

Case Report

Thoracoscopic ligation of the thoracic duct for a massive chylothorax following a thoracoscopic oesophagectomy

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ABSTRACT

Chyle leak is an uncommon yet solemn complication following several head, face and neck surgeries, especially malignancies. Thoracic duct injury usually has an insidious onset and a long course of response and improvement rendering the patient nutritionally debilitated and immunocompromised. Hence, the prompt identification and treatment of a chyle leak is essential for an optimal surgical outcome. Here, we present an interesting case report of a chylothorax, as a postoperative sequela in a 70-year-old male with carcinoma oesophagus who underwent a Thoracoscopic oesophagectomy. He was managed by a thoracoscopic ligation of the thoracic duct, which not only negated the need for a major thoracic procedure, but also provided a good surgical outcome.

Keywords: Carcinoma oesophagus, Chylothorax, Management of thoracic duct chyle leak, Thoraco-laparoscopic-oesophagectomy, Thoracic duct injury

INTRODUCTION

Chylothorax results from the accumulation of lymphatic fluid in the pleural space due to an obstruction or leakage of the thoracic duct or one of its tributaries.¹ Although chylothorax is relatively uncommon, it is a serious and potentially life-threatening event if not managed properly. The resultant respiratory, nutritional and immunologic complications are profound and bacterial infection and sepsis may be potentiated by these losses.² The ideal treatment for chylothorax has not been well established yet, however, the prompt identification and treatment of a chyle leak is essential for an optimal surgical outcome. Regardless of the cause video-assisted thoracic surgery (VATS) offers an effective means of treating chylothorax, with the advantage of minimal

access to thoracic structures avoiding the morbidity of more extensive procedures.² We are reporting an interesting case of chylothorax as a post-operative sequela of thoracoscopic oesophagectomy in a 70-year-old male for carcinoma oesophagus. He was managed by a thoracoscopic clipping of the thoracic duct, which not only negated the need for a major thoracic procedure, but also provided a good surgical outcome.

CASE REPORT

A 70-year-old male presented with complaints of progressive dysphagia for 3 months for both solids and liquids at our clinic. There was a history of significant weight loss and appetite. He had no relevant past history and no significant co-morbidities.

The patient was diagnosed with carcinoma of the oesophagus. After an adequate preoperative assessment and work up, he underwent a Thoracoscopic oesophagectomy with a gastric pull through.



Figure 1: Isolation of leaking thoracic duct.

On the 4th postoperative day, the patient was started on feeds. It was then observed that his right-side chest drains had an output of 800 milliliters of milky fluid.

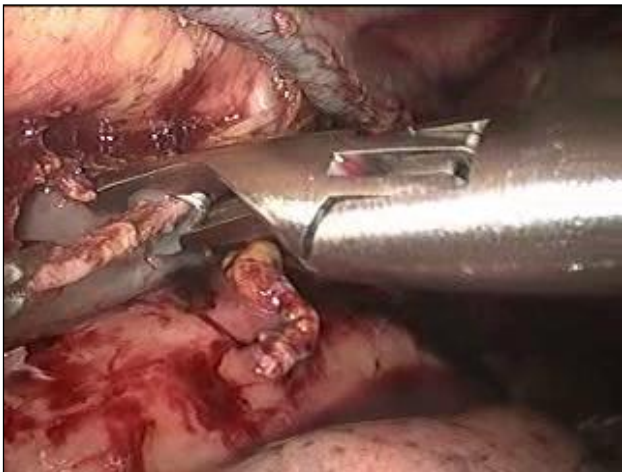


Figure 2: Clipping of leaking thoracic duct.

On clinical examination and evaluation, the patient had a fair general condition. He was afebrile with stable vitals. He showed signs of mild dyspnea and was tolerating oral feeds. His operative sites appeared healthy.

An HRCT Thorax was done, which was suggestive of a post-oesophagectomy with gastric pull through surgery status, with a moderate collection in right pleural cavity.

The drain fluid analysis of this white, opaque and odorless fluid was high in triglycerides which was diagnostic of a chylous leak. Patient was hence diagnosed to have Chylothorax.

A trial of non-fat, high protein, high calorie diet with adequate essential amino acids supplementation was tried to see if the chyle output decreased. The patient was immobilized with a 30-40-degree head elevation. However, he continued to have a drain output of ~1000 ml per day. Hence, it was decided to ligate the thoracic duct thoracoscopically.

