

A Rare Case of Right-Sided Chylothorax Following Thoracoscopic Sympathectomy Due to an Anomalous Thoracic Duct

Review began 08/28/2024

Review ended 09/16/2024

Published 09/19/2024

© Copyright 2024

Amate Neto et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

DOI: 10.7759/cureus.69726

André Amate Neto ¹, Amanda Tollini de Moraes ², Felipe Ramos Camargo Preto ¹, Sarah Lopes Salomão ², Tales Rubens de Nadai ¹

1. Department of Thoracic Surgery, Bauru Medical School, University of São Paulo, Bauru, BRA 2. Department of Medicine, Bauru Medical School, University of São Paulo, Bauru, BRA

Corresponding author: Amanda Tollini de Moraes, amandatollini@gmail.com

Abstract

Chylothorax, despite being a common complication after thoracic surgery, is rare after thoracic sympathectomy, especially on the right side of the thorax. We present a case of a patient who developed a right chylothorax after a thoracoscopic sympathectomy due to the presence of an anomalous thoracic duct located on the right side of the patient's chest. A 37-year-old woman underwent a bilateral video-assisted thoracic sympathectomy for the treatment of primary focal axillary hyperhidrosis. During the postoperative period, there was an excessive discharge of a white, milky fluid through the chest drain, with an average daily output of 350-500 mL/day. Chylothorax was confirmed after laboratory analysis, which revealed a triglyceride level of 146 mg/dL. Due to the worsening appearance of the pleural fluid and the increased drainage volume, reaching 1,000 mL, the patient underwent exploratory videothoracoscopy. During the procedure, a lymphatic fistula was visualized in the region of the sympathetic chain, allowing the identification of an anomalous thoracic duct on the right side of the patient's thorax. The anomalous thoracic duct was dissected, with inferior and superior clipping of the duct. The patient remained stable and was discharged three days after the procedure. This case report describes an especially rare presentation, being one of the few cases of right chylothorax after thoracoscopic sympathectomy described in the literature to date. This study points out that, despite thoracic sympathectomy being considered a safe surgical procedure, unusual complications, such as chylothorax, and anatomical variations of the thoracic duct must be considered.

Categories: Cardiac/Thoracic/Vascular Surgery

Keywords: case report, thoracic surgery, sympathectomy, hyperhidrosis, chylothorax

Introduction

Thoracoscopic sympathectomy is a highly recommended minimally invasive surgical procedure for treating disorders related to the sympathetic nervous system, such as primary focal hyperhidrosis (PFH), a condition characterized by excessive sweating in specific areas of the body, most often the axillae, palms, soles, and craniofacial region [1,2].

Surgery is typically performed through small incisions in the chest wall, usually between the third and fourth ribs. A thoracoscope is inserted through one of the incisions to visualize the sympathetic chain along the spine, and through the other incisions, the sympathetic nerves responsible for the symptoms are resected or cauterized, with the objective of reducing sympathetic overactivity and, in the case of PFH, decreasing excessive sweating [3]. Once the procedure is complete, the thoracoscope and instruments are removed, and the small incisions are closed, typically with sutures or adhesive strips.

Although thoracic complications such as hemothorax and pneumothorax occasionally occur after thoracoscopic sympathectomy, chylothorax is a rare complication, occurring postoperatively in approximately 0.5% of all intrathoracic procedures [4]. It is especially rare on the right side of the thorax, with very few cases reported in the literature [1].

Chylothorax typically occurs when the thoracic duct (TD), the largest lymphatic vessel in the body, responsible for collecting lymph from smaller lymphatic vessels and draining approximately 75% of the body's lymph, is injured. When the TD is damaged, chyle leaks into the pleural cavity, leading to the accumulation of fluid, which can cause respiratory difficulties and compromise the patient's nutritional and immune status [5].

