Minimally invasive lobar preservation in the setting of spontaneous middle-lobe torsion

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Received for publication Sept 27, 2023; revisions received Nov 2, 2023; accepted for publication Nov 14, 2023; available ahead of print Nov 23, 2023.

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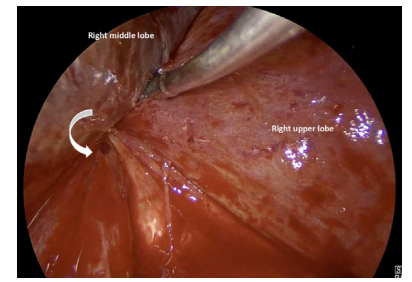
JTCVS Techniques 2024;23:154-7
2666-2507

https://doi.org/10.1016/j.xjtc.2023.11.009



Intraoperative image of torsed bronchovascular pedicle from posterior perspective.

CENTRAL MESSAGE

Spontaneous middle-lobe torsion is difficult to diagnose and can result in ischemia. A minimally invasive approach in this setting, as well as lobar preservation, are possible with prompt diagnosis.

Video clip is available online.

Pulmonary middle-lobe torsion is a rare event, most commonly occurring in patients who have previously undergone pulmonary resection.[1] Spontaneous lobar torsion is even more rare, presenting a diagnostic and surgical challenge. We present a case of a 51-year-old female patient with alcohol-related end-stage liver disease who presented to the hospital in respiratory failure and was found to have a right middle-lobe (RML) torsion. The patient provided consent for the publication of this study, and no institutional review board approval was required.

CASE REPORT

A 51-year-old female patient with alcohol-related liver disease and hepatic hydrothorax requiring regular thoracentesis, with a Model for End-stage Liver Disease score of 29, initially presented to a community hospital with respiratory failure. She was hypoxic and tachycardic with a leukocytosis and was admitted to the intensive care unit. Computed tomography (CT) scan of the chest revealed a large right hydrothorax and right lower-lobe (RLL) consolidation suggestive of pneumonia (Figure 1). She was given antibiotics and underwent therapeutic thoracentesis. She remained at the community hospital for 2 weeks, during which time her liver function declined further, with worsening international normalized ratio, thrombocytopenia, and rising bilirubin level. She was then transferred to our university-based institution for possible liver transplant. Admission CT scan of the abdomen incidentally identified complete consolidation of the RML and RLL and large pleural effusion. CT scan of the chest demonstrated an abrupt cutoff of the pulmonary vasculature to the RML concerning for torsion (Figure 2). We then proceeded

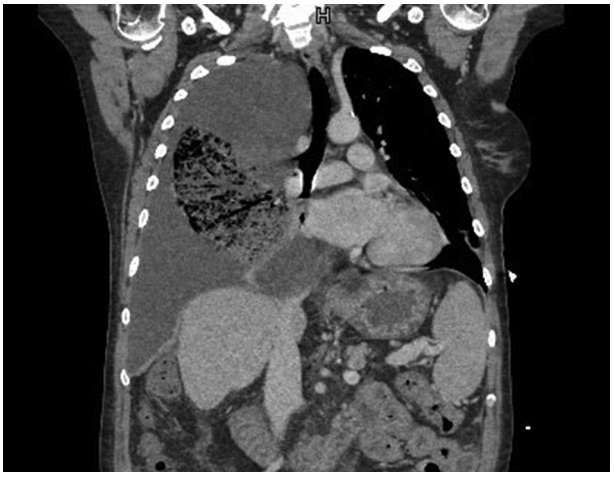


FIGURE 1. Computed tomography scan done at the outside hospital before admission to our institution demonstrates large effusion.

