

Unusual airway obstruction due to thoracic duct injury after whiplash injury

 Dae Sung Ma, M.D.,¹  Sung Wook Chang, M.D.,¹  Dong Hun Kim, M.D.²

¹Department of Thoracic and Cardiovascular Surgery, Trauma Center, Dankook University Hospital, Cheonan-Republic of Korea

²Department of Surgery, Trauma Center, Dankook University Hospital, Cheonan-Republic of Korea

ABSTRACT

Traumatic chylothorax is a rare condition following blunt trauma. Although a chyle leak resulting from direct damage to the duct may occur at any level because of an anatomical variation, an airway obstruction due to thoracic duct injury after blunt trauma has never been described. Here, we report a very unusual case with airway obstruction due to thoracic duct injury after whiplash injury. A 60-year-old man presented to the emergency department with allodynia after blunt trauma. Initial chest computed tomography (CT) showed a prevertebral hematoma and pneumomediastinum from C2 to T3 spinal level without vertebral fracture. Seven days later, repeat CT showed an increased amount of mediastinal and prevertebral fluid collection extending to the upper neck level with airway compression. He underwent an operation to drain the fluid via a neck incision and a thoracic duct ligation via right thoracotomy and was discharged without complaint. The findings suggest that if hematoma and pneumomediastinum are found in the prevertebral space at the level of the cervical and upper thoracic spine, the patient should be closely observed to exclude the complication of airway obstruction caused by thoracic duct injury.

Keywords: Airway obstruction; chylothorax; injuries, thoracic duct; trauma.

INTRODUCTION

Traumatic chylothorax is a rare condition after blunt trauma and it can be sub-classified into iatrogenic or non-iatrogenic causes.^[1-7] During neck dissection or thoracic surgery, a chyle leak resulting from direct damage to the duct may occur at any level, such as in the neck and the thoracic cavity.^[1,3,7] When it is not related to surgery, it is often associated with spinal fractures from hyperextension injury.^[2,8-10] In addition, the damage to the thoracic duct usually results in the accumulation of a large amount of fluid in the pleural space because of its anatomical position.^[2,6] Although there are several anatomical variations of the thoracic duct, airway obstruction due to chylothorax without a vertebral fracture after blunt trauma has never been reported. Here, we describe a very unusual case with airway obstruction due to thoracic duct injury after blunt trauma.

CASE REPORT

A 60-year-old man presented to the emergency department after being injured in a high-speed car accident, and he was inside the car. Physical examination revealed tenderness on the left lateral thoracic wall with bruise and allodynia on both upper arms without fracture. Initial chest computed tomography (CT) showed a mediastinal and prevertebral fluid collection with pneumomediastinum and left 4th-5th rib fractures on the lateral arc with scanty hemopneumothorax (Fig. 1a). Magnetic resonance imaging (MRI) showed prevertebral hematoma from C2 to thoracic spinal level without abnormal signal intensity in the spinal cord and bone (Fig. 1b). We recommended admission for closer observation, but the patient chose to leave the hospital against medical advice.

Cite this article as: Ma DS, Chang SW, Kim DH. Unusual airway obstruction due to thoracic duct injury after whiplash injury. *Ulus Travma Acil Cerrahi Derg* 2021;27:478-482.

Address for correspondence: Sung Wook Chang, M.D.
201 Manghyangro, Dongnam-gu 31116 Cheonan-si - South Korea
Tel: +82 41-550-6195 E-mail: changsw3@naver.com

Ulus Travma Acil Cerrahi Derg 2021;27(4):478-482 DOI: 10.14744/tjtes.2020.08055 Submitted: 08.02.2020 Accepted: 23.03.2020

