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PERIOPERATIVE AIRWAY MANAGEMENT FOR TRACHEAL RECONSTRUCTION IN A PATIENT WITH SUBGLOTTIC STENOSIS – A CASE REPORT

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ABSTRACT: Benign subglottic stenosis is a life-threatening condition. It commonly corresponds to postintubation injuries associated with prolonged endotracheal intubation. The surgical correction of a subglottic stenosis presents anaesthetic challenges which are unique to airway anatomy, physiology and shared surgical airway. Management of these patients involves an integrated multidisciplinary approach and close-loop communication with the surgical team regarding tracheal excision and re-anastomosis, proper intubation and extubation strategies and, adequate postoperative care. Here, we present a case of successful management of a nineteen-year-old girl with post-intubation tracheal stenosis who presented with stridor and difficulty breathing after a history of being intubated for 6 days. She was refractory to conservative management and hence was posted for tracheal resection and anastomosis which is the gold standard therapy. This case report throws light on the challenges faced by an anaesthesiologist in the perioperative management of the same.

INTRODUCTION: Benign subglottic stenosis is a life-threatening condition commonly caused by prolonged endotracheal intubation. Sixty-five percent of tracheal stenosis cases around the world correspond to postintubation injuries [1]. This obstruction compromises effective airway oxygenation and ventilation. Although bronchoscopic interventions are simple, inexpensive, and efficient adjuncts in the treatment of tracheal stenosis, open surgeries remain the gold standard therapy and have the potential of being curative in most cases [2]. However, this surgery is difficult and carries a mortality rate of 3 percent [3].

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Management of these patients involves a multidisciplinary approach and close-loop communication with the surgical team during tracheal excision and re-anastomosis, proper extubation technique, and adequate postoperative care.

Case Presentation: A 19-year-old female presented with tracheal stenosis following prolonged endotracheal intubation, which is the subject of this case. The patient came with complaints of breathlessness on exertion (NYHA grade 2) for the last seven months. The symptoms were not associated with fever and cold. She had a history of fall from a three-meter height on Nov 2023 following which she had a hospital admission and endotracheal intubation for 6 days in a private setup in Kanpur. The patient was decannulated on the seventh day and then discharged. She gradually developed difficulty in breathing on exertion after discharge from the hospital.

Rigid Bronchoscopy was done on 19/12/23 which was suggestive of tracheal stenosis. She was referred to AIIMS Bhopal in January 2024, for which she underwent conservative management.

CT Neck and Thorax was performed on 11/1/24 which showed focal irregular narrowing of mid trachea noted approximately 6.5-7 cm above carina involving 18 mm long segment. The patient was refractory to serial rigid bronchoscopic dilatations and hence planned for surgical management.

The patient was admitted to our institute on July 7, 2024, and was planned for tracheal resection and anastomosis. A complete pre anaesthetic checkup was performed. On examination, the patient was vitally stable, with a heart rate of 88 bpm (beats per minute), blood pressure of 120/80 mmHg, and maintaining saturation of 100% on room air. Systemic examination revealed equal and clear bilateral chest air entry and normal heart sounds were noted. The patient demonstrated good effort tolerance. The patient had a three-finger mouth opening and Mallampati grade 1, i.e. m- TAC 1. All the investigations were within normal limits.

Intraoperative Management: A complete pre-anaesthetic checkup was done the day before surgery and an informed consent was taken from the patient's relatives. Difficult airway cart and all the extra airway equipment, such as the Montgomery T-tube, flexometallic tubes, microlaryngeal tubes, videolaryngoscope, and paediatric and adult fibreoptic bronchoscopes that could be required were checked and kept ready on the day of surgery. The patient was administered an antibiotic intravenously half an hour before incision time. The patient was taken inside the operating theatre. All the non-invasive monitors were attached. The patient was then preoxygenated with 100% oxygen, and premedications were given: an injection of glycopyrrolate 0.2 mg IV followed by an injection of fentanyl 100 mcg. The patient was induced with an injection of propofol 100 mg. Non-depolarizing Muscle relaxant Inj. Rocuronium (1.2 mg/kg) was administered and after one minute of manual ventilation, a smaller sized 4.5 mm Endotracheal Tube was secured via direct laryngoscopy, and high-pressure mechanical ventilation was achieved. An inhalational agent, isoflurane, was started along with a combination of air and oxygen. Now, the patient was handed over to the surgeon. The trachea was opened at the 5th tracheal ring, stenotic segment was visualized. A flexometallic tube was secured through the 5th tracheal ring and a sterile breathing circuit was attached following which orotracheal extubation was done. Around 3 cm tracheal resection was done including the 5th, 6th, and 7th tracheal rings, and end-to-end anastomosis was done from the 4th to 7th tracheal ring. Stoma was placed at the 8th tracheal ring and a Montgomery T–tube was inserted, the cranial end of which was kept closed using a gauze piece with a thread tied to it to allow minimal leak during ventilation, the breathing circuit was attached to the horizontal limb of T-tube, after which the flexometallic tube was removed. This made us achieve a secured tracheostomized airway using a Montgomery T-tube, wherein the outsourced oxygen will directly be supplied to the respiratory passage without any leaks from the oropharyngeal side. At the same time, the Montgomery T-tube would prevent the reconstructed trachea from collapsing and fibrosis, while the trachea takes its time to heal after surgery. The wound was closed and the Montgomery T-tube was secured at the site of the skin stoma. Analgesics Inj. Paracetamol 1 gm and Inj. a Diclofenac 75 mg were given intravenously. Inj. Ondansetron was given thirty minutes before the end of the procedure. After confirming adequate muscle tone and respiratory efforts the patient was reversed from anaesthesia and shifted to the Intensive Care Unit.