Under all aseptic precautions and general anesthesia, with the patient in prone position. The thorax was entered through the previous right 5th and 7th intercostals port sites, A double lumen endotracheal tube was used, and the right lung was collapsed to further facilitate the procedure.

Pre-operatively, the administration of lipophilic dye (e.g. Evans blue) and the use of high fat cream orally, helps to locate the site of lymphatic leakage during the procedure.³ This patient was fed high fat cream 60 minutes prior to surgery, and during the surgery through a Ryle's tube.



Figure 3: No chyle leak post clipping of the thoracic duct.

The leaky thoracic duct was first identified, isolated and ligated thoracoscopically (as shown in Figure 1, 2 and 3). It was checked for no leakage by an induced Valsalva man oeuvre and Trendelenburg positioning where the anesthesiologist applied positive pressure to raise intra-thoracic pressure which propagates hydrostatic forces through the course of the thoracic duct to increase chyle flow and distend the distal thoracic duct to improve visibility.

DISCUSSION

Chyle in the pleural space was first described by Bartolet in 1633 and Quinke reported the first case in 1875.⁴ It results from an anatomical disruption of the thoracic duct and/or a major lymphatic tributary. In 1948, Lampson reported the first successful treatment of chylothorax by the supradiaphragmatic ligation of the thoracic duct.⁵

Prompt recognition is needed to avoid malnutrition, immunodeficiency and fibrothorax. After ligation, there is usually some obstruction to lymph flow distal to the ligated site until new collateral channels are formed within 2 to 3 weeks.

Surgical anatomy⁶

Chyle passes from the intestinal lymphatics to cisterna chyli and then ascends through the thoracic duct to eventually empty into the venous system. The thoracic duct begins at the cisterna chyli near the level of T12 vertebra and ascends through the aortic hiatus of the diaphragm on the anterior surface of the vertebral body between the aorta and the azygos vein into the posterior mediastinum.

At the level of the fifth thoracic vertebra, it then crosses to the left of the vertebral column and ascends behind the aortic arch to the left of the subclavian artery adjacent to the mediastinal pleura. At the level of the transverse process of the seventh cervical vertebra, the duct turns laterally and runs anterior to the vertebral and thyrocervical arteries and the sympathetic trunk. Passing behind the carotid sheath, it descends anterior to the origin of the left subclavian artery and terminates near the junction of internal jugular and subclavian veins.⁷

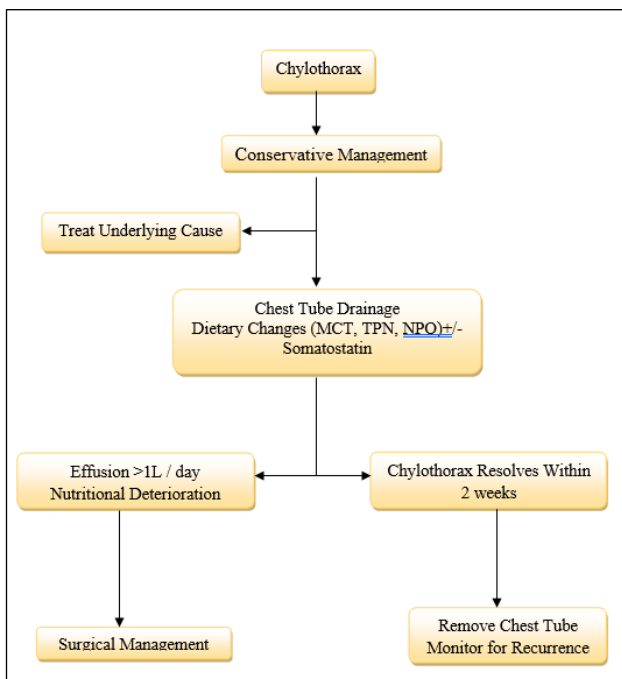


Figure 4: Conservative treatment and management of chylothorax.

