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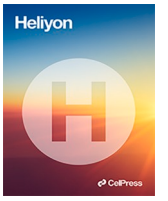

Case report

WHOLE-LUNG torsion following bilateral lung transplant, a rare complication: A case report

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ABSTRACT

Whole lung torsion following bilateral lung transplant is a rare complication. This case report describes the diagnostic difficulties and consequences in a 59 year old patient. This study also includes a brief description of other cases in the literature.

A 59-year-old patient underwent a bilateral lung transplant for pulmonary fibrosis associated with TERT mutation.

Surgery was performed as follows for both lungs: Double anterior thoracotomy under veno-arterial extracorporeal membrane oxygenation (ECMO). Stapling-Section of the trunk of the pulmonary artery and mediastinal artery using an automatic vascular forceps. Stapling-section of the two pulmonary veins using automatic vascular forceps. Pneumonectomy with a section of the recipient's right stem bronchus flush with the mediastinum. Opening of the pericardium and control of the left atrium. Section of the donor's stem bronchus a ring above the bifurcation with preservation of peribronchial tissue. Bronchial suture: continuous overlock. Clamping of the left atrium and anastomosis of the left atrium with a continuous overlock. Clamping of the pulmonary artery and performing the pulmonary arterial anastomosis using a continuous overlock. Performing purges, controlled ventilation of the lung, half-flow reperfusion for 10 minutes. There was no particular event during the surgery other than a significant discrepancy between the left main bronchus of the recipient and the donor; in particular, there was no mismatch between the size of the lungs and the thorax's recipient. The donor's predicted total lung capacity was 73% of the recipient's value. The first few days (Days 0–3) were marked by primary graft dysfunction and early Haemophilus influenzae pneumonia leading to prolonged veno-venous ECMO support.

Postoperative bronchoscopy revealed moderate ischemic bronchitis of the right lung, an atypical configuration in the upper lobe bronchus of the left lung just after the anastomosis and a smaller internal caliber of the lower lobe bronchus.

Because of difficult weaning and persistent pulmonary opacities on the chest ray of the left lung four days after the surgery, an enhanced CT scan was performed on day 3. A lack of enhancement of the pulmonary parenchyma and vessels of the left lower lobe was observed related to a twist of the left pulmonary artery associated with the interruption of the left bronchial tree (Fig. 1A).

Surgery was performed on Day 8: Revision of the left anterolateral thoracotomy. A rotation of the left lung, about 120° forward, with the culmen facing the thoracotomy and a tilt of the left lower lobe at the apex was noted. Nelson's segment infarction was observed (Fig. 1B). Detortion of the lung was performed to return to the anatomical position. Nelson's segment was left in place. Postoperative bronchoscopy revealed normal anatomy with moderate bilateral ischemic bronchitis.

Three days later (Day 11), an enhanced CT scan was performed showing persistent consolidation of the left lower lobe, with air

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bronchogram but without pulmonary parenchyma or vessel enhancement in the arterial or portal phase, corresponding to Nelson's segment infarction, which led to excision of this segment by lateral thoracotomy (Day 12). The evolution was marked by difficult ventilatory support weaning and multiple episodes of pneumonia leading to multiple organ failure and death (Day 28).

Discussion: Several cases of lobar twist [1–4] after lung transplant have been described, while to the best of our knowledge, only three cases of whole-lung torsion [5,6] (Table 1) have been reported, making this diagnosis a challenge for the physician. Because of potential dramatic complications, lung torsion following bilateral lung transplantation should be identified early. Several risk factors have been identified and should alert the physician in case of respiratory failure following lung transplant, including significant differences in size between the donor's lung and the recipient's chest, lobar resection, transection of the pulmonary ligament of the donor and ischemia–reperfusion injury [1].

In summary, any anatomic abnormality at bronchoscopy should lead to an urgent enhanced CT scan to seek CT scan signs of lobar vascular torsion (lack of pulmonary parenchymal and vessel enhancement and bronchial tree torsion). In the other case report diagnosis was made with a CT scan or fibroscopy, in one other case diagnosis was made intraoperative with transesophageal echography (TEE) showing elevated velocities in venous pulmonary flow. When diagnosed, this complication requires emergency surgical detorsion to avoid irreversible ischemic lung damage.

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Statement of Informed consent

Informed consent was acquired from the relative and the relative consent to the publishing of all images, clinical data, and other data included in the manuscript.

Data availibity statement

No data was used for the research described in this article.

