Indian Journal of Thoracic and Cardiovascular Surgery (July–August 2024) 40(4):489–492
https://doi.org/10.1007/s12055-023-01683-5

CASE REPORT

VATS thoracic duct clipping in post-CABG with chylothorax

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Received: 1 October 2023 / Revised: 22 December 2023 / Accepted: 27 December 2023 / Published online: 30 January 2024

Abstract
Post-coronary artery bypass graft (CABG) surgery, chylothorax is a rare, but a serious, complication. We report a case of 49-year-old female who underwent CABG, and developed pleural effusion on post-operative day 2 which was milky in nature. Chylothorax was confirmed based on the biochemical analysis of the pleural fluid. As the medical line of management failed, video-assisted thoracoscopic surgery (VATS) was done and thoracic duct clipped on the right side. Close to the proximal portion of the left internal thoracic artery, disrupted tributaries of thoracic duct were noted and clipped. Rarity of the case and management is highlighted.

Keywords Coronary artery bypass grafting · Video-assisted thoracoscopic surgery · Thoracic duct ligation · Left internal mammary artery

Introduction

Thoracic duct injury is one of the causes of chylothorax. It usually results from trauma or tumor and occasionally from idiopathic causes. Due to the anatomical course of the thoracic duct, it can cause right-sided effusion if damage is below the T5 vertebra level, or left-sided pleural effusion if damage is above the T5 vertebra level. The incidence of chylothorax in esophageal procedures is 0.4–4%, but 2.5–4.7% following congenital heart surgeries [1, 2].

Incidence of chylothorax after coronary artery bypass graft (CABG) surgery is rare and a thorough search of literature noted that only 50 cases have been reported so far [3]. Malnutrition, dehydration, nutritional deficiencies, mediastinal inflammation, immunosuppression, respiratory dysfunction, and increased vulnerability to infection are associated with persistent high-output chylothorax [4]. There is no consensus on the treatment strategy because of the rarity of chylothorax after CABG. This case report highlights the management of chylothorax after CABG and describes video-assisted thoracoscopic surgery (VATS) thoracic duct clipping.

Case report

A 49-year-old lady, a known hypertensive, presented with chest discomfort, sweating, and palpitations with features of angina. Coronary angiography revealed critical triple vessel disease. She underwent off-pump CABG procedure. During surgery, in a standard manner, left internal mammary artery (LIMA) pedicled graft was harvested. LIMA was anastomosed to left anterior descending (LAD) artery, great saphenous vein graft to posterior descending artery (PDA), radial artery to obtuse marginal artery (OMA). The patient developed milky chylous discharge of about 1400 mL in the left intercostal drain (ICD) on the second post-operative day. Biochemical pleural fluid analysis revealed triglycerides of 544 mg/dL, total cholesterol level 96 mg/dL, glucose 96 mg/dL, and lactate dehydrogenase (LDH) 664 IU/L, with no bacterial growth.

Diagnosis of chylothorax was made based on these findings. Patient was put on medium-chain fatty acid diet and calorie intake was restricted to 1500 kcal/day. Chest drain

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output was monitored daily. As the drain output was persistently high (>1200 mL), 100 µg of octreotide was started. A 1000-mL drain output was noted even on octreotide therapy; hence, the decision was taken for thoracoscopic inspection and clipping of the thoracic duct. Patient was fasting overnight and was fed cream 2 h before surgery.

VATS thoracic duct clipping

Patient was intubated with double-lumen endotracheal tube with collapse of the right lung. Procedure started with right-side thoracoscopy to visualize and clip the thoracic duct in the right hemithorax. Two 10-mm ports, one in the 7th intercostal space along the posterior axillary line and the other in the 5th intercostal space along the mid-axillary line, were placed. The 5-mm port in the 7th intercostal space along the anterior axillary line was placed. The azygous vein was identified and traced. The parietal-pleura was incised in between the azygous vein and the descending aorta near the inferior pulmonary ligament. With meticulous dissection adjacent to the azygous vein, the thoracic duct was identified. The thoracic duct was delineated after dissection (Fig. 1) and clipped proximally and distally. Hemostasis was achieved and an ICD was placed in the 5th intercostal space.

Next the patient was placed in the right lateral decubitus position. With the left-side lung deflated, ports were placed as on the right. The thoracic cavity was inspected thoroughly. There was about 200 mL of chyle which was removed. Near the LIMA harvested area a milky fluid leak was noted. It was close to the proximal portion of the IMA and was diffuse. Multiple ligaclips (Fig. 2) were applied to ligate the tributaries of the duct depicted anatomically (Fig. 3). Once it was confirmed that there was no leak, an ICD was placed in the 5th intercostal space. The patient was extubated and shifted to the ward in a stable condition.

Post-operative care The patient was started on incentive spirometry. She was ambulated the next day. No chylous discharge was noted in the next 3 days. The chest tube was removed on the 4th post-operative day as the output was <50 mL.