A bicuspid valve at the lymph venous junction prevents the reflux of blood into the duct. The duct itself has numerous valves throughout its length. However, in up to 50% of individuals, the route of thoracic duct is anomalous and unpredictable, thus making it more susceptible to damage during surgical procedures.^{3,4}

This duct carries lymph from the entire body, except from the right side of the head, neck, chest, both lungs, and the right upper extremity that empties into the right lymphatic duct. There are extensive anastomotic vessels present between various lymphatics, and numerous lymphatic venous anastomosis between the thoracic duct and the azygos, intercostals, and lumbar veins. The richness of this collateral circulation allows the safe ligation of the thoracic duct at any level.³

Chyle is propagated within the thoracic duct primarily by the muscular action of breathing and further facilitated by the duct's smooth muscles and internal valves, which prevent retrograde flow. Factors that modulate chyle flow include diet, intestinal function, physical activity, respiration rate, and changes in intra-abdominal and intrathoracic pressure.⁸

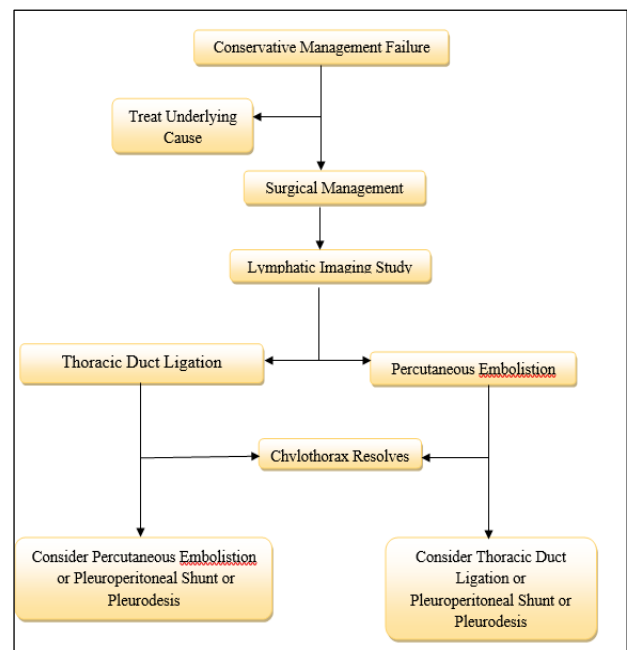


Figure 5: Surgical treatment and management of chylothorax.

Postoperatively, the sudden high increases in drain output, especially following resumption of feedings that contain fat, should immediately raise suspicion of a chylous leak. On local examination, the neck may exhibit signs of erythema, lymphedema, or a palpable fluid collection in the supraclavicular region. Usually the management is done as shown in the schematic diagram. (Figure 4 and 5).³

The chest drain would have a creamy or milky appearance. While it can be diagnosed clinically, a biochemical assay may be helpful to confirm one's suspicion.

Drain fluid with triglyceride level greater than 100 mg/dL or serum triglyceride or with the presence of chylomicrons confirms the diagnosis of a chylous leak.⁷

While low output leaks (<500ml/day) respond well to conservative therapies, high output (>500ml/day) ones might not and may require surgical intervention.⁹ Age old surgical practices combined with recent advances have shown promising results whilst conserving low output leaks.

Bed rest with a 30-40-degree head elevation and nutritional support in the form of total parenteral nutrition that supplements medium chain fatty acids (MCFA) and a low-fat diet have shown promising results.¹⁰ This in conjunction with the use of medical management, like Somatostatin and Octreotide has shown a marked reduction of chyle formation. The use of sclerosing glues, cyanoacrylate-late, OK 42 sclerosing agents and polyglactin (vicryl) meshes have also shown results. Interventional techniques usually include the decompression of the pleural effusion by an intercostal approach with or without the use of sclerosants.^{2,11-14}

Surgical re-exploration should be considered only after conservative measures have failed or as a last resort. The suggested criteria for re-exploration range from outputs of >500 mL/day to >1000 mL/day output for 5 days as stated by literature.¹⁵⁻¹⁸ They include techniques like thoracic duct ligation, pleuroperitoneal shunts and percutaneous embolization techniques.¹⁹⁻²⁰

CONCLUSION

In conclusion, the patients with chylous leaks are often debilitated, malnourished and immunocompromised. This usually contributes to their poor general health and reduced wound healing. They often have electrolyte disturbances and associated compromised cardiovascular function.

While several conservative management techniques have promising outcomes, surgical interventions are usually considered only after conservative measures have either been exhausted or deemed ineffective. They include various techniques like thoracic duct ligation, pleuroperitoneal shunts and per-cutaneous embolization.

As experienced with this patient, the thoracoscopic ligation of the thoracic duct provided a safe and effective treatment. It almost completely avoided the need of a thoracotomy and the troubles associated with a major thoracic procedure.

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