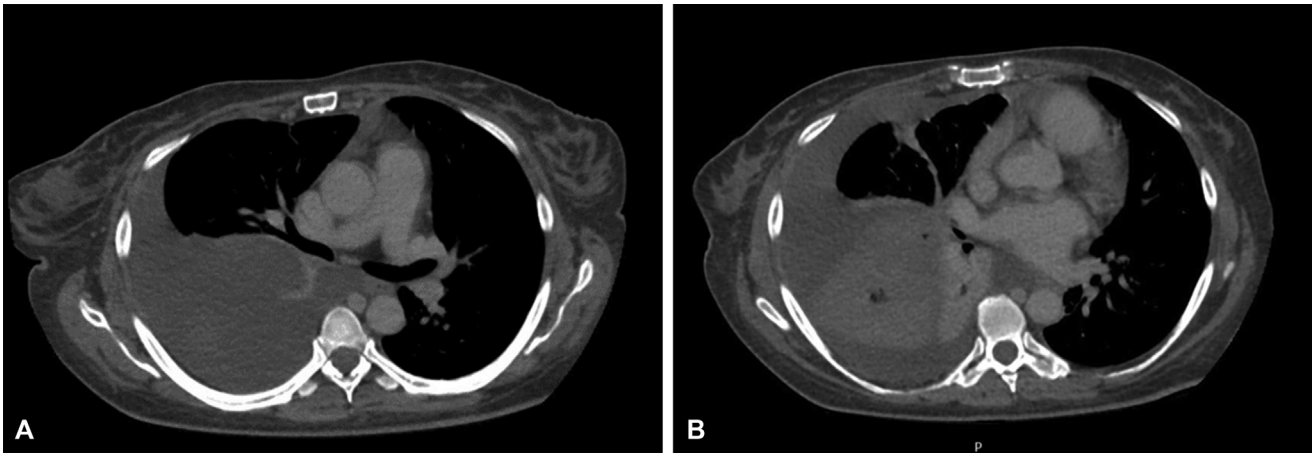


FIGURE 2. Computed tomography scan done preoperatively at our institution demonstrates: A, Abrupt cutoff of RML bronchovascular pedicle and large effusion. B, Posteriorly displaced RML and collapsed RLL. *RML*, Right middle lobe; *RLL*, right lower lobe.

emergently to the operating room for middle-lobe detorsion and possible lobectomy.

Preoperative bronchoscopy demonstrated a normal right main stem and right upper-lobe bronchus. The RML orifice was spiraled. We then proceeded with right thoracoscopy. The pleural space contained hemorrhagic effusion. The RML appeared engorged and in an unusually inferior position (Video 1). There was no fissural connection between the middle and upper lobes. The lower lobe appeared completely atelectatic. A 180° counterclockwise torsion was identified on examination of the anterior hilum, which displaced the RML inferiorly and posteriorly. The middle lobe was then rotated clockwise and successfully detorsed. The anesthesia team then noted blood in the endotracheal tube. Bronchoscopy was again performed, noting a normal bronchial tree but with blood in the RML orifice. We performed saline lavage until the effluent returned clear. The lungs were then inflated under direct thoracoscopic visualization. The RML was aerating normally and appeared pink, soft, and viable. A pexy at this point was considered; however, the RML remained somewhat engorged and the upper and lower lobes would not reach for a safe pexy. The decision was made to not perform a lobectomy at this point, given the considerable risk of lobectomy in a patient with end-stage liver disease.

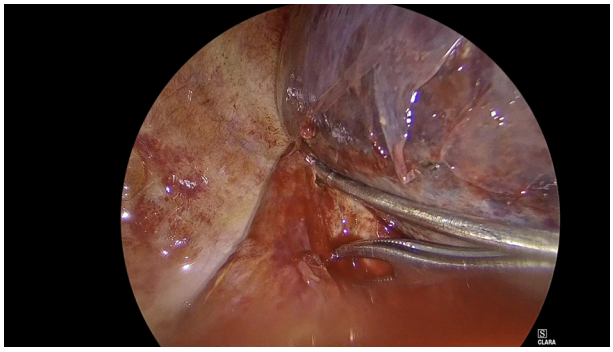
She was extubated on postoperative day 2 due to continued low-volume airway bleeding, which resolved. CT scan on postoperative day 7 demonstrated a normally aerated RML but with thrombosis of the pulmonary vasculature (Figure E1). However, the parenchyma appeared viable, likely supplied by bronchial arteries. The middle lobe was functionally excluded from the cardiopulmonary system. She was recovering very well, and the decision again was made to not perform a lobectomy. She was able to avoid the morbidity of a pulmonary resection, which allowed her prompt listing for liver transplantation. She has recovered well and has since received an orthotopic liver transplant.

