Med & Health Jul 2025; 20(2): 829-833 https://doi.org/10.17576/MH.2025.2002.31

CASE REPORT

Montgomery T-tube to Bypass Tracheal Dehiscence: UiTM Experience

MUHAMMAD RAZIIN ZAINAL ABIDIN[1], ILMI AKMALUDIN MOHAMAD[1], SYARIFAH NAFISAH SYED HAMZAH[1], NORAZILA ABDUL RAHIM[2]*, MASAANY MANSOR[2]

[1]Department of Otorhinolaryngology-Head & Neck Surgery, Hospital Al-Sultan Abdullah UiTM, 42300 Bandar Puncak Alam, Selangor, Malaysia

[2]Department of Otorhinolaryngology-Head & Neck Surgery, Faculty of Medicine, Universiti Teknologi MARA, 47000 Sungai Buloh, Selangor, Malaysia

Received: 28 July 2024 / Accepted: 13 September 2024

ABSTRAK

Montgomery T-tube diperkenalkan oleh Dr William W. Montgomery pada tahun 1964. Kebiasaannya, ia digunakan untuk merawat saluran pernafasan yang sempit. Kami membincangkan kes seorang wanita berumur 75 tahun, di mana Montgomery T-tube digunakan sebagai pintasan kebocoran trakea yang disebabkan oleh jangkitan kuman pada kawasan pembedahan selepas pembedahan radikal untuk kanser tiroid folikular (SHIN IV). Pembedahan tinjauan semula dilakukan selepas 3 bulan dan menunjukkan tapak anastomosis yang sembuh dengan baik. Kami berkongsi pengalaman dalam merawat kebocoran trakea selepas pembedahan pemotongan trakea and anastomosis menggunakan Montgomery T-tube sebagai pintasan sementara untuk kes kanser tiroid yang telah lanjut.

Kata kunci: *Kebocoran trakea; kesempitan larinks dan trakea; T-tube Montgomery*

ABSTRACT

Montgomery T-tube was introduced by Dr William W. Montgomery in 1964. Conventionally it is used to treat laryngotracheal stenosis. We discussed a case of a 75-year-old lady who required Montgomery T-tube as a bypass stent due to tracheal dehiscence secondary to surgical site infection following radical surgery for advanced follicular thyroid carcinoma (SHIN stage IV). Second look surgery was done after 3 months and revealead a well-healed anastomotic site. We shared our experience in managing tracheal dehiscence following tracheal resection and primary anastomosis by utilising Montgomety T-tube as a temporary bypass stent in advanced thyroid carcinoma.

Keywords: Laryngotracheal stenosis; Montgomery T-tube; tracheal dehiscence

Address for correspondence and reprint requests: Norazila Abdul Rahim. Department of Otorhinolaryngology-Head & Neck Surgery, Faculty of Medicine, Universiti Teknologi MARA, 47000 Sungai Buloh, Selangor, Malaysia. Tel: +603-33963204 Email: norazila3587@uitm.edu.my

INTRODUCTION

Montgomery T-tube (T-tube) was introduced by William Montgomery in 1962. As its names implies, it is made in the shape of 'T' consisting of internal limb (within the trachea) and external limb (protruding out through stoma). In its early design, the T-tube was originally made from acrylic. However, due to its rigidity, insertion can be challenging (Hu et al. 2018). Thus, a newer model made of silicone was innovated and this design remains in use until today. General anaesthesia is the method preferred for insertion as it provides more controlled environment. Montgomery uses the T-tube as a stent following tracheal reconstruction and also in cases of subglottic stenosis. Until now, it is also used in malignant diseases such as primary tracheal tumour or metastatic disease. However, T-tube is rarely used to bypass tracheal dehiscence. We discuss a novel approach of T-tube as a bypass stent in managing tracheal dehiscence following radical thyroid surgery.

CASE REPORT

We present a case of 75-year-old lady with underlying hypertension and dyslipidaemia. She initially presented to a secondary centre with gradually enlarging right neck swelling associated with stridor, reduce effort tolerance and dysphagia. Computed tomography revealed thyroid mass with tracheal involvement. Rigid bronchoscope revealed airway stenosis of Cotton Myer (CM) III and tumour debulking were performed by intervention pulmonologist. Stenosis improved to CM II. Histopathological examination of the tracheal mass revealed follicular thyroid carcinoma.