Copyright 2021 Turkish Association of Trauma and Emergency Surgery



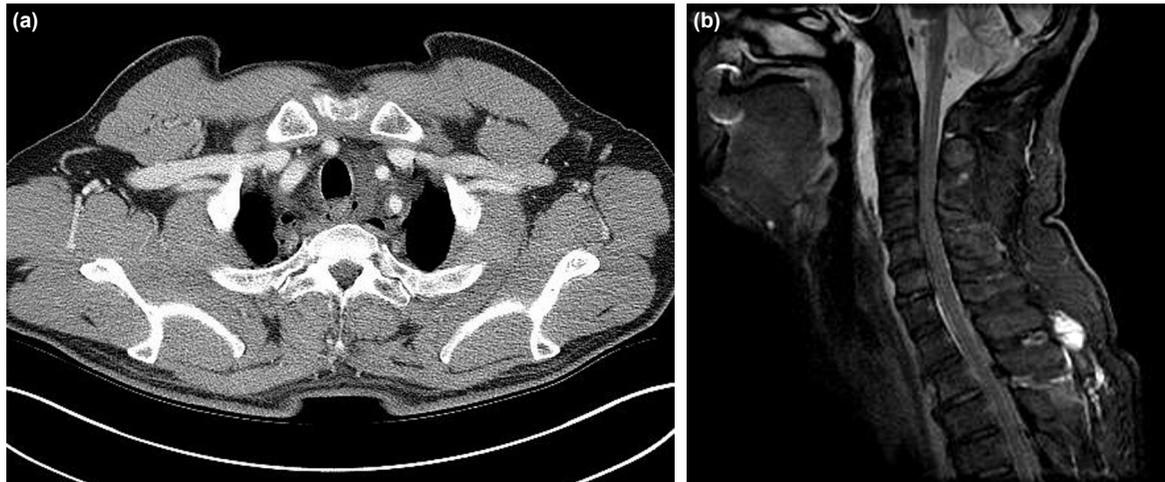


Figure 1. (a) Initial computed tomography (CT) scan of the chest shows a mediastinal and prevertebral fluid collection, pneumomediastinum without fracture of the thoracic spine. (b) The sagittal T2 weighted magnetic resonance imaging (MRI) of cervical and upper thoracic spine shows prevertebral hematoma from C2 to thoracic spinal level and low-grade partial tear in paravertebral muscle from C7 to T3 spinal level.

Seven days later, he came back to our hospital with severe dyspnea accompanied by a stridor. The point-of-care ultrasonography for thorax and portable chest X-ray revealed massive bilateral pleural effusions. His initial vital signs were as follows: blood pressure, 174/81 mmHg; heart rate, 98 beats/min; respiratory rate, 30 breaths/min; oxygen saturation, 80%; body temperature, 36.8°C. We performed bilateral closed thoracostomy and endotracheal intubation simultaneously. Initially, 960 ml of milky fluid on the right hemithorax and 860 ml on the left hemithorax were drained after thoracostomy. Results of chemical examination of pleural fluid were as follows: pH, 7.5; protein, 3 g/dL; LDH, 636 IU/L; cholesterol, 71 mg/dL; triglycerides, 368 mg/dL. Fluid chylomicron concentration test was not available at our hospital, so the diagnosis of chylothorax was made on the basis of the fluid chemistry. Compared to previous chest CT, the CT showed an increased amount of mediastinal and prevertebral fluid collection with pneumomediastinum extending to upper neck

level and airway compression and left internal jugular vein (Fig. 2). A day later, a neck CT was performed to evaluate the status of fluid collection at the level of the upper neck (Fig. 3). Despite closed thoracostomy, fluid was retained with airway compression and the vessel in the retropharyngeal space extending to the superoposterior mediastinal space. The patient underwent an operation to drain the fluid. The collar incision that we used showed yellowish, watery fluid, which was suspected to be chylomediastinum in the retropharyngeal space, but the active leakage point was not identified. After a catheter was placed to drain the fluid, postoperative conservative management involving parenteral nutrition and restriction of oral intake was continued. Although 1300–1800 mL of fluid was drained from the neck and thorax, the fluid persisted in the left hemithorax for three days. Additionally, percutaneous drainage and octreotide injection were started, but the amount of drained chyle did not decrease for three days. On hospital day 4, we decided to perform intranodal lymphan-

