CHAPTER 16

MANAGEMENT OF CHYLOTHORAX

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CHYLOTHORAX AND THORACIC DUCT

Introduction

Chylothorax is the accumulation of lymphatic fluid in the pleural space as a result of disruption of the thoracic duct or its lymphatic tributaries. It can be caused by many reasons such as trauma, iatrogenic damage or malignancy. Missing chylothorax or delay of the treatment may lead to life-threatening metabolic disorders. There is a broad range of treatment regimen for chylothorax from conservative treatment to different surgical procedures.

The chylous content was first described by Bartolet in 1934, and thoracic duct was defined by Veslingus a year later. The first successful supradiaphragmatic thoracic duct ligation was performed by Lampson in 1948 for traumatic chylothorax (1).Before surgery was considered as a treatment modality for chylothorax, mortality rate of traumatic and non-traumatic chylothorax was 50% and 95% respectively. To identify chylous leak and spot the ductus thoracicus, Schumacker and Moore recommended to increase chylous drainage by feeding with cream before surgery in 1951. Klepser, on the other hand, recommended to use lipophilic dyes in order to visualize chylous leak (2,3).

ANATOMY

Understanding the anatomy of the thoracic duct is crucial in terms of minimizing iatrogenic injuries and deciding the appropriate treatment modality. The thoracic duct is the main collecting vessel of the entire lymphatic system in the body. Lymphatic system arises from endothelium of the venous vasculature after development of cardiovascular system at the fifth week of embryonic period. Early thoracic duct is a bilateral structure containing many bridging vessels and usually fuses to form a single duct. However, it may manifest different anatomical and physiological variations during its development. It has been stated that only 65% of the population has a standard anatomical structure.

Thoracic duct arises in the abdomen from a structure called “cisterna chyli” on the anterior surface of the L2 vertebra.This structure is the thickest part of the entire thoracic duct. It is about 3-4 cm long and 2-3 cm wide (2). Thoracic duct crosses diaphragm and enters thorax at the T10-12 level via the aortic hiatus. It rises up by the back of the esophagus on the right side to the level of T5-6, crosses the aortic arch at this level, continues to rise by the left paraesophageal area and drains into venous system by Pirfoff’s angle (junction of left jugular vein and left subclavian vein) (4,5).

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When the chylothorax is unilateral, the surgical method is performed from the side of the chylous leak. By this way, the leak area can be detected and ligated. In cases with bilateral chylothorax, surgical intervention targeting the right supradiaphragmatic area, which is the entrance of the thoracic duct to the thorax, is generally recommended.

When the location of the chylous leak can be spotted, direct ligation is performed with non-absorbable sutures both to the distal and proximal of the leak. When the thoracic duct is fragile or inflamed, sutures with pledget may be used to repair the thoracic duct or providing flap support from the surrounding tissues may be necessary. It is not always easy to locate the fistula with VATS or thoracotomy (39). The most commonly used method to spot the fistula site is to give cream or olive oil through a nasogastric tube approximately 1 hour before the operation. Administration of 1% Evans blue from a peripheral lymphatic or filling the thorax with intraoperative saline may also facilitate the detection of milky chylous leakage. If the leak cannot be located, mass ligation of all tissue between the aorta, vertebra, esophagus, azygous vein and pericardium is often the preferred method. Mass ligation of the thoracic duct with the surrounding tissue is generally performed over the diaphragmatic hiatus where the pulmonary ligament is located at the right hemithorax. After the mediastinal pleura and pulmonary ligament are released, the tissue between the aorta and the azygos vein are tied together using non-absorbable sutures. During this procedure, it is necessary to protect the integrity of the esophageal wall (40). The success rate of this procedure is about 80% in cases where thoracic duct cannot be located. Stasis due to mass ligation is usually not seen. Lymphatic-venous anastomoses, which are frequently located in the intercostal or lumbar area prevent this stasis.

Chemical pleurodesis following decortication may be required in patients with incompletely thickened pleura. Expansion can be achieved with this procedure, so that the accumulation of chylous fluid in the thoracic cavity may thus be prevented. In order to clarify the underlying pathology, it is recommended to take biopsies from the pleura and lymph nodes during the procedure (41).

It may be challenging to manage mediastinal lymphoma or metastasis related chylothorax. Effective treatment of the underlying malignancy with radiation or chemotherapy usually stops the leak. Multiple interventions, including percutaneous embolization of the thoracic duct should be attempted in cases where the malignancy is resistant to chemoradiation. Ligation or direct repair of the canal may be difficult or impossible due to the burden of disease and the general condition of the patient. In such cases, the placement of a valved subcutaneous pleuroperitoneal shunt may allow drainage of the pleural fluid and reabsorption in the peritoneum. Pleuroperitoneal shunt has a success rate of up to 80% especially in pediatric cases resistant to conservative treatment. In both adult and pediatric patients, the patient should not have ascites during the placement of the shunt (42).

In conclusion, chylothorax should be kept in mind in patients with increased respiratory distress and increased pleural output after surgical intervention. High mortality and morbidity rates may be observed in untreated patients or with delayed treatment due to metabolic or immunologic issues. Therefore, quick diagnosis of chylothorax and appropriate treatment will prevent the morbidity and mortality.

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