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Letter to Editor

Perioperative anaesthetic challenges in paediatric tracheal resection with severe subglottic stenosis

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Tracheal resection and anastomosis (TRA) is a highly specialized procedure that necessitates close collaboration between the surgeon and the anaesthesiologist for effective airway management.[1] It is typically indicated when tracheal stenosis fails to respond to conservative interventions such as balloon dilation or scar excision, particularly in cases involving congenital anomalies, post-intubation injury, tracheomalacia, or tracheal tumors.[2] While bronchoscopic interventions remain the preferred initial treatment for simple stenosis, complex or long-segment stenoses require a multidisciplinary, team-based approach.[3] In instances of glottic stenosis, tracheal resection followed by Montgomery T-tube placement is performed to minimize the risk of vocal cord oedema.

We report the case of a 14-year-old girl referred to our institution for TRA due to severe subglottic stenosis. Three months prior, she had attempted suicide by hanging and was subsequently admitted to the intensive care unit (ICU). During her ICU stay, she experienced cardiac arrest, requiring two to three cycles of cardiopulmonary resuscitation (CPR). Post-resuscitation, she developed cardiomyopathy, with echocardiography revealing a significantly reduced ejection fraction (EF) of 35%. Additionally, she suffered hypoxic brain injury (HBI), confirmed by magnetic resonance imaging (MRI). Due to her depressed neurological status—reflected by a low Glasgow Coma Scale (GCS) score—she was intubated and mechanically ventilated. Prolonged intubation for nearly one month necessitated a tracheostomy.

Subsequently, she developed tracheal stenosis at the tracheostomy site. Flexible laryngoscopy revealed grade 4 subglottic stenosis (**Figure 1**). A CT scan of the neck demonstrated severe cervical tracheal stenosis extending approximately 1.5 cm at the C7 level, with complete loss of luminal patency and distortion of tracheal ring architecture (**Figure 2**). She was scheduled for definitive surgical management via TRA.

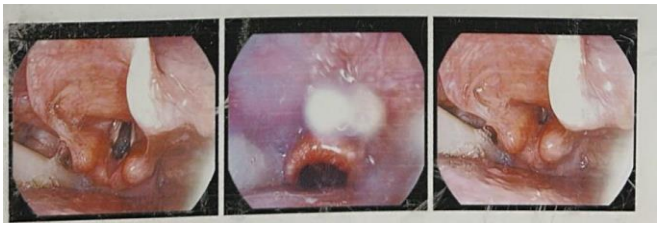

Figure 1: Flexible laryngoscopy showing subglottic stenosis grade 4

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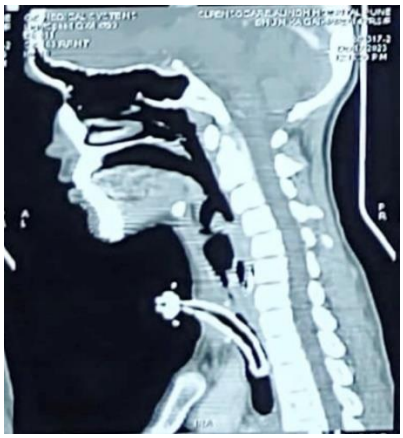

Figure 2: CECT Scan showing the overlying stenotic segment of the trachea

A comprehensive pre-anaesthetic evaluation was conducted, with special attention given to the patient's respiratory and cardiovascular status, both of which were found to be unremarkable. Routine laboratory investigations, arterial blood gas analysis, chest X-ray (**Figure 3**), and ECG results were within normal limits. A 2D echocardiogram performed prior to surgery showed a normalised ejection fraction (EF) of 55%, indicating recovery from the earlier cardiac insult. Written informed consent was obtained, covering both intraoperative management and anticipated ICU and postoperative ventilatory care.

On the day of surgery, standard monitoring including end-tidal carbon dioxide was initiated. All airway equipment was meticulously checked and prepared. The patient arrived in the operating theatre with a size 7 cuffed PVC tracheostomy tube (TT) in situ. After adequate preoxygenation, anaesthesia was induced with 100 mg of propofol, and muscle relaxation was achieved using vecuronium. Following three minutes of manual ventilation, the patient was transitioned to volume-control ventilation, maintained with sevoflurane in a mixture of air and oxygen, and then handed over to the surgical team.