Anatomical variations of the TD are significant due to its vulnerability to injury during surgical procedures. One such variation is the right-sided TD, a rare condition in which the duct, instead of following its usual path on the left, drains into the venous system on the right. Typically, the TD ascends through the thorax, crossing from right to left at the T5-T6 vertebrae, and empties into the left venous angle. However, in some

How to cite this article

Amate Neto A, de Moraes A, Preto F, et al. (September 19, 2024) A Rare Case of Right-Sided Chylothorax Following Thoracoscopic Sympathectomy Due to an Anomalous Thoracic Duct. Cureus 16(9): e69726. DOI 10.7759/cureus.69726

cases, it remains on the right and drains into the right venous angle, which is considered an anatomical anomaly [4,5]

In this article, we report the case of a patient who developed right-sided chylothorax following thoroscopic sympathectomy due to the presence of an anomalous TD located on the right side of the patient's chest. This reported case is an especially rare presentation, being one of the few cases of right-sided chylothorax after thoroscopic sympathectomy described in the literature to date [6].

Case Presentation

A 37-year-old woman sought medical attention with a complaint of excessive axillary sweating. The patient had no underlying medical conditions and denied a history of recent illness. On physical examination, bilateral focal axillary hyperhidrosis was observed. Therefore, surgical treatment was indicated. She underwent video-assisted bilateral thoracic sympathectomy through the intercostal space between the fourth and fifth ribs, without any intraoperative complications. A chest tube was placed at the time of the operation. Postoperatively, she remained stable but complained of significant pain at the drain incision.

The next day, there was an excessive discharge of white, milky fluid from the chest tube (Figure 1). This finding raised suspicion of chylothorax, and the fluid was sent for laboratory analysis, which revealed a triglyceride level of 146 mg/dL, confirming the diagnosis of chylothorax, as the diagnostic cutoff is 110 mg/dL of triglycerides.



FIGURE 1: Chylous output in the chest drain

Chylous fluid outflow from the patient's chest drain.

In the first seven days of follow-up, the average daily drainage was between 350 and 500 mL/day. On the eighth postoperative day, after transitioning from a low-fat diet to a general diet, the patient presented a chylous output of 1,000 mL. Due to the worsening appearance of the pleural fluid and the increase in the drainage volume, exploratory videothoracoscopy was indicated to ligate the lymphatic fistula and treat the post-sympathectomy chylothorax.

On the ninth postoperative day, the patient underwent exploratory videothoracoscopy. After the infusion of 200 mL of oil through the nasogastric tube, 90 minutes waited for the evident exit of the chyle through the chest drain. During videothoracoscopy, chyle exit was visualized in the region of the sympathetic chain, allowing the identification of an anomalous thoracic duct on the right side of the patient's thorax (Figures 2A, 2B).

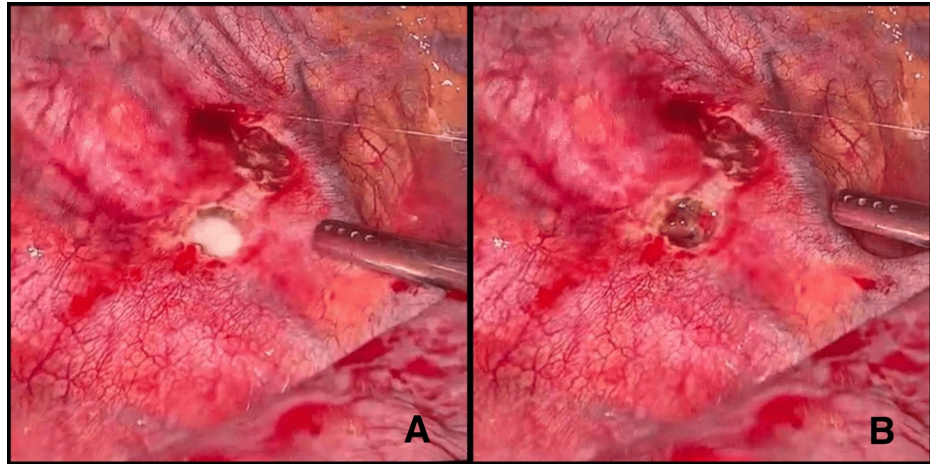


FIGURE 2: Lymphatic fistula

Chyle discharge in the sympathetic chain region through a lymphatic fistula, allowing for the identification of an anomalous thoracic duct (A). Lymphatic fistula following aspiration of chylous fluid (B).

