of the knife to the thorax in the left paraspinal muscle at the sixth space and chylous leakage was controlled. Then, chemical pleurodesis was performed using talc. The patient was discharged in good general condition after three weeks, and no pleural effusion was observed in the follow-up examination of the lungs.

Discussion

In this study, we reported a case with the diagnosis of chylothorax, who underwent thoracoscopic drainage. There are several ranching patterns and pathways of the thoracic duct, and injury to this system depends on the anatomical variant [7]. The transportation of chyle and lymph from the intestine, liver, abdominal wall, and lower limbs to the central venous system is performed by the thoracic duct [2].

Thoracic duct pathology resulting in chylothorax was first reported in 1633 by Bartolet [5]. The most common reason for chylothorax is trauma to the thoracic duct [2]. Mostly, traumatic chylothorax is iatrogenic [8].

Worthington et al. reported isolated thoracic duct injury after penetrating trauma [1]. However, isolated thoracic duct injuries after penetrating chest trauma without any major vascular or tracheoesophageal injuries is rare [9]. In our case, isolated thoracic duct injuries due to three knife stabs on the left paraspinal region in the sixth intercostal space and posterior axillary line in the ninth and third intercostal spaces were observed on admission.

The diagnosis of chylothorax is difficult; it includes triglyceride levels exceeding 110 mg/dl in pleural fluid in the presence of

chylomicrons, increased lymphocytes, and decreased cholesterol level. In our case, abnormal triglyceride level of higher than 150 mg/dl was reported. Timely diagnosis of chylothorax is crucial because of serious complications of this problem. However, diagnosis may be delayed owing to the lack of observation of pleural fluid in fasting patients [10]. High index of suspicion should be considered in the diagnosis of chylothorax and chylous pleural effusion. In case of milky pleural fluid, the diagnosis of chylothorax should be suspected. Although pleural fluid from chylothorax is typically milky, the pleural fluid in our case was cloudy due to bleeding [2].

There are various approaches for the management of thoracic duct injuries. Early surgical intervention is performed by some physicians, while conservative approaches are adopted by others. First, the conservative approach is preferred. In this approach, a fat-free diet is used after drainage of the pleural cavity, and then medium-chain triglycerides or nil are administered parenterally. After drainage of the pleural cavity, adjuvant therapy including somatostatin is performed in the most cases. However, the likelihood of conservative management failure is approximately high in the management of high-output chylothorax. However, it should not continue for more than 2-3 weeks. Malnutrition, immunodepression, and metabolic derangements may occur due to persistent chylothorax. Nonetheless, this approach is relatively expensive. Surgery is usually suggested in cases with higher than one liter discharge per day for more than five days [3, 11].

Early surgical ligation of the thoracic duct in cases with isolated thoracic duct injuries is useful and reduces the risk of fluid, nutritional, and immunologic depletion. Based on a study by Worthington et al., left lateral thoracotomy was performed by pleurectomy over Poirier's triangle. They identified leakage from the thoracic duct in most patients with isolated thoracic duct injury. In patients with isolated right-sided chylothorax, ligation of the thoracic duct should be performed at the level of the diaphragm [1]. Closure of patch or ligation, application of fibrin glue in pleural space, use of pleuroperitoneal shunt, pleurodesis, pleurectomy, pleural abrasion, thoracic duct embolization, and thoracoscopic ligation are different suggested approaches for closure of duct [12-14]. Moreover, muscle-sparing incisions, lymphangiography, and other surgical approaches facilitating access to the thoracic cavity could be used in these patients [10, 15, 16].

In our case, thoracoscopic drainage of pleural effusion was performed due to persistent secretion of fluids. However, the treatment of choice for the drainage of pleural effusion was thoracotomy in some studies. This difference may be related to patient's condition. Moreover, non-use of general anesthesia in thoracoscopic drainage is one of the advantages of thoracoscopic drainage. On the other hand, decreased hospitalization period and lower costs are the advantages of early surgical intervention compared to conservative approaches.

There is no accurate data on the proper time of surgery with persistent traumatic chylothorax patients. Based on one study by Patterson et al., the proper time for surgery is determined one week after conservative therapy [17], while others suggested at least two weeks or longer [1], because at these times the patient is

at lower risk. Mortality due to sepsis is observed based on other reports, which usually occurs eight days after chyle drainage^{117, 181}. In our case, thoracoscopic drainage was performed two weeks post-injury due to continued secretion of pleural effusion. In summary, chylothorax should be considered as a differential diagnosis in patients who develop pleural effusion after penetrating chest trauma. Conservative management should be considered as a useful and less invasive approach for the management of patients with chylothorax.

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Figure 1. A large pleural effusion based on chest X-ray (CXR)

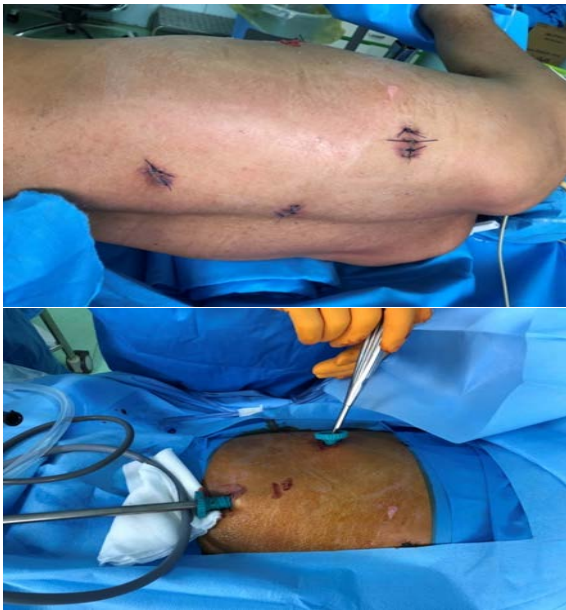


Figure 2. Thoracoscopic drainage of pleural effusion