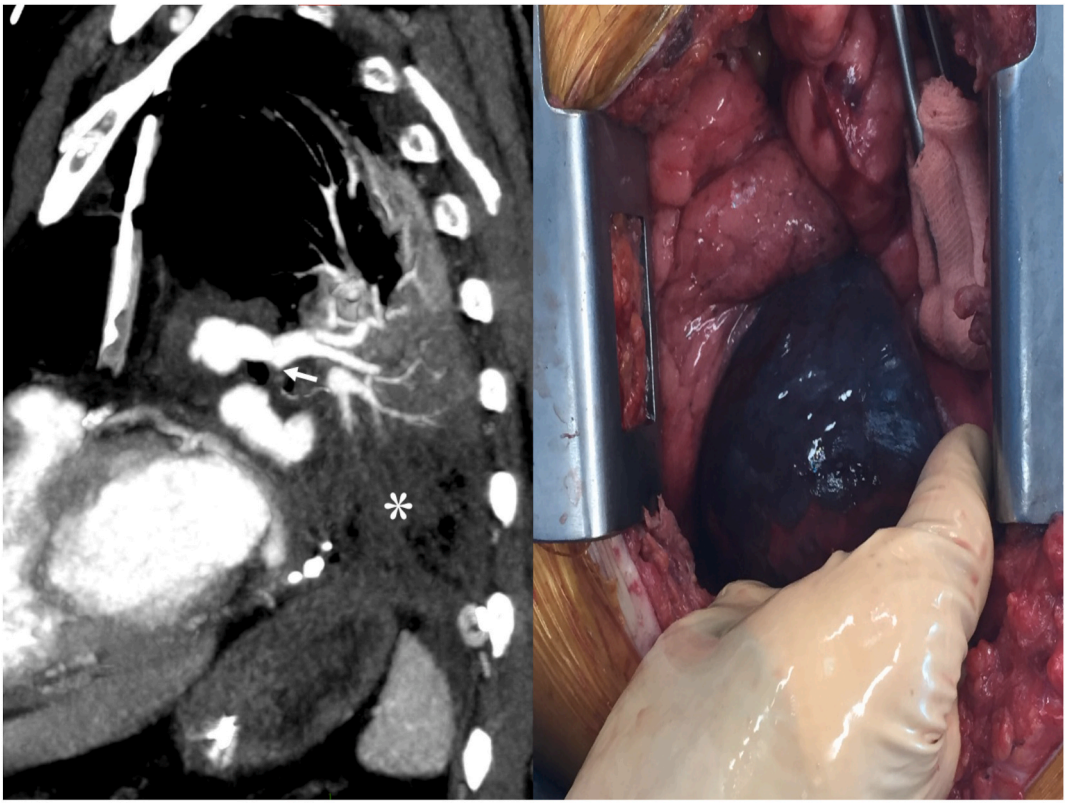

Fig. 1. **A** An enhanced CT-scan sagittal reformat view of the left lung clearly shows the difference in the lack of enhancement of the left lower lobe (*) and the occlusion of the left lower lobe pulmonary artery (arrow), **B** Infarcted Nelson's segment.

Table 1
Presentation of whole-lung torsion following lung transplantation.

Authors	Age (years)	Sex	Lung transplant indication	Single/Double lung transplant	Lung torsion's side	Diagnosis delay	Diagnostic method	Outcomes
Reed et al. [5]	67	Male	Scleroderma	Double	Left	Per-operative	TEE + fibroscopy	Immediate revision surgery with detorsion without resection
Nguyen et al. [7]	61	Male	Idiopathic pulmonary fibrosis	Double	Left	Day 5	CT scan + fibroscopy	Revision surgery with detorsion and without resection, released alive out of the ICU
David et al. [6]	25	Male	Cystic fibrosis	Double	Left	Day 5	CT scan + fibroscopy	Revision surgery with detorsion and without resection
Stern et al.	59	Male	Pulmonary fibrosis associated with TERT mutation	Double	Left	Day 4	CT scan + fibroscopy	Revision surgery with detorsion and resection of Nelson's segment Death in the ICU

TEE: Transesophageal echography.
CT: computed tomography.

CRediT authorship contribution statement

J. Stern: Writing – review & editing, Writing – original draft. **A. Khalil:** Supervision, Conceptualization. **A. Roussel:** Supervision. **Montravers P:** Writing – review & editing, Writing – original draft, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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