The anomalous thoracic duct was dissected, with inferior and superior clipping of the duct (Figures 3A, 3B). The surgery was completed with the insertion of a chest drain and layered closure of the wound. No complications occurred intraoperatively. During postoperative follow-up, the patient remained stable and on a low-fat diet. Daily drainage was between 50 and 75 mL/day, and the chest tube was removed on the third postoperative day. The patient was discharged without any further complications.

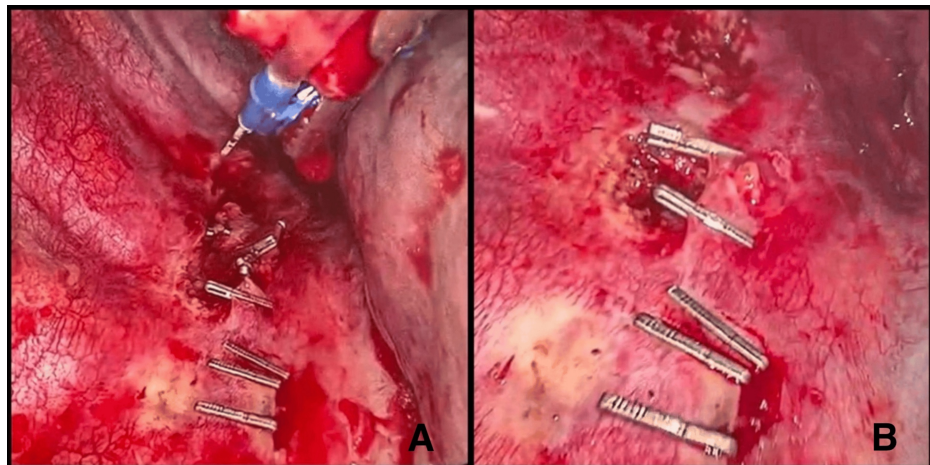


FIGURE 3: Clipping of the anomalous thoracic duct

Dissection of the anomalous thoracic duct, with inferior and superior clipping (A). Result of clipping of the anomalous thoracic duct (B).

Discussion

Chylothorax, although a common complication after thoracic surgery, is rare following thoracic sympathectomy, with limited reports in the literature, particularly on the right side of the thorax. In a review of the PubMed database, we identified only one case report of right-sided chylothorax after sympathectomy [1], with a similar approach to our case. Sapmaz et al. reported a case of a 23-year-old male who developed right-sided chylothorax after thoracic sympathectomy. Diagnostic video-assisted exploration of the right hemithorax revealed a chyle leak at the R4 level, which was controlled with vascular clips [1].

Hyperhidrosis is a disorder characterized by excessive and uncontrollable sweating, diffuse or localized, beyond the body's physiological needs. It can be classified as primary or secondary [2]. Primary hyperhidrosis is idiopathic and related to the hyperactivation of sympathetic nerves, typically affecting specific areas of the body, most often the axillae, palms of the hands, soles of feet, or the craniofacial region. Secondary hyperhidrosis usually results from complications of underlying diseases or medical conditions. Although not fatal, hyperhidrosis has a substantial impact on patients' lives, causing embarrassment and psychosocial disorders, which result in reduced quality of life [2,3].

Conservative treatments for PFH do not guarantee satisfactory results, with success rates considerably lower compared to the curative outcomes of surgical procedures [3]. Therefore, blocking the thoracic sympathetic branches through thoracic sympathectomy or sympathicotomy is considered the most widely accepted treatment for PFH. Sympathicotomy is regarded as the optimal treatment for primary hyperhidrosis due to its shorter operative time, reduced compensatory sweating, and fewer adverse effects related to compensatory sweating. This procedure is considered less invasive than sympathectomy, as it involves cutting part of the nerve rather than removing or destroying a portion of the sympathetic chain. These procedures are performed thoracoscopically, typically accessing the sympathetic chain between the third and fourth ribs [1,7].

