

# From Intubation to Tracheal Resection: Navigating Severe Airway Complications in a Post-COVID-19 Patient with Comorbidities

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## ABSTRACT

Laryngotracheal stenosis (LTS) is a significant complication post-intubation in COVID-19 patients, with incidence rates between 12.7% and 40%, exacerbated by comorbidities like diabetes and obesity. We report a 44-year-old female with type II obesity (BMI=39.8 kg/m<sup>2</sup>), diabetes mellitus, and hypertension, who developed LTS after 8 days of intubation for severe COVID-19. Her condition rapidly progressed from grade 3 to grade 4 LTS, requiring emergency tracheostomy, Shian-Yann-Lee procedure, and tracheal resection with anastomosis (TRA). Complications included anastomotic dehiscence, sepsis, and deep venous thrombosis. Serial dilatations and intralesional steroid injections (SILSI) were needed to manage restenosis. This case highlights the complexity of LTS management in patients with significant comorbidities, emphasising the need for early intervention, tailored strategies, and meticulous postoperative care to prevent complications like Critical Illness Weakness (CIW) and thromboembolic events.

## Keywords

Tracheal resection, Tracheal anastomosis, Laryngotracheal stenosis, Open airway surgery

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## INTRODUCTION

The incidence of LTS in COVID-19 patients post-intubation is significant (12.7% to 40%), with rapid progression observed in severe cases despite multiple interventions.<sup>1,2</sup> Recommendations for TRA are: severe mature stenoses (grade III-IV) with a cranio-caudal length between 1 cm and 5.5 cm, and/or impairment of the laryngo-tracheal structure, or if multiple endoscopic procedures failed to yield a response.<sup>3</sup> This case is highlighted due to its complex and severe progression of LTS following COVID-19 in a patient with diabetes and obesity, necessitating extensive surgical interventions including TRA, complicated by anastomotic dehiscence and significant complications due to prolonged mechanical ventilation post-surgery and hospitalization.

## CASE SUMMARY

A 44-year-old female with type II Obesity (BMI = 39.8 kg/m<sup>2</sup>), diabetes mellitus, and hypertension was intubated for 8 days following Covid-19 Category 5. A month later, she developed hoarseness and biphasic stridor. An emergency tracheostomy was performed. Tracheoscopy revealed 80% LTS, Cotton-Meyer 3 (CM 3), in the form of a mature fibrotic semicircular segment, 4 cm from the free edge of the vocal cord and 1.8 cm in length. She was referred to another hospital for expert airway management, but the stenosis had progressed rapidly to CM 4. The Shian-Yann-Lee procedure was performed, followed by insertion of the Montgomery T-Tube. During planned decannulation 19 months later, suprastomal granulation tissue was noted, creating a ball-valve effect that caused immediate dyspnoea, requiring re-insertion of the tracheostomy tube.

Two direct laryngoscopies, SILSI, excision of suprastomal granulation tissue, and dilatation were performed, one month apart, but 70% restenosis was noted after the second procedure (Figure 1). TRA was performed with a total of 2.2 cm of tracheal segment removed (1.5 cm above the tracheal stoma and 0.7 cm below). Her neck was placed in a flexed position and secured by chin-to-chest stay sutures. She was intubated for 20 days and hospitalized for 2 months. During the intensive care period, she had anastomotic dehiscence and massive subcutaneous emphysema due to severe coughing after the first attempt at extubation on postoperative day 4 (Figure 2). The dehiscence was confirmed by CT scan and repaired immediately with a sternocleidomastoid flap. Post-extubation, unilateral vocal palsy was noted. She also suffered from multiple episodes of sepsis, severe extensive fungal skin lesions, and deep venous thrombosis due to prolonged immobilization and diabetes. Serial dilatations and SILSI were performed at 8, 10, and 14 weeks post-TRA due to restenosis, resulting in 20% mature, non-progressing stenosis. To date, she is rehabilitating well with normalised vocal cord mobility, good voice, and airway.



**Figure 1:** 70% tracheal stenosis after removal of T-tube and multiple dilatations.



**Figure 2:** Tracheal dehiscence was evident by bubbles from the anastomotic area.

## DISCUSSION

The incidence of LTS in patients intubated due to COVID-19 may be related to the SARS-CoV-2 virus affecting the tracheal epithelium, causing structural weakness due to oedema and tracheitis.<sup>4,5</sup> Prolonged intubation, large endotracheal tubes, and high cuff pressures contributed to tracheal injury. Lesions form when the endotracheal tube (ETT) pressure exceeds mucosal capillary pressure, leading to ulceration and cartilage necrosis, which results in fibrotic scarring visible 3 to 4 weeks post-extubation.<sup>2</sup>

Tracheostomy may exacerbate tracheal injury by causing suprastomal collapse and stenosis.<sup>6</sup> Our patient experienced rapid progression from CM grade 3 to grade 4 LTS, highlighting the aggressive nature of the disease. Repeated interventions, such as multiple direct laryngoscopies, SILSI, and dilations, indicated persistent and recurrent airway issues. After various attempts, the patient met the criteria for TRA.

Postoperative anastomotic complications are more common in patients with comorbidities, previous tracheal appliances, reoperations, long segment resections, and prolonged ICU stays.<sup>7</sup> The presence of diabetes and obesity increased the complexity of both the initial COVID-19 management and the postoperative complications. Diabetes adversely affects microcirculation, impairing wound healing at the anastomotic site. Additionally, obesity is associated with prolonged mechanical ventilation and ICU stays.<sup>8</sup>

In patients with LTS, diabetes is a significant risk factor for anastomotic complications.<sup>9</sup> No major perioperative complications in a series of post-COVID-19 patients with similar comorbidities who underwent TRA.<sup>3</sup> Dehiscence may be managed conservatively or surgically using surrounding tissues, as in our case. For restenosis patients, further dilatation can stabilise the airway.<sup>10</sup> Prolonged mechanical ventilation, as in this case, can result in Critical Illness Weakness (CIW), which affects

over 50% of ICU patients. Early mobilisation is crucial to prevent CIW and thromboembolic complications.<sup>8</sup>

## CONCLUSION

This case exemplifies the complexities of managing severe airway complications following COVID-19 in patients with significant comorbidities. Advanced surgical interventions, repeated procedures, and meticulous post-operative care highlight the need for a multidisciplinary approach. Patient selection and optimisation of comorbidities, such as weight loss programs and diabetic control, are essential prior to TRA.

## INFORMED CONSENT

Written informed consent was obtained from the patient.

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