Subsequently, she was referred to our centre for further management. Clinical examination revealed midline neck fullness extending to right lateral border of trachea. Flexible nasopharyngolaryngoscopy (FNPLS) revealed subglottic mass over right side extending posteriorly to the left and inferiorly involving 3rd and 4th tracheal ring with stenosis of CM III (Figure 1).

Following multidisciplinary discussion, patient was subjected for tracheostomy, total thyroidectomy, bilateral neck dissection and tracheal resection with primary repair. Intraoperative finding revealed tracheal mass extending from infracricoid to 3rd tracheal ring measuring about 25 mm. Resection and primary anastomosis was performed without tension while keeping the single lumen tracheostomy tube size 7.5 in situ below the anastomotic site. Patient developed surgical site infection at the anastomotic site 2 weeks post-operatively which resulted in tracheal dehiscence above the tracheostomy site (Figure 2).

Patient was brought back to operating room and underwent neck exploration and wound debridement. Intraoperatively, the dehiscence was measured at 16 mm from the upper border of tracheostoma and the length of dehiscence was 24 mm (Figure 3).

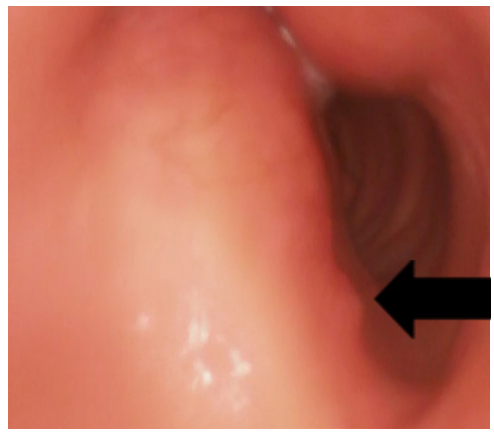

FIGURE 1: Tracheoscopy revealed thyroid mass in tracheal lumen arising from the right side (black arrow)

FIGURE 2: Tracheal dehiscence (white arrow) and surrounding slough just above the tracheostomy tube.

The primary repair of trachea was not feasible due to unhealthy mucosa and friable tissue. Montgomery safe T-tube standard size 11 mm was inserted to replace the tracheostomy tube and the dehiscence segment was bypassed by the upper portion of internal limb of the T-tube. Post operatively, regular dressing was done, and patient was treated with intravenous Ceftazidime 10 days. Histopathological examination confirmed papillary thyroid carcinoma with tracheal involvement (SHIN 4). Assessment done 3 months after T-tube insertion, showed well healed dehiscent site with no tracheomalacia (Figure 4). Patient completed radioiodine therapy and has been cancer free past 3 months.

DISCUSSION

T-tube was first introduced by Dr William. W. Montgomery in 1964 which serves as an upper airway stent to following reconstruction of trachea and subglottic stenosis (Montgomery 1965). T-tube consist of vertical limb and horizontal limb. Vertical limb has proximal and distal end which are intraluminal and the horizontal limb is extraluminal. The first prototype of T-tube was acrylic, however, due to difficulties to manipulate during insertion, an improved version of silicone T-tube was made (Montgomery 1980). The silicone T-tube is more flexible allowing easy manipulation for insertion of the tube, it is inert therefore causes less irritation and no or less tissue reaction. Another benefit of silicone T-tube is it allows the surgeon to adjust the length of the vertical limbs during the insertion for better placement.

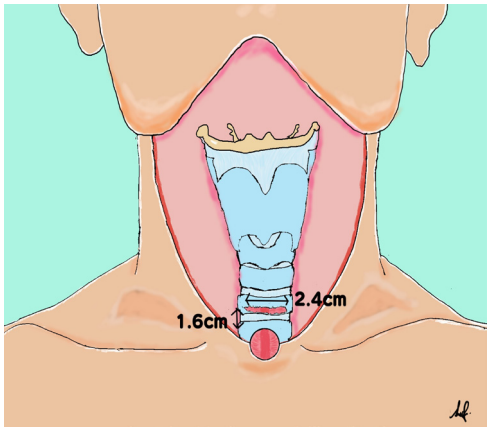

FIGURE 3: Graphical representation of trachea dehiscence following surgical site infection