Among the advantages of video-assisted thoracoscopic surgery (VATS) are a shorter hospital stay, lower intensity of postoperative pain, faster recovery, and better aesthetic results [3]. However, in addition to frequent complications such as pneumothorax and compensatory hyperhidrosis, this procedure can present atypical complications, including Horner's syndrome, large vessel injury, and brachial plexus injury [1,8]. Chylothorax is a rare complication following thoracic sympathectomy. This condition is caused by obstruction or extravasation of the TD or its branches, leading to the accumulation of lymphatic fluid in the pleural cavity [9].

The origin of the TD is found in the cisterna chyli, an abdominal structure that drains the lymphatic vessels of the intestine, pelvis, and lower limbs, and serves as the main conduit for fat absorbed by the digestive system [10]. The TD enters the thorax through the aortic hiatus, located in the posterior part of the diaphragm, and runs to the right side of the midline between the aorta and the azygos vein. It ascends through the posterior mediastinum and, at the level of T5-T6, crosses to the left of the midline, continuing superiorly before arching and ending at the junction between the left subclavian and jugular veins [10,11]. The TD can present several anatomical variations, considering that it can have many collateral canals and be drained into the intercostal veins or azygos veins [1,10].

Due to these anatomical variations, the TD and its branches can be injured during thoracic surgeries, leading to the occurrence of chylothorax. Because of the anatomy of the TD's course, injuries above the thoracic plane typically cause left-sided chylothorax, while injuries below the thoracic plane usually result in right-sided chylothorax. Bilateral chylothorax can occur with injuries at the level of the thoracic plane [11]. Therefore, in the case of complications from thoracic surgery, left-sided chylothorax is commonly expected. However, in our case, due to an anomalous TD located on the right side of the chest, our patient developed right-sided chylothorax (FIGURE 4).

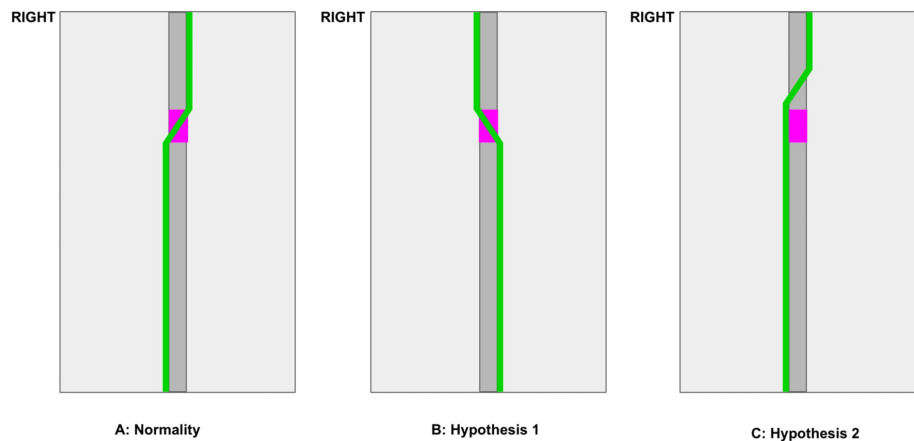


FIGURE 4: Line diagram showing the normal origin and termination of the thoracic duct, along with possible anomalous courses of the duct

A: Normal anatomy: the thoracic duct (green) enters the thoracic region, in a cranial direction on the right, through the diaphragmatic hiatus and follows the spinal column, crossing to the left side between the fifth and sixth thoracic vertebrae (pink) until reaching the left subclavian artery.

In the case presented, there are two possible hypotheses:

B: Hypothesis 1: the thoracic duct is completely inverted, ascending paravertebrally to the left and, between the fifth and sixth vertebrae, passing to the right side and reaching the right subclavian artery.

