

Case Reports

Successful Percutaneous Thoracic Duct Embolization for Chylothorax After Total Arch Replacement

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Abstract

Chylothorax after cardiac surgery is a rare complication associated with severe morbidity and mortality. This report documents successful treatment with percutaneous thoracic duct embolization for chylothorax after total arch replacement. A 69-year-old man underwent replacement of the aortic arch to treat a ruptured aortic aneurysm. After surgery, the left thoracic drain discharged 2,000 to 3,000 mL serosanguineous fluid per day, even though the patient took nothing orally and was administered subcutaneous octreotide therapy. On postoperative day 9, percutaneous thoracic duct embolization was performed, and the drain could be removed. The chylothorax did not recur, and the patient was discharged on postoperative day 17.

Keywords: Aortic aneurysm; thoracic surgery; chylothorax

Case Report

Presentation and Physical Examination

A 69-year-old man was admitted to the hospital with bloody sputum. Computed tomography scans revealed the impending rupture of an aortic arch aneurysm measuring 110 mm (Fig. 1). Physicians decided to perform emergency surgery. After median sternotomy, cardiopulmonary bypass was established, and total aortic arch replacement was performed successfully. On postoperative day 1, approximately 3,000 mL of serosanguineous discharge emerged from the left thoracic drain, although the patient continued to take nothing by mouth. High-dose antihypertensives were administered intravenously for blood pressure maintenance. Biochemical and microbiological analysis of the discharge showed 0.79 mmol/L (70 mg/dL) triglycerides and 0.91 mmol/L (35 mg/dL) cholesterol. On postoperative day 2, subcutaneous octreotide at 100 µg 3 times per day was implemented. Although the patient received subcutaneous octreotide therapy, 2,000

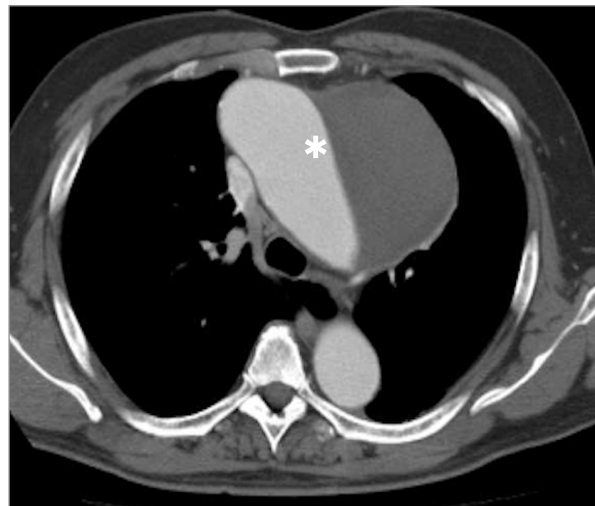


Fig. 1 A computed tomogram shows a saccular aneurysm of the aortic arch measuring 110 mm (asterisk).

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to 3,000 mL per day of serosanguineous discharge emerged from the left thoracic drain for a few days.

Medical History

The patient's medical history was unremarkable.

Differential Diagnosis

The differential diagnosis for this patient included iatrogenic thoracic duct injury and postoperative pleural effusion.

Technique

On postoperative day 9, percutaneous thoracic duct embolization was performed under general anesthesia. The right inguinal lymph node was punctured using a 23-gauge needle under ultrasound guidance. A test dose of contrast medium (Lipiodol Ultra Fluid; Guerbet) was injected slowly under fluoroscopic guidance, and the lymphatic vessels were examined. After the cisterna chyli was confirmed by contrast medium enhancement, it was cannulated using a 21-gauge needle via a right transabdominal approach. A stiff, 0.018-in guidewire (V-18 ControlWire Guidewire; Boston Scientific Corporation) and a microcatheter (Prominent; Tokai Medical Products, Inc) were used to access the thoracic duct and were advanced until the left venous angle. After the identification of chyle leakage (Fig. 2A), 2 coils were placed in front of the venous angle, and N-butyl cyanoacrylate (NBCA) (Histoacryl; B. Braun SE) diluted in Lipiodol Ultra Fluid was used for embolization (Fig. 2B). After surgery, the left thoracic drain was removed when the drainage was reduced to less than 150 mL per day. There was no recurrence of chylothorax or complications, so the patient was discharged from the hospital on postoperative day 17 after total arch replacement.

Latest Follow-Up

One year of postoperative outpatient follow-up showed no recurrence of chylothorax.