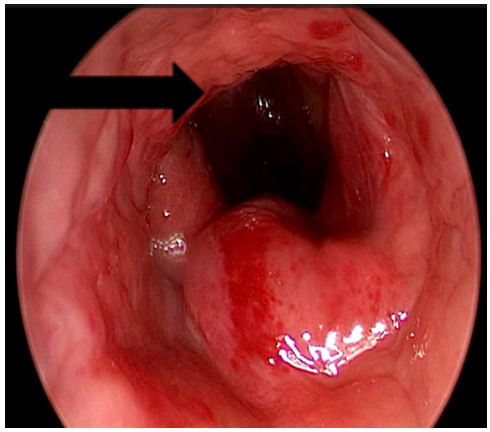

FIGURE 4: Upon removal of Montgomery T-tube, dehiscence site proximal to tracheostoma was well-healed. Black arrow indicated tracheostomy tube used to ventilate patient intraoperatively

Traditionally, T-tube is used to maintain airway patency following dilatation by stenting the stenotic segment (Montgomery 1965; Montgomery 1980). However, T-tube can serve as palliative measure for malignant cases such as tracheal tumors, metastatic esophageal cancer and metatastatic thyroid cancers (Margallo Iribarnegaray et al. 2021). T-tube can also serve as a therapeutic intervention to address post-operative complication such as dehiscence although it is rare (Cheng et al. 2015). Our patient underwent tracheal resection and anastomosis complicated with tracheal dehiscence post operatively and surgical repair was not successful. Thus, T-tube was chosen to bypass the dehiscence to allow the dehiscence to heal naturally at the same time maintaining airway, prevention of restenosis and allowing phonation (Figure 5). Another reason is to improve patient's prognosis by not delaying her post-operative radioactive iodine treatment. Appropriate size and length are important in T-tube placements to ensure its success. The length of stenosis, the distance of stenosis from vocal fold proximally and from carina distally should be examined via computed tomography for CM IV cases, and if permissible to do a 3D-reconstruction of the trachea. Intraoperative endoscopic findings alone are enough to determine the final length of the T-tube internal limbs for CM II and III. In our case, preoperative CT scan of the neck was done to assess the thyroid cancer and its invasion, not for determination of the t tube length since the stenosis was only CM III. The T-tube diameter cannot be too large as it increases the risk of granulation tissue formation and restenosis. The length of the internal limb should be at least 3 mm more than the segment it should bypass and the proximal limb should be at least 0.5-1.0 cm below the glottis (Carretta et al. 2009; Hu et al. 2018). Montgomery T-tube size 11 mm was found to have a proximal limb of 2.0 cm which is the ideal measurement to bypass the dehiscence (1.6 cm from upper border of tracheostoma),

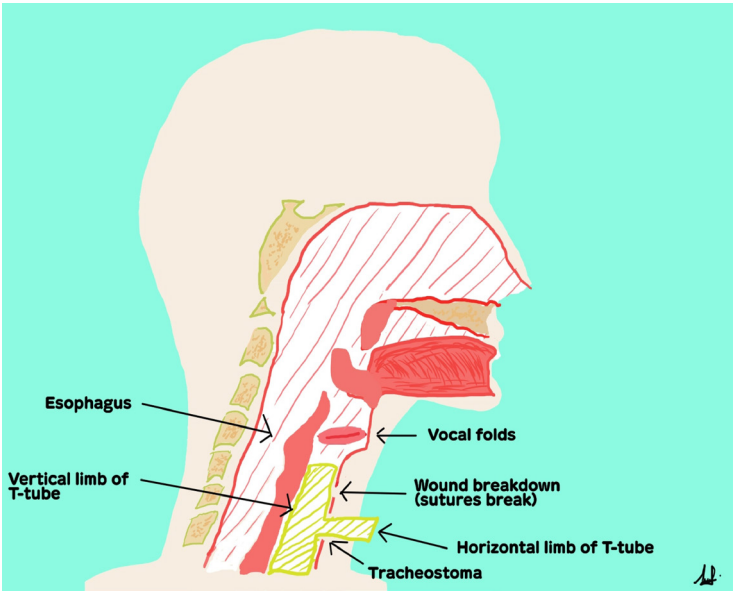

FIGURE 5: Montgomery T-tube to bypass dehiscence

thus no refashioning of the proximal limb was required.