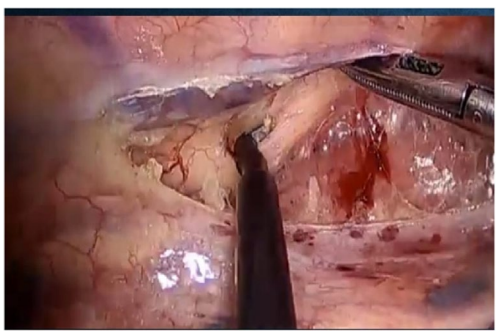

Fig. 1 Dissection of thoracic duct before clipping

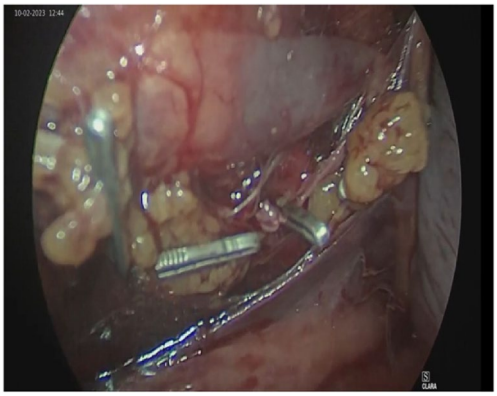

Fig. 2 VATS clipping of tributaries of thoracic duct

Discussion

Dissection or disruption of thoracic duct, where it drains into the jugular-subclavian vein junction, can cause chylothorax. When a surgeon attempts to harvest the maximum length of LIMA, it is the small branch avulsion, instead of complete transection of the thoracic duct, that causes complication in majority of the patients [5]. The chief destructive mechanism appears to be the use of electrocautery during harvesting of LIMA. Abnormalities of lymphatic collateral circulation could be the possible cause of chylothorax [5]. The need for surgery and prolonged hospitalization can be reduced by early diagnosis and prompt initiation of conservative treatment [4]. Medical management, embolization by image-guided radiological methods, and surgical ligation of thoracic duct are the main treatment strategies available for management of chylothorax [4].

Conservative management

Based on the cause, degree, and duration of chylothorax, management varies. Presence of pleural fluid chylomicrons or triglyceride level >100 mg/dL confirms the diagnosis of chylothorax. Leaks >1000 mL/day are classified as high-volume chylothorax and <1000 mL/day as low-volume. Nil per oral, total parenteral nutrition, and low-fat diet or a diet rich in medium-chain triglycerides (MCTG) are often used for managing low-output chylothorax (< 1000 cc/day). Octreotide inhibits glucagon, insulin, and growth hormones more potently than somatostatin, and is a synthetic analogue of somatostatin [6]. Octreotide reduces the lymph fluid

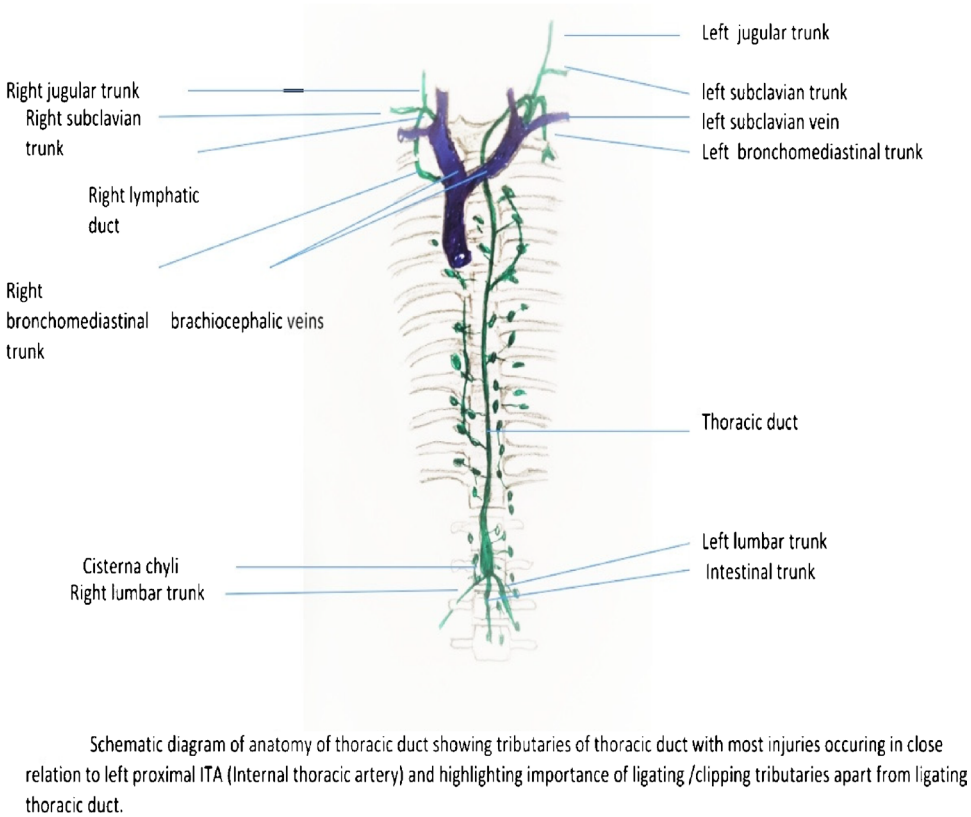

Fig. 3 Anatomy of the thoracic duct (hand-drawn diagram)