C: Hypothesis 2: the thoracic duct crosses more cranially than usual (above the fifth thoracic vertebra).

Preoperative imaging is essential for identifying anatomical variations of the TD, contributing significantly to the prevention of complications such as chylothorax in thoracic surgeries. This type of imaging provides essential information about the location and anatomy of the TD, helping surgeons avoid injuries during the procedure. Imaging techniques that can provide details about the anatomy of the TD include magnetic resonance ductography, computed tomography, and lymphangiography [12].

Postoperative chylothorax is suspected when chest tube drainage becomes persistent and develops a milky or turbid appearance. The diagnosis is confirmed by laboratory analysis of pleural fluid, with triglycerides measurement. A pleural fluid triglyceride concentration greater than 110 mg/dL is generally diagnostic of chylothorax [13].

Treatment options for chylothorax include conservative management with a diet enriched with medium-chain triglycerides or total parenteral nutrition, combined with effective pleural fluid drainage, somatostatin or octreotide therapy, or surgical intervention, as demonstrated in our case [14]. Dietary modification helps reduce chyle flow through the TD and promotes spontaneous closure of the leak site [13]. Drainage facilitates lung re-expansion and apposition of the pleura over the fistula, speeding up its closure. However, persistent leakage of more than 1000 mL/day, as observed in our case, indicates high-output chylothorax, with little chance of spontaneous resolution, indicating surgical treatment [15]. Definitive treatments include thoracoscopic pleurodesis, TD embolization, or TD ligation, which can be performed via open thoracotomy or video-assisted thoracoscopy [15].

Intraoperative identification of the fistula in the TD can be challenging, especially in cases with rare anatomical variations. Administering cream or oil approximately one hour before surgery, either orally or via a nasogastric tube, promotes the formation of milky fluid (chyle), which helps identify the leakage point during surgery [13]. Ligation can be performed using traditional suturing or clipping techniques. After surgical treatment, a rapid reduction in chest drain output is expected. Before removing the drain, a high-fat meal is administered to verify if the TD fistula has closed. If there is no increase in the volume of secretion, the surgical treatment is considered successful [10].

Conclusions

In conclusion, although thoracic sympathectomy is considered a safe surgical procedure with a high success rate, uncommon complications such as chylothorax should be taken into account. Chylothorax is a rare complication after this procedure, particularly on the right side of the thorax. The TD, which can be visualized using magnetic resonance ductography or conventional lymphangiography, may exhibit anatomical variations along its course. Therefore, it is essential for thoracic surgeons to be familiar with the

origin, typical course, and clinically relevant anatomical variations of the TD. In suspected cases, the anatomical variations of the TD should be considered and evaluated through imaging techniques prior to surgery, enabling early and effective diagnosis and treatment of potential chylothorax.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Amanda Tollini de Moraes, André Amate Neto, Felipe Ramos Camargo Preto, Tales Rubens de Nadai

Acquisition, analysis, or interpretation of data: Amanda Tollini de Moraes, Sarah Lopes Salomão

Drafting of the manuscript: Amanda Tollini de Moraes, Sarah Lopes Salomão

Critical review of the manuscript for important intellectual content: Amanda Tollini de Moraes, André Amate Neto, Felipe Ramos Camargo Preto, Tales Rubens de Nadai

Supervision: André Amate Neto, Tales Rubens de Nadai

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. Human Research Ethics Committee of the Hospital for Rehabilitation of Craniofacial Anomalies of the University of São Paulo (CEP-HRAC-USP) issued approval 6.981.426. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

André Amate Neto and Amanda Tollini de Moraes contributed equally to the work and should be considered co-first authors.