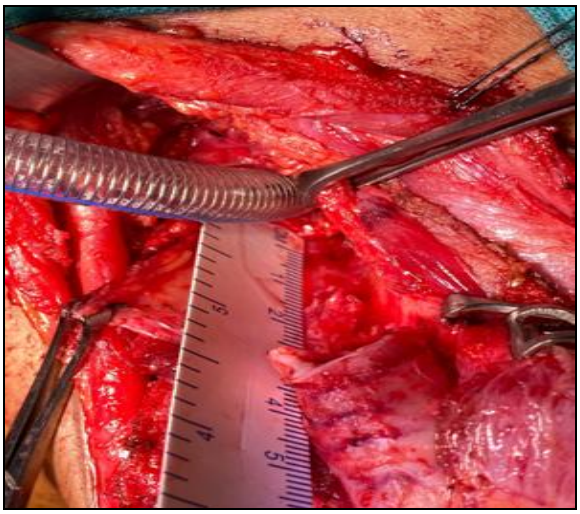

FIG. 1: INTRAOPERATIVE FINDINGS SHOWING RESECTED TRACHEA WITH FLEXO-METALLIC TUBE FOR MECHANICAL VENTILATION

DISCUSSION: Adult tracheal stenosis results mainly from inflammatory lesions. Cough and dyspnoea on exertion are the first to develop. In severe cases, the patient may also present with dyspnoea on exertion. Definitive treatment of tracheal stenosis includes bronchoscopic interventions and open surgery. Laser-assisted mechanical dilation, electrosurgery knife, mechanical dilation with rigid bronchoscopy, endoscopic balloon dilation, intralesional steroid injection, or mitomycin application are the bronchoscopic interventions performed [4, 5]. Decisions on the management and clinical course are decided by the disease acuity, patient's co-morbidities, functional status, and importantly, the etiology, location, extent, morphology, degree of airway narrowing, and severity of symptoms. However tracheal resection and reconstruction remain the procedure of choice in most patients with tracheal stenosis [6]. Surgery offers definitive treatment and has high success rates when performed by experienced operators. The potential for loss of control of airway is the most feared complication where we share the airway with the surgical team. Airway management strategies are framed mainly on the location and the degree of airway obstruction [7]. Intubation, intubation with high- frequency jet ventilation (HFJV), and veno-venous extracorporeal membrane oxygenation (VV-ECMO) are commonly employed strategies for airway management during tracheal reconstruction [8-10].

Several ventilation strategies exist for patients with T-tubes during tracheal resection [11]. The technique of upper limb occlusion of the t–tube by throat pack, gauze piece, and fogarty catheter, preserves normal respiration, and phonation. In this patient, the upper vertical limb of T-Tube was stuffed with a gauze piece before inserting the T-Tube which ensured that the leak was as minimal as possible and that the patient received the required tidal volume intra-operatively

Complications following tracheal resection and anastomosis can be broadly categorized as either anastomotic or non-anastomotic. Anastomotic complications encompass the formation of granulation tissue, tracheal restenosis, various levels of anastomotic separation, and the development of fistulas [11]. Comorbidities, previous tracheal resection, and the length of tracheal resection of more than 4 cm were statistically significant factors for the onset of complications. Non-anastomotic complications specific to upper airway reconstruction include laryngeal edema and glottic dysfunction, affecting either phonation or swallowing.

CONCLUSION: Benign subglottic stenosis is a life-threatening condition commonly caused by prolonged endotracheal intubation. Management of these patients involves a multidisciplinary approach and close communication with the surgical team. However, this surgery carries a mortality rate of 3 percent when performed in experienced centers [3]. As of today, our patient has a repaired trachea with normal vocalization and breathing.

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CONFLICT OF INTEREST: The authors declare no conflict of interest.

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