Discussion

Chylothorax after cardiothoracic surgery is a rare but severe complication, with an incidence rate of 0.3% to 1.5%.¹ It can cause severe repercussions, including dehydration, electrolyte disturbance, malnutrition, coagulopathy, and infection. The treatment for chylothorax includes conservative management, surgical treatment,

Key Points

- Active conservative treatment should be initiated promptly in the event of postoperative chylothorax.
- Surgical repair or percutaneous thoracic duct embolization should be considered if conservative management is unsuccessful.
- Percutaneous thoracic duct embolization for chylothorax is minimally invasive and can be considered as an alternative to surgical treatment.

Abbreviations and Acronyms

NBCA N-butyl cyanoacrylate

and interventional radiologic treatment. It is suggested that surgery be performed in the event conservative treatment fails. Surgery is the most practical treatment modality, albeit with an attendant high risk of complications, mortality, and morbidity. By contrast, percutaneous treatment for chylothorax seems to be a minimally invasive and effective alternative to the surgical method.

Postoperative chylothorax is a common cause of traumatic thoracic chyle leakage and may result in severe complications. Even in its early stages, chylothorax can cause severe cardiorespiratory and volemic complications. In the presence of a chronic comorbidity, malnutrition and immunologic complications can occur, which are responsible for a mortality rate up to 50%.

Three options are available for the treatment of chylothorax. Conservative management—including alimentary therapy (a low-fat diet, taking nothing by mouth, and total parenteral nutrition) and subcutaneous injection of octreotide with percutaneous chest drainage—typically constitutes the first step in the treatment of chylothorax. Diet therapy can reduce chyle flow. Conservative management, however, is not successful in up to 70% of cases.² The success rate is especially reduced when the volume of thoracic drainage is greater than 1,000 mL per day.

Surgical management is traditionally performed in patients who do not respond to conservative management. Surgical management includes thoracic duct ligation, peritoneovenous shunt implantation, lymphatic-venous anastomosis, and pleurodesis. Watanabe et al³ have also reported performing left-sided, video-assisted thoracoscopic surgery of a left chylothorax following left-sided thoracic surgery. Although this treatment is considered as minimally invasive as interventional radiology, treatment with open surgery or under endoscopic guidance



Fig. 2 A) A lymphangiogram shows contrast medium leakage from the thoracic duct and thoracic drain (arrow); **(B)** 2 coils (asterisk) and N-butyl cyanoacrylate were used for percutaneous thoracic duct embolization, and there was no leakage of the contrast medium.

is difficult in patients who do not have distinct cisterna chyli. In addition, surgery is not always effective and is associated with substantial complication rates. It should be taken into account that thoracotomy may lead to mediastinitis, especially in patients after cardiac surgery, such as the patient in the present case.

Percutaneous thoracic duct embolization is a minimally invasive alternative to surgical management. This method was devised by Cope et al⁴ and comprises diagnosis and treatment. Percutaneous thoracic duct embolization involves several stages, including lymphangiography by percutaneous transabdominal catheterization and embolization of the thoracic duct using coils and NBCA. Itkin et al⁵ reported a 71% success rate for percutaneous thoracic embolization for patients with traumatic thoracic duct leakage, including the 18% of patients for whom surgical ligation failed. If the thoracic duct can be accessed successfully, the success rate of the procedure exceeds 90%.⁶ The advantage of this method is that it can have a high success rate for patients for whom it is difficult to perform ligation; if challenges are still encountered and antegrade embolization is not possible, retrograde transvenous lymphatic embolization via the basilic or cephalic vein through the ostial valve of

the thoracic duct should be considered, especially after extensive lymph node dissection.⁷

Studies have suggested that combination treatment with coiling and NBCA is more successful than treatment with coiling alone.⁶ Embolization with NBCA, however, can be accompanied by complications such as pain, infection, Lipiodol extravasation, intra-alveolar hemorrhage, Lipiodol embolism, and allergic reaction to Lipiodol. Lee et al⁸ suggested that reducing the volume of Lipiodol injected may decrease these complications. The incidence of complications for all embolization procedures is approximately 3%, and no fatal outcomes have been reported.⁶ Lymphography is an important clinical technique in the location of the chylous leak. Percutaneous thoracic duct embolization therefore seems to be a relatively safe, effective, and minimally invasive treatment for chylothorax.

Conclusion

Active conservative treatment should be initiated promptly in the event of postoperative chylothorax. Surgical repair or percutaneous thoracic duct

embolization should be considered if conservative management is unsuccessful. Percutaneous thoracic duct embolization for chylothorax is minimally invasive and can be considered as an alternative to surgical treatment.

Article Information

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