CASE REPORT

Montgomery tracheal tube - a boon with a challenge

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Abstract

Crico-tracheal resection and anastomosis are commonly used operative techniques in managing crico-tracheal stenosis grade III-IV. The Montgomery T-tube is used both as a tracheal stent and tracheostomy. Still, it poses various challenges to anaesthesiologists, like loss of anaesthetic gases through the open proximal end of the vertical limb and lack of standard anaesthesia circuit connectors. Here we present a case of 27 years old male with a history of gunshot injury to the neck three years ago with right vocal cord palsy with subglottic tracheal stenosis grade IV posted for microlaryngobronchoscopy (MLB) with crico-tracheal resection and anastomosis with Montgomery tracheal tube insertion. In this case, we used LMA proseal, which not only enabled us to stop the anaesthetic gas loss via the proximal vertical limb of the T-tube but also aided in checking airway patency and proper positioning of the T-tube via flexible bronchoscope through it.

Keywords: Subglottic stenosis, Montgomery tracheal tube, Laryngeal mask airway

Introduction

Crico-tracheal resection and anastomosis are currently the standard operative technique in the curative treatment of crico-tracheal stenosis grade III-IV. This procedure uses the Montgomery tracheal tube (T-tube) as a tracheal stent and a tracheostomy. However, using the Montgomery T-tube poses various anaesthetic challenges, like hypoventilation and loss of anaesthetic gases through the
open upper end of the vertical limb, resulting in patient awareness\[^1\]. Different anaesthetic management has been described with Montgomery T-tube in situ.

Here, we present the successful anaesthetic management of a posttraumatic subglottic tracheal stenosis grade IV scheduled for crico-tracheal resection-anastomosis (CTRA).

**Case report**

A 27-year-old 80 kg male patient with a history of gunshot injury to the neck three years ago underwent emergency tracheostomy with neck exploration and foreign body removal (bullet) with the pharyngeal-oesophageal-laryngeal repair. Subsequently, according to the Cotton-Myer scale \[^2\], he developed right vocal cord palsy with subglottic tracheal stenosis grade IV.

Now, the patient was posted for elective microlaryngobronchoscopy (MLB) with CTRA with Montgomery T-tube insertion.

On examination, the patient was conscious, oriented, and obeying commands. The patient had a size 8 mm internal diameter (I.D) cuffed tracheostomy tube in situ and maintained oxygen saturation of 99% on room air. All preoperative investigations were in range, and systemic examination appeared normal.

Standard monitors were attached in the operating room (OR). After obtaining intravenous (i.v) access, the patient was adequately pre-oxygenated with 100% oxygen via a tracheostomy tube. The patient was premedicated with glycopyrrolate 0.2 mg, fentanyl 100 µg i.v and induction were done with inj. propofol (2 mg /kg bw) and received inj. Rocuronium (0.6mg/kg bw) for muscle relaxation. The tracheostomy tube was replaced with a size 8mm I.D. cuffed flexo-metallic endotracheal tube (E.T.) via the tracheostomy wound and secured with skin sutures. A bi-spectral index monitor and neuromuscular monitors were attached. Anaesthesia was maintained with 50% oxygen, nitrous oxide (N2O), and 7-8% desflurane (MAC 1-1.2%). Intermittent boluses of inj. rocuronium was used to maintain adequate muscle relaxation. Multimodal analgesia was provided with inj morphine 8 mg repeated 4 hourly and bilateral superficial cervical plexus nerve block with 5 ml of 0.25% bupivacaine on each side.