References

1. Sapmaz E, Karataş O, Işık H: Right chylothorax after thoracic sympathectomy: a very rare case . *Turk Gogus Kalp Damar Cerrahisi Derg.* 2018, 26:484-6. [10.5606/tgkdc.dergisi.2018.15313](https://doi.org/10.5606/tgkdc.dergisi.2018.15313)
2. Bellet JS: Diagnosis and treatment of primary focal hyperhidrosis in children and adolescents . *Semin Cutan Med Surg.* 2010, 29:121-6. [10.1016/j.sder.2010.05.004](https://doi.org/10.1016/j.sder.2010.05.004)
3. Nicolini EM, Costa VO, Montessi J, et al.: Video-assisted thoracic sympathectomy: literature review . *Rev Col Bras Cir.* 2019, 46:2157. [10.1590/0100-6991e-20192157](https://doi.org/10.1590/0100-6991e-20192157)
4. Thoracic duct and chylothorax: general considerations . (2024). Accessed: March 7, 2024; <https://medicine.uiowa.edu/iowaprotocols/thoracic-duct-and-chylothorax-general-considerations>.
5. Rabattu PY, Sole Cruz E, El Housseini N, et al.: Anatomical study of the thoracic duct and its clinical implications in thoracic and pediatric surgery, a 70 cases cadaveric study. *Surg Radiol Anat.* 2021, 43:1481-9. [10.1007/s00276-021-02764-z](https://doi.org/10.1007/s00276-021-02764-z)
6. Cheng WC, Chang CN, Lin TK: Chylothorax after endoscopic sympathectomy: case report . *Neurosurgery.* 1994, 35:330-2. [10.1227/00006123-199408000-00025](https://doi.org/10.1227/00006123-199408000-00025)
7. Mohebbi HA, Mehrvarz S, Manoochehy S: Thoracoscopic sympathectomy vs sympathectomy in primary hyperhidrosis. *Trauma Mon.* 2012, 17:291-5. [10.5812/traumamon.6335](https://doi.org/10.5812/traumamon.6335)
8. Dumont P: Side effects and complications of surgery for hyperhidrosis . *Thorac Surg Clin.* 2008, 18:193-207. [10.1016/j.thorsurg.2008.01.007](https://doi.org/10.1016/j.thorsurg.2008.01.007)
9. Zhang RG, Liu YM, Yao ZY, et al.: Risk factors of chylothorax after congenital heart surgery in infants: a single-centre retrospective study. *Ther Clin Risk Manag.* 2024, 20:161-8. [10.2147/TCRM.S436991](https://doi.org/10.2147/TCRM.S436991)
10. Vaz MA, Fernandes PP: Chylothorax. *J Bras Pneumol.* 2006, 32:197-203. [10.1590/S1806-37132006000900006](https://doi.org/10.1590/S1806-37132006000900006)
11. Bhatnagar M, Fisher A, Ramsaroop S, et al.: Chylothorax: pathophysiology, diagnosis, and management-a comprehensive review. *J Thorac Dis.* 2024, 16:1645-61. [10.21057/jtd-23-1636](https://doi.org/10.21057/jtd-23-1636)
12. Johnson OW, Chick JFB, Chauhan NR, et al.: The thoracic duct: clinical importance, anatomic variation, imaging, and embolization. *Eur Radiol.* 2016, 26:2482-93. [10.1007/s00330-015-4112-6](https://doi.org/10.1007/s00330-015-4112-6)
13. Samanidis G, Kourelis G, Bounta S, et al.: Postoperative chylothorax in neonates and infants after congenital heart disease surgery-current aspects in diagnosis and treatment. *Nutrients.* 2022, 14:1805. [10.3390/nu14091805](https://doi.org/10.3390/nu14091805)
14. Panthongviriyakul C, Bines JE: Post-operative chylothorax in children: an evidence-based management algorithm. *J Paediatr Child Health.* 2008, 44:716-21. [10.1111/j.1440-1754.2008.01412.x](https://doi.org/10.1111/j.1440-1754.2008.01412.x)

15. Schild HH, Strassburg CP, Welz A, et al.: Treatment options in patients with chylothorax . Dtsch Arztebl Int. 2013, 110:819-26. [10.3238/arztebl.2013.0819](https://doi.org/10.3238/arztebl.2013.0819)