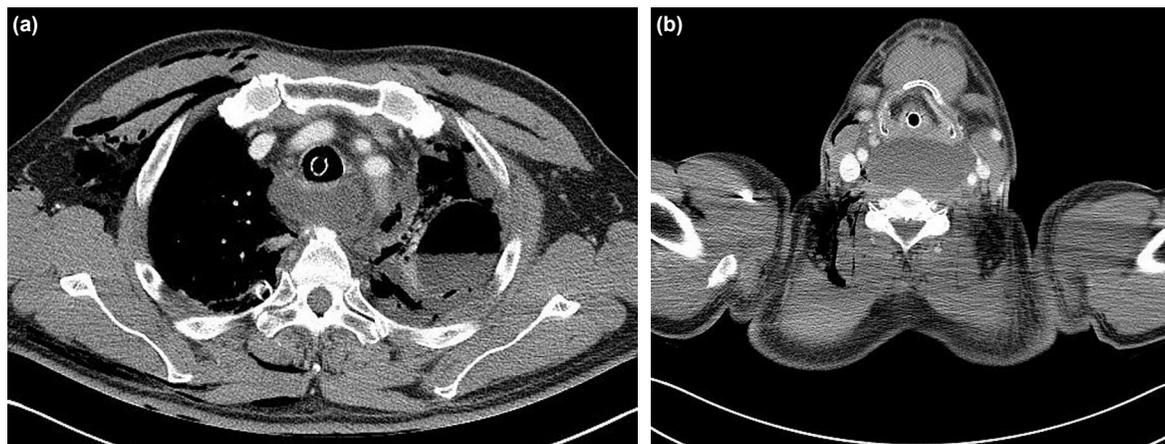


Figure 2. (a) Follow-up computed tomography (CT) scan of the chest shows an increase in the size of the prevertebral hematoma with pneumomediastinum, and multi-loculated air-containing pleural effusion. (b) Follow-up computed tomography (CT) scan of the neck shows an increase in the size of the mediastinal fluid collection extending to upper neck level, compressing left internal jugular vein and upper airway.



Figure 3. Repeated follow-up computed tomography (CT) scan of the neck shows fluid collection in retropharyngeal space to superior-posterior mediastinal space.

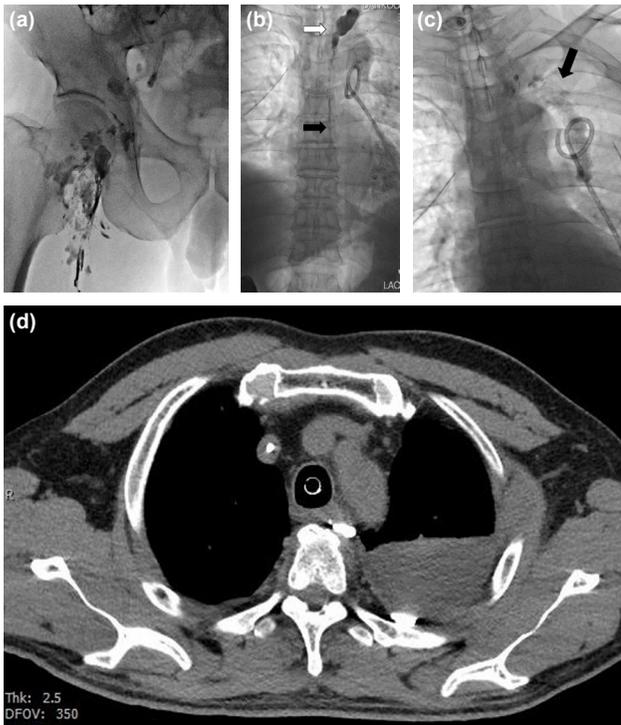


Figure 4. (a) Intranodal lymphangiography through the right inguinal lymph node with warm ethiodized oil shows an inguinal lymph node. (b) Intranodal lymphangiography shows a thoracic duct (black arrow) and drainage to the left subclavian vein (white arrow). (c) Intranodal lymphangiography shows an oil leakage from the injured upper thoracic duct of left hemithorax (black arrow). (d) After intranodal lymphangiography, a follow-up computed tomography (CT) scan of the chest shows a contrast leakage at upper thoracic duct level of lymphatics and a small amount of extravasated contrast material in the left pleural space.

giography, which is a therapeutic option to cease the chyle leakage as well as a tool to diagnose the point of leakage.

