ΩΝΑΣΕΙΟ ΝΟΣΟΚΟΜΕΙΟ

Lobar stenting post lung transplantation retains whole lung aerated. The role of collateral ventilation.

ΠΑΝΕΠΙΣΤΗΜΙΑΚΟ ΓΕΝΙΚΟ ΝΟΣΟΚΟΜΕΙΟ ATTIKON

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Introduction : Airway complications (AC) remain significant source of morbidity following lung transplantation. The reported incidence of AC varies widely from 1.4% to 44.0% and profoundly affects survival and quality of life. Several predictors for AC have been described, including male gender, COPD, early rejection, postoperative infection, particularly with Aspergillus sp., and mechanical ventilation (1). Endoscopic management, particularly balloon dilatation, ablative therapies, and airway stenting, has become central to the treatment of airway stenosis in transplant recipients. However, the decision to deploy stents at lobar or segmental levels is complex, as it carries greater procedural risk and the potential to impair ventilation of preserved lung (2).
We present a case of successful treatment of multilevel airway stenosis after lung transplantation using targeted lobar stenting following detailed fissure analysis.

Case Presentation

We present a case of a 61-year-old male, who underwent bilateral sequential LuTx for end-stage respiratory failure due to A1-AT-Deficiency. A standard protocol with inhalative antimicrobial and antifungal prophylaxis was initiated until bronchial healing. Nevertheless, on day 33, a probable bronchial aspergillosis (positive Galactomannan-Ag 3,4, negative BAL and tissue culture) was diagnosed in RMB, RUL-Carina and BI. Despite prompt start of antifungal therapy with Voriconazole p.o. and Ambisome p.i., the patient presented on day 101 with stridor, dyspnea, FEV1-Decline and volume loss on the right hemithorax. Bronchoscopy revealed a complex airway complication as seen in Figure 1 according to the ISHLT 2018 Consensus Classification.(3)
In 4 months, the patient underwent 6 rigid bronchoscopies using multiple modalities, such as electrocautery, Balloon dilatation, cryotherapy, and Mitomycin instillation, all of which proved unsuccessful to maintain airway patency and normal anatomy. A recanalization attempt resulted in the bronchial severe bleeding due to artery's wall injury with atelectasis of the right lung and severe respiratory failure.
Since recanalization of the BI was no longer possible, we aimed to at least recanalize RUL-Bronchus. Interlobar fissure analysis revealed incomplete fissure (85%) thus we deployed a SEM stent in the RUL-Bronchus ending up above the main carina anticipating collateral ventilation of the lower lobe. Indeed, the whole ventilation of the right lung was restored. The patient weaned from LTOT. No mucus plugging or post-stenotic infections were observed in the in vivo period of stenting. The patient was relisted for right-sided re-transplantation, and after a successful organ allocation, the patient was re-transplanted on day 394.

Figure 1. AC classification based on ISHLT 2018 Consensus.

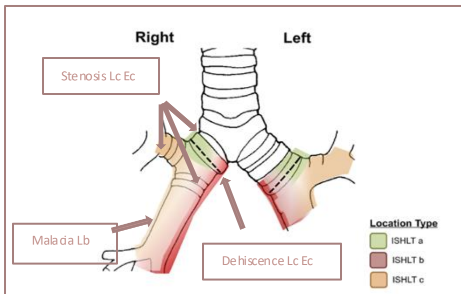


Figure 2. StratX Analysis.

Figure 3. Endoscopy image on diagnosis day (d101)

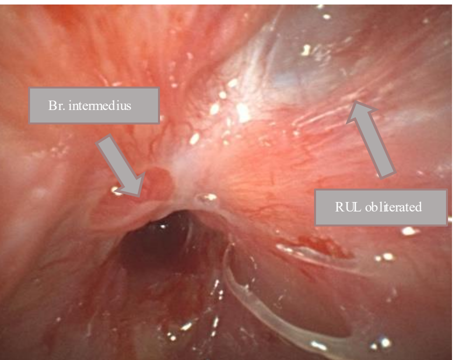
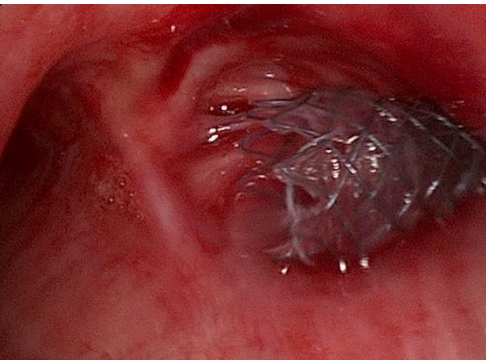


Figure 1. Stent in situ on d241



Discussion

Despite prompt and combined antifungal therapy, Aspergillus may produce severe complex airway disease. The rapid recurrence of BI collapse and the loss of normal anatomical landmarks despite multiple modalities, illustrate the limits of conventional bronchoscopic therapies in severe, structurally compromised bronchi.
In this case, the focus shifted from complete anatomical restoration to strategic preservation of ventilation to viable segments. This is where fissure analysis and collateral ventilation assessment played a pivotal role. The quantitative analysis was carried out with StratX, a tool originally designed for endoscopic lung volume reduction planning. This case illustrates that in selected lung transplant recipients with complex multilevel airway stenosis and non-salvageable distal bronchi, fissure-based collateral ventilation analysis can guide to innovative stent strategies. Targeted lobar SEMS placement into the RUL bronchus allowed preservation of whole-lung ventilation, avoidance of emergency pneumonectomy, and successful bridging to elective re-transplantation.

Literature

1. Huang J et al. JHLT. 2023 Sep;42(9):1251-1260.
2. Sethi, Sonali Wang, Juan et al. CHEST, Volume 146, Issue 4, 732A
3. Crespo MM et al. JHLT. 2018 May;37(5):548-563. .2.\