Anterior 1/3\(^{rd}\) of the cricoid and trachea was resected till the stoma site. The E.T. tube was intermittently removed and reinserted to provide optimal surgical exposure under a brief period of apnea, ensuring adequate oxygen saturation and haemodynamic
stability. The posterior tracheal wall was anastomosed with the posterior lamina of the cricoid. Similarly, the anterior tracheal wall was anastomosed with an inferior margin of the thyroid cartilage. The flexo metallic tube was replaced with a Montgomery T-tube with a 12 mm external diameter (E.D.). Air leakage through the open intratracheal upper end of the tube was contained with the help of an occluded laryngeal mask airway (LMA) Proseal size 4. The cuff of LMA was inflated, and Ryle's tube was passed into the stomach through the gastric port (Fig. 1). The tracheal tube connector of the polyvinyl chloride E.T. tube of size 8mm I.D. fitted well in the extratracheal part of the Montgomery tube (Fig. 1), and ventilation was continued through it. Airway patency and positioning of the T-tube were checked with a flexible bronchoscope size 4.4 mm through LMA while ventilation continued via the extratracheal part of the T-tube. Strap muscles were sutured, skin closed in two layers, and pressure dressing was done. Surgery was performed in a dedicated Otolaryngology operation theater. The procedure went uneventful; it lasted 8 hours and satisfactory ventilation was maintained throughout the surgery. Post-operatively patient was managed in anaesthesia intensive care unit, shifted to ward after 3 days, he remained admitted in Ward for 2 weeks then he was discharged after 4 weeks along with Montgomery T-tube In-situ with follow up advice and was decannulated after 3 months.

At the end of the procedure, residual neuromuscular block was antagonized with i.v. neostigmine (4mg) and glycopyrrolate (0.8mg). After achieving adequate tidal volume and respiratory rate with spontaneous eye-opening, the LMA was removed, and the circuit was disconnected from the extratracheal part of the T-tube. The patient was breathing spontaneously through both parts of the Montgomery T-tube.

**Discussion**

In 1968, Dr William Montgomery developed the silicone T-tube to stent the airway following laryngotracheoplasty [3]. This uncuffed Montgomery T-tube consists of a short upper laryngeal, lower long tracheal and extratracheal part protruding through the tracheostomy site [4].

The Montgomery T-tube is a device which serves as a tracheal stent and tracheostomy conduit to prevent tracheal stenosis postoperatively [4]. The use of a Montgomery T-tube poses various challenges. It does not come with a standard 15mm circuit connector and does not offer any airway protection against aspiration; both the upper and lower ends of the intraluminal limb are open; therefore, loss of inhalational gases through the upper part may lead to hypoventilation and inadequate depth of anaesthesia leading to awareness. It is important to note that total intravenous anesthesia can be utilized in such cases. However, there may be an issue with oxygen and air leakage from the upper part of the Montgomery T-tube. Therefore, a solution is needed to prevent this air leak. The tube is available in sizes ranging from 4.5-16 mm E.D. [6]. It is associated with little or no tissue reaction as it is made up of silicon; also, it does not harden with extended contact with body temperature and secretions [7].

Kerai S et al. used a ribbon gauge to block the upper end of the Montgomery T-tube to
prevent air leaks, which seemed inconvenient. In another study, authors used a Fogarty embolectomy catheter to block the upper lumen of the Montgomery T Tube; passing the Fogarty catheter is cumbersome, and there is no way to perform fiberoptic bronchoscopy to check the anastomosis site.

We used a technique previously described by Uchiyama and Yoshin in which the top end of the LMA was occluded as a means of upper airway occlusion. At the same time, ventilation was continued via the extratracheal part of the Montgomery tube. This method provides a mechanism to ventilate the patient's lungs. It permits using a flexible bronchoscope to check the airway patency, vocal cord status, and position of the T-tube.

We used a tracheal tube connector of a PVC ET tube of size 8mm I.D. that worked well in the extratracheal part of the T-tube.

The above-described technique offers the dual advantage of adequate ventilation by limiting gas loss with the help of LMA and allowing surgeons to check the airway patency and proper positioning of the T-tube with bronchoscope via LMA without causing a hindrance to ventilation. We hope that managing such patients with a shared airway with the abovementioned method will improve safety.

References