A right inguinal lymph node was punctured with a 25-gauge spinal needle under ultrasound guidance and warm ethio-

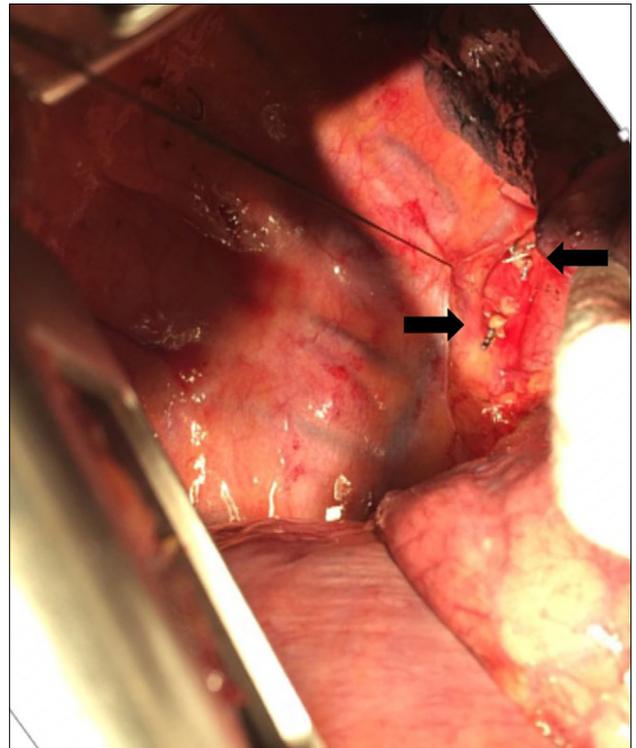


Figure 5. Intraoperative findings show the thoracic duct that was cut and ligated using multiple clips (black arrow).

dized oil (Lipiodol: Guerbet, Paris, France) was injected manually (Fig. 4a). The injected volume was 7.2 mL and we found oil leakage at the level of the upper thoracic spine (Fig. 4b and 4c). Unfortunately, intranodal lymphangiography with Lipiodol did not result in cessation of the chyle leak and a follow-up computed tomography (CT) scan of the chest shows an extravasated contrast material in the left pleural space (Fig. 4d).

We decided to ligate the thoracic duct via video-assisted thoracoscopic surgery (VATS) using three ports on hospital day 10. VATS showed multiple loculated chyle collections and severe pleural adhesion, so we made an additional incision in the 9th intercostal space (ICS) for a thoracotomy. The thoracic duct was identified, and then this was excised and ligated with clipping (Fig. 5). On the first postoperative day, chest and neck drainage volumes decreased to 150 mL/day in total. On a postoperative day 3, the patient was started on a normal dietary regime, and all drains were removed on postoperative day 6. The patient was discharged and followed for one year without any complaints.

DISCUSSION

The thoracic duct begins in the cisterna chyli and extends to the root of the neck near the junction of the left subclavian vein and the left internal jugular vein.^[2,6] Usually, the duct crosses from the right side to the left side at the level of the fourth to sixth thoracic vertebrae.^[2,6] Injuries below that level lead to a right chylothorax, while injuries above that level lead to a left chylothorax. If chyle accumulates in

the mediastinum, the chylothorax may develop bilaterally.^[2,11] Also, the chylothorax has been reported in the case with thoracic spine or posterior rib fractures.^[2,6] Therefore, the clinical manifestations depend on the level and extent of the injury. In this case, initial chest CT revealed pneumomediastinum and fluid collection at the prevertebral space in the thorax. Also, MRI demonstrated the prevertebral hematoma from C2 to the thoracic spine level without abnormal signal intensity in the spinal cord or bone. Even if these findings are not associated with a fracture, they may be a clue to thoracic duct injury resulting in bilateral chylothorax extending to the neck. A rapid accumulation of chyle may result in airway obstruction through the prevertebral space owing to a previous hematoma, and a large amount of chyle in the neck may not be drained through a bilateral closed thoracostomy, as in this case.