Schematic diagram of anatomy of thoracic duct showing tributaries of thoracic duct with most injuries occuring in close relation to left proximal ITA (Internal thoracic artery) and highlighting importance of ligating /clipping tributaries apart from ligating thoracic duct.

formation by acting on vascular somatostatin receptors and is the main component in conservative treatment of chylothorax [7]. Octreotide rarely reduces it completely, but may slow the rate of leak [8]. Use of talc intra-pleurally causes fibrosis and adhesion by intense inflammatory response with sealing of the leak. Ineffective conservative treatment of chylothorax is associated with 50% mortality [7].

Invasive management

Biological sealants, pleural flap cover, suturing of the leaking area, parietal pleurectomy, pleuro-peritoneal shunts, thoracic duct venous anastomosis, pleurodesis, thoracic duct ligation, and surgical ligation of leaking lymphatics are the various strategies and techniques at the time of invasive management reported in the literature. In the early 1990s, minimally invasive techniques like VATS were introduced. VATS replaced routine surgical approaches and has been used successfully for application of fibrin glue and for thoracic duct clipping. Identifying the thoracic duct or its leak is the main difficulty in surgical intervention. Intra-operatively, through Ryle's tube, cream or oil is administered for better identification. If the thoracic duct is not identified, mass ligation of tissues in the presumed course of the thoracic duct can be tried [7]. The entire field can be stained; hence, dyes must be avoided [8].

Thoracic duct embolization by image-guided percutaneous method has been used in recent years for management of chylothorax [8]. Thoracic duct embolization by percutaneous technique can lead to healing in patients who have failed even after surgery [9]. Percutaneous embolization (PE) is time-consuming and needs expert interventional radiologist, and success rate is only 60%. To identify the location of the leak, diagnostic lymphangiography can be done. To perform lymphangiography is easier and this may help to select the surgical approach [8].

For refractory chylothorax, surgery remains the cornerstone in the management of chylothorax [10]. Surgical thoracic duct ligation (TDL) is the most effective treatment available for chylothorax, though it is the most invasive option [7]. Surgical TDL has minimal morbidity and is effective in >80% of cases [8]. Thoracic duct ligation is the ideal intervention for iatrogenic thoracic duct injury in the post-operative period. However, the best treatment is unclear for nontraumatic patients [10]. In our case, decision for early thoracoscopic intervention was made in view of high-output chylothorax, which avoids unnecessary prolonged period of conservative treatment, morbidity, and mortality associated with protracted chylothorax.

Our experience in this case also highlights the importance of doing bilateral VATS as this presentation was left-side chylothorax. Management of thoracic duct leak should not be confined to ligation of thoracic duct alone for the chances

of missing smaller tributaries, which may later present with persistent chyle leak in the post-operative period. If the presentation was right-sided chylothorax, maybe unilateral VATS was sufficient.

VATS-guided clipping avoids thoracotomy and the morbidities associated with a major thoracic procedure. It is a simple and a highly effective operation with better visualization. Our study echoes with reports by others indicating that for high-output chylothorax cases, surgical intervention can be performed safely at the earliest, especially after surgical trauma like in this case of post-CABG.

Conclusion

Chylothorax is a rare complication after CABG. Complications are more common with harvesting of left internal mammary artery pedicle. Conservative treatment should be initiated without further delay and surgical intervention must be implemented as early as possible in high-output chylothorax, if conservative management fails, to avoid developing complications of chylothorax.

Our experience in this case also highlights the importance of doing bilateral VATS with thoracic duct clipping and also ligating the smaller tributaries. Thoracic duct clipping by VATS technique is a better option for cases which are not managed conservatively and is an ideal intervention for post-operative patients of chylothorax with an iatrogenic thoracic duct injury.

Author contribution SG and SN analyzed and interpreted the patient data and were major contributors in writing this article. SG and AG were the chief operating surgeons in this case. VS was the chief anesthestist while operating; TN helped with review of literature. All authors read and approved the final manuscript.

Funding None.

Data availability All data generated or analyzed during this study are included in this article.

Declarations

Ethics approval Not applicable.

Informed consent statement Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Conflict of interest No conflict of interest.

Statement of human and animal rights Not applicable.

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