DISCUSSION

Diagnosis of lobar torsion is notoriously difficult.[2] Radiographic findings on CT can be subtle and easily missed, especially in the absence of a full 360° torsion.[1,3,4]

There are some anatomic features that can predispose to RML torsion. These include a long bronchovascular pedicle, completely developed fissures, and a narrow RML hilum.[5] Our patient had a completely atelectatic RLL due to the preexisting hepatic hydrothorax along with a fully developed minor fissure. In the context of a large hydrothorax and critical illness, this increases the chance of torsion.[4]

Spontaneous RML torsion occurring in the setting of hepatic hydrothorax is uncommon.[4] Limited cases in the literature report lobar necrosis necessitating open lobectomy.[4] However, there are limited accounts of minimally



VIDEO 1. A short intraoperative video demonstrating the mobilization of the RML and detorsion. Video available at: https://www.jtcvs.org/article/S2666-2507(23)00460-1/fulltext.

invasive RML detorsion.[2] Reports of open lobectomy in this setting document complete lobar ischemia, abnormal anatomy, infection, bleeding, and critical illness.[3] Reports of minimally invasive management without resection are sparse and controversial.[2] Frank necrosis, anatomic variation, and lobar congestion can make addressing torsion difficult in a minimally invasive setting. In addition, difficulties in diagnosis often lead to a late presentation. Early diagnosis of our patient's condition allowed for thoracoscopic detorsion before significant lobar ischemia occurred.

Our patient had significant liver dysfunction and was at high risk of surgical complications. She was able to avoid the morbidity of a thoracotomy and lobectomy, which preserved her ability to promptly list for liver transplant. However, we did follow her closely in the hospital for several days before her discharge, understanding that any clinical deterioration would lead to another operation and lobectomy. This decision is not without risk. Re-expansion pulmonary edema, pneumonia, pulmonary embolism, reoperation, and respiratory failure are all possible outcomes.[2] Although lobectomy is often necessary in this scenario, this case supports the argument that avoiding pulmonary resection is a viable option on a case-dependent basis.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

References

1. Acharya MN, Haqzad YS, Rao JN, Socci L. Uniportal thoracoscopic management of middle lobe torsion after upper lobectomy. *Asian Cardiovasc Thorac Ann*. 2015; 23:1129-31. https://doi.org/10.1177/0218492315592994
2. Sakai M, Kurimori K, Saeki Y, Kitazawa S, Kobayashi K, Iguchi K, et al. Video-assisted thoracoscopic conservative repair of postoperative lobar torsion. *Ann Thorac Surg*. 2014;98:e119-21. https://doi.org/10.1016/j.athoracsur.2014.07.080
3. Felson B. Lung torsion: radiographic findings in nine cases. *Radiology.* 1987;162: 631-8. https://doi.org/10.1148/radiology.162.3.3809475
4. Donato BB, Sewell M, Harakeh HA, Sen A, Patel BM, Morgan P, et al. Spontaneous middle lobe torsion: an institutional case series. *J Thorac Cardiovasc Surg Tech*. 2023;20:176-81. https://doi.org/10.1016/j.xjtc.2023.04.006
5. Ohde Y, Nakagawa K, Okumura T, Kondo H. Spontaneous pulmonary torsion secondary to pseudo-Meigs' syndrome. *Interact Cardiovasc Thorac Surg*. 2005;4: 59-60. https://doi.org/10.1510/icvts.2004.096594

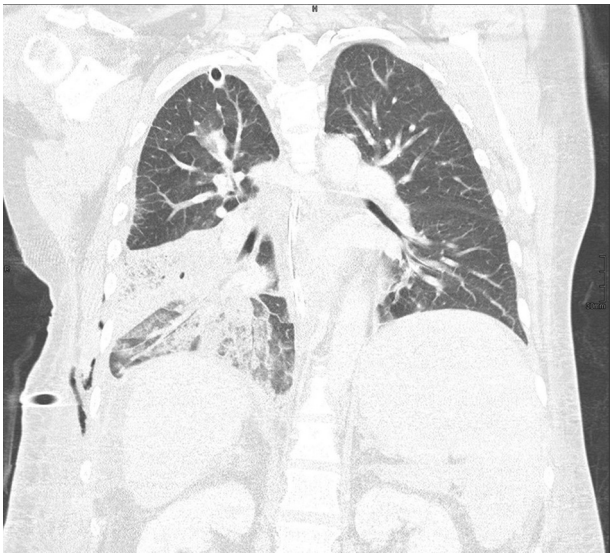


FIGURE E1. Computed tomography scan done on postoperative day 7 demonstrates thrombosis of pulmonary vasculature to RML but viable-appearing RML parenchyma and restoration of normal anatomy. *RML*, Right middle lobe.