In a patient with post-traumatic chylothorax, conservative management is recommended as the initial treatment.^[1–3,5,10,12] As an alternative to surgery, several cases have been reported on the role of thoracic duct lymphangiography and embolization, which have suggested that lipiodol induces an inflammatory reaction during its leak, resulting in cessation of chyle leakage. However, these are not always widely available.^[6,7,13–15] We have previously seen a case that was successfully treated by the closure of the duct after intranodal lymphangiography. Thus, we decided to perform lymphangiography, which is a therapeutic option, as well as a tool to diagnose the point of leakage. The intranodal lymphangiography showed the leakage point at an upper thoracic spinal level between the aortic arch and the esophagus, but the closure of the duct after intranodal lymphangiography was unsuccessful.

Most authors would agree that surgical treatment should be considered for patients with failed conservative management or a minimally invasive technique.^[2–4,6] As an anatomical aspect of the surgical approach, the right-sided supradiaphragmatic approach is favored because the descending thoracic aorta may lead to technical difficulties in identifying the thoracic duct on the left side; consequently, thoracic duct ligation via an approach from the right offers a 90% success rate.^[1,2,5,6,16] In this case, we initially performed the exploration for drainage via a neck incision at first because the chyle could not be drained and airway obstruction could not be improved after bilateral thoracostomy. Despite treatment for 10 days, over 1000 mL of fluid had to be drained daily, so we decided to perform a thoracic duct ligation in addition.

In summary, a chyle leak from thoracic duct injury is rare but is a potentially severe complication. Rapid loss of chyle could be associated with hypovolemia and respiratory difficulty, so it should be diagnosed and treated promptly in cases with suspected chylothorax. It is noteworthy that a mediastinal and prevertebral fluid collection with pneumomediastinum on chest and neck CT may arise from by thoracic duct injury. Therefore, all patients should be informed of the need for

closer observation to detect any significant progress, such as airway obstruction caused by thoracic duct injury, even if a fracture of the spinal column is not detected.

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

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: S.W.C.; Design: S.W.C.; Supervision: D.S.M.; Data: D.S.M.; Analysis: D.S.M.; Literature search: S.W.C.; Writing: S.W.C., D.H.K.; Critical revision: S.W.C, D.H.K.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Abdel-Galil K, Milton R, McCaul J. High output chyle leak after neck surgery: the role of video-assisted thoracoscopic surgery. *Br J Oral Maxillofac Surg* 2009;47:478–80. [\[CrossRef\]](#)
2. McGrath EE, Blades Z, Anderson PB. Chylothorax: aetiology, diagnosis and therapeutic options. *Respir Med* 2010;104:1–8. [\[CrossRef\]](#)
3. Ilczyszyn A, Ridha H, Durrani AJ. Management of chyle leak post neck dissection: a case report and literature review. *J Plast Reconstr Aesthet Surg* 2011;64:e223–30. [\[CrossRef\]](#)
4. Seitelman E, Arellano JJ, Takabe K, Barrett L, Faust G, Angus LD. Chylothorax after blunt trauma. *J Thorac Dis* 2012;4:327–30.
5. Sendama W, Shipley M. Traumatic chylothorax: A case report and review. *Respir Med Case Rep* 2015;14:47–8. [\[CrossRef\]](#)
6. Pillay TG, Singh B. A review of traumatic chylothorax. *Injury* 2016;47:545–50. [\[CrossRef\]](#)
7. Toriyama K, Kokuho N, Yajima C, Kawagoe J, Togashi Y, Tsuji T, et al. Chylothorax after spinal fusion surgery: A case report and literature review. *Respir Med Case Rep* 2019;26:260–4. [\[CrossRef\]](#)
8. Sriprasit P, Akaraborworn O. Chylothorax after Blunt Chest Trauma: A Case Report. *Korean J Thorac Cardiovasc Surg* 2017;50:407–10. [\[CrossRef\]](#)
9. Brown SR, Fernandez C, Bertellotti R, Asensio JA. Blunt rupture of the thoracic duct after severe thoracic trauma. *Trauma Surg Acute Care Open* 2018;3:e000183. [\[CrossRef\]](#)
10. Benato C, Magnanelli G, Terzi A, Scanagatta P, Bonadiman C, Calabrò F. Very unusual case of post-traumatic chylothorax. *Ann Thorac Surg* 2006;81:1488–91. [\[CrossRef\]](#)
11. Kozul C, Jassal K, Judson R. Massive bilateral chylothorax post blunt trauma. *Trauma Case Rep* 2017;12:63–5. [\[CrossRef\]](#)
12. Kumar S, Mishra B, Krishna A, Gupta A, Sagar S, Singhal M, et al. Nonoperative management of traumatic chylothorax. *Indian J Surg* 2013;75:465–8. [\[CrossRef\]](#)
13. Lee EW, Shin JH, Ko HK, Park J, Kim SH, Sung KB. Lymphangiography to treat postoperative lymphatic leakage: a technical review. *Korean J Radiol* 2014;15:724–32. [\[CrossRef\]](#)
14. Chang SW, Kim BM, Ryu KM, Ryu JW. Intranodal lymphangiography as a possible therapeutic option for patients with isolated thoracic duct injury from penetrating chest trauma. *J Thorac Dis* 2015;7:E499–501.
15. Matsumoto T, Yamagami T, Kato T, Hirota T, Yoshimatsu R, Masunami T, et al. The effectiveness of lymphangiography as a treatment method for various chyle leakages. *Br J Radiol* 2009;82:286–90. [\[CrossRef\]](#)
16. Patterson GA, Todd TR, Delarue NC, Ilves R, Pearson FG, Cooper JD. Supradiaphragmatic ligation of the thoracic duct in intractable chylous fistula. *Ann Thorac Surg* 1981;32:44–9. [\[CrossRef\]](#)