Surgical access was obtained via an incision made inferior to the tracheostomy site. Midway through the procedure, the tracheostomy tube was replaced with a flexometallic tube to facilitate better surgical manipulation. To optimize surgical exposure and ensure a precise anastomosis, three scheduled apnoea cycles were performed. Protective ventilation strategies were employed throughout, using low tidal volumes and increased respiratory rates. Following each apnoea cycle, lung recruitment maneuvers were performed to reduce the risk of atelectasis.

At the conclusion of the procedure, a short segment of the trachea was intentionally left unsutured. A 12 mm Montgomery T-tube was inserted, along with a 5 mm Fogarty catheter introduced into one tracheal end and its cuff inflated. The flexometallic tube was then removed, and the T-tube was positioned in a non-anastomosed segment. The Fogarty catheter cuff was inflated to prevent air leaks at the oropharyngeal end, while the T-tube provided structural support to prevent airway collapse during healing. The T-tube was connected to the ventilator circuit to facilitate oxygen delivery.

To stabilize the anastomosis and ensure neck flexion, a mento-sternal guardian suture was placed at closure. Postoperatively, the patient was monitored in the ICU and gradually weaned from ventilatory support. The Fogarty catheter was removed the following day, once spontaneous breathing through both the nasal passages and the T-tube was confirmed. After a successful trial, the extratracheal end of the T-tube was plugged, allowing the patient to breathe and speak independently. The T-tube was retained in situ at the time of discharge for ongoing airway stabilization and monitoring.

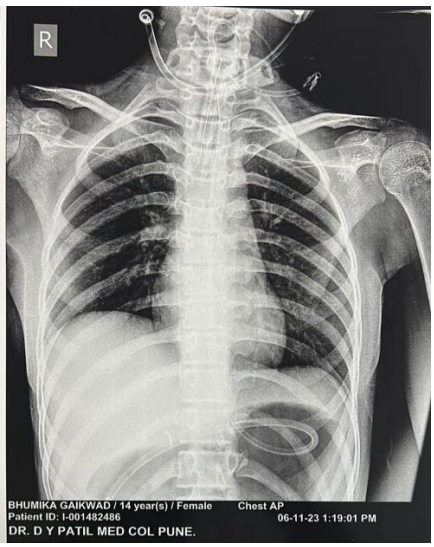

Figure 3: Chest X-ray on the day of admission

In this case, the conventional method of distal tracheal intubation with cross-field ventilation was employed to manage the airway. While more contemporary techniques—such as supraglottic airway devices, regional anaesthesia, and extracorporeal support—are increasingly highlighted in recent literature, cross-field ventilation, jet ventilation, and endotracheal intubation remain the gold standards for airway management in tracheal surgeries.[4]

Tracheal resection is inherently complex, with multiple perioperative challenges. A safe surgical outcome relies heavily on meticulous preoperative planning and close collaboration between the anaesthesiologist and surgical team. In this particular case, the patient’s history of hypoxic brain injury and cardiomyopathy significantly heightened the anaesthetic risks. Comprehensive evaluation and optimization of her cardiac, neurological, and respiratory status were essential before proceeding with surgery. These comorbidities added layers of complexity to anaesthesia management, with particular focus on maintaining adequate

cerebral and myocardial perfusion, ensuring a secure and patent airway, and enabling unhindered surgical access.

Intraoperatively, the anaesthetic strategy centered on maintaining normoxia and normocapnia through carefully titrated ventilation, while aggressively avoiding hypotension to preserve cerebral perfusion. Given the compromised airway and the need to share it with the surgical team, even minor errors in judgment or timing could have led to catastrophic consequences.[5] Cross-field ventilation, along with scheduled apnoea cycles, was instrumental in maintaining airway patency while facilitating optimal surgical exposure.

Although re-stenosis remains a recognized risk following tracheal resection, early postoperative imaging revealed no signs of airway collapse or obstruction. Continuous postoperative monitoring of the T-tube and the surgical site was essential to identify and manage any emerging complications promptly.

This report aims to contribute to the growing body of knowledge surrounding the anaesthetic management of complex airway surgeries in pediatric patients. It underscores the importance of interdisciplinary coordination, anticipatory planning, and intraoperative vigilance in achieving a favorable outcome. We share our experience with the hope of informing and guiding future cases of similar complexity.

1. Declaration of Patient Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images

2. Conflict of Interest

None.

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