Another case was reported by Cheng et al. (2015), incorporating the same idea of using T-tube to bypass dehiscence. In the report, the author used 3D-printed custom designed T-tube. The patient was diagnosed with recurrent medullary thyroid cancer and underwent tracheal resection and reconstruction, which also developed surgical site infection and given intravenous antibiotics. The author then uses a custom design T-tube based on a 3D model of the patient's trachea.

T-tube insertion requires pre-requisite tracheostoma for insertion. Traditionally, Montgomery uses 2 haemostat-technique. First hemostat is to clamp the proximal limb of the vertical portion. The lower limb is inserted through a tracheostoma and advanced into the trachea. Once all vertical portion is intraluminal, the second hemostat will grasp the horizontal portion and the first hemostat is released. Final step is an anterior pull to ensure the tube is in place (Montgomery 1980). We chose to insert the T-tube endoscopically based on technique described by Rahimah et al. (2016). Via this technique ventilation would be continuous throughout the process of T-tube insertion. Although rare, complications may still arise due to T-tube stenting. These include airway obstruction due to buildup of secretion in the tube and presence of granulation tissue (Hu et al. 2018; Osman et al. 2017). Other complications include tracheal mucosa tear, mediastinal emphysema and pneumothorax (Hong et al. 2023). To date there is no mortality reported with the use of T-tube.

CONCLUSION

Montgomery T-tube functions as a stent to maintain airway patency and allowing phonation with normal humidification in nasal cavity. Our case highlights another function of T-tube as a bypass conduit to overcome tracheal dehiscence post tracheal resection and anastomosis with good results.

Conflict of interest: The authors declare that they have no conflicts of interest.

REFERENCES

Carretta, A., Casiraghi, M., Melloni, G., Bandiera, A., Ciriaco, P., Ferla, L., Puglisi, A., Zannini, P. 2009. Montgomery T-tube placement in the treatment of benign tracheal lesions. *Eur J Cardiothorac Surg* **36**(2): 352-6.

Cheng, G.Z., Folch, E., Brik, R., Gangadharan, S., Mallur, P., Wilson, J.H., Husta, B., Majid, A. 2015. Three-dimensional modeled T-tube design and insertion in a patient with tracheal dehiscence. *Chest* **148**(4): e106-8.

Hong, P.Y., Huang, M.H., Zhan, F.F., Lin, Y.L., Qiu, S.Z., Zhang, X.B. 2023. Case series: Montgomery T-tube placement for subglottic tracheal stenosis: a report of 3 cases. *Medicine* **102**(2): e32680.

Hu, H., Zhang, J., Wu, F., Chen, E. 2018. Application of the Montgomery T-tube in subglottic tracheal benign stenosis. *J Thorac Dis* **10**(5): 3070-7.

Margallo Iribarnegaray, J., García Luján, R., Pina Maíquez, I., Revuelta Salgado, F., Alfaro Abreu, J., de Miguel Poch, E. 2021. Montgomery T-Tube in the treatment of tracheal stenosis: Experience of a respiratory endoscopy unit and review of the literature. *Arch Bronconeumol* **57**(1): 70-1.

Montgomery, W.W. 1965. T-tube tracheal stent. *Arch Otolaryngol* **82**: 320-1.

Montgomery, W.W. 1980. Manual for care of the Montgomery silicone tracheal T-tube. *Ann Otol Rhinol Laryngol Suppl* **89**(4 Pt 5): 1-8.

Osman, M.E., Roushdy, M.M., Abdel-Haleem, A.K., Ramadan, M.O. 2018. Montgomery tracheal t-tube stenting as a single first-line treatment in postintubation laryngotracheal stenosis. *Egypt J Otolaryngol* **34**: 293-300.

Rahimah, A.N., Shahfi, F.I., Masaany, M., Gazali, N., Siti, S.H. 2016. Tracheal T-tube: A novel endoscopic insertion technique. *J Laryngol Otol* **130**(10): 967-8.