OLGU SUNUMU - ÖZ

Whiplash (kamçı) yaralanması sonrası torasik kanal yaralanmasına bağlı olağan dışı solunum yolu tıkanıklığı**Dr. Dae Sung Ma,¹ Dr. Sung Wook Chang,¹ Dr. Dong Hun Kim²**¹Dankook Üniversite Hastanesi, Travma Merkezi, Göğüs Kalp ve Damar Cerrahisi Bölümü, Cheonan-Kore Cumhuriyeti²Dankook Üniversite Hastanesi, Travma Merkezi, Cerrahi Bölümü, Cheonan-Kore Cumhuriyeti

Travmatik şilotoraks, künt travmayı takiben nadir görülen bir durumdur. Anatomik bir varyasyon nedeniyle herhangi bir seviyede kanala doğrudan hasar sonucu lenfatik sıvı sızıntısı meydana gelebilse de, künt travma sonrası torasik kanal yaralanmasına bağlı bir solunum yolu tıkanıklığı hiç tanımlanmamıştır. Bu yazıda, whiplash yaralanması sonrası torasik kanal yaralanmasına bağlı solunum yolu tıkanıklığı gelişen olağan dışı bir olguyu sunuyoruz. Altmış yaşında erkek hasta künt travma sonrası alodini ile acil servise başvurdu. Başlangıç toraks bilgisayarlı tomografisinde (BT) vertebral kırık eşlik etmeyen, C2'den T3 spinal seviyesine kadar bir prevertebral hematoma ve pnömomediastinum görüldü. Yedi gün sonra çekilen BT'de, solunum yolunun kompresyonuyla beraber üst boyun seviyesine uzanan artmış miktarda mediastinal ve prevertebral sıvı birikimi gösterdi. Hasta, sağ torakotomi yoluyla torasik kanal ligasyonu ve boyun insizyonu yoluyla sıvının boşaltılması için ameliyat edildi ve şikayeti olmadan taburcu edildi. Prevertebral boşlukta servikal ve üst torasik omurga seviyesinde hematoma ve pnömomediastinum bulunduğu, torasik kanal yaralanmasının neden olduğu solunum yolu tıkanıklığı komplikasyonunu dışlamak için hasta yakından izlenmelidir.

Anahtar sözcükler: Hava yolu tıkanıklığı; şilotoraks; torasik kanal; travma; yaralanmalar.

Ulus Travma Acil Cerrahi Derg 2021;27(4):478-482 doi: 10.14744/tjtes.2020.08055