

CASE REPORT

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Salivary bypass tube in managing persistent and large pharyngocutaneous and tracheoesophageal fistulas: a series of seven cases

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Abstract

Background A salivary bypass tube (SBT) is a silicone tube that directs oral content from the mouth to the esophagus. We studied a series of seven cases of persistent and large neck fistulas of different aetiologies to assess the beneficial use of SBTs in each case.

Case presentation A total of seven patients underwent SBT insertion, six cases were post-total laryngectomy with underlying laryngeal malignancy, and one case was poor wound healing of a neck abscess after extensive drainage. Five cases have pharyngocutaneous fistula (PCF) and two cases have tracheoesophageal fistula (TEF), and all of the cases have failed conservative and multiple surgical management for fistula closure, with some concurrently having neopharynx stenosis. Post-insertion, all patients were able to eat orally after day 2 to 1-week. The duration of tube usage was one month in the three cases of persistent PCF post-operatively, and in two cases, the fistula was healed and the tube was removed without fistula recurrence. The other four cases (three post-radiotherapy fistulas and one stoma recurrence) were planned for lifelong use, with the duration of usage ranging from 4 months to 3 years. The outcome is their fistula is dry, and they tolerate the tube well. There were no intraoperative or immediate postoperative complications, and no complications were observed in the temporary usage cases. Among the patients who had to use the tube for a longer term, one had localised pressure necrosis of regional soft tissue that resolved after tube adjustment, and another had a loose-fitting tube that displaced distally into the oesophagus and resolved with a larger tube.

Conclusions SBT is safe, easy-to-apply, reduces morbidity, improves mental health, reduces inpatient stay, and overall improves the patient's quality of life in the management of persistent and large TEF and PCF for temporary or long-term usage.

Keywords Pharyngocutaneous fistula, Tracheoesophageal fistula, Total laryngectomy, Salivary bypass tube, Montgomery tube

Background

The salivary bypass tube (SBT) is designed to guide saliva into the distal esophagus, preventing salivary leakage and allowing for spontaneous closure of the neck fistula [1]. It has a funnel-shaped superior end that fits the hypopharynx (Fig. 1) and prevents stomach contents

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Fig. 1 SBT consists of a hollow tube with a funnel-shaped superior end

from refluxing while also being large enough to permit oral feeding [2].

Montgomery first introduced the SBT in 1955, and it was used in the case of laryngoesophagectomy [2]. In 1978, he further described in detail SBT used in the cases of pharyngocutaneous fistula (PCF) and pharyngoesophageal stenosis (PES), of patients having advanced carcinoma of the pharynx, following ingestion of corrosive material and following laryngoesophagectomy, along with the tube insertion technique [3]. SBT is now used as an alternative treatment to minimize salivary leakage in case of persistent or large PCF, large tracheoesophageal fistula (TEF) following primary puncture in a post-total laryngectomy (TL), and stent the PES [1].

The aim of this series is to share our experience of using SBT to manage persistent and large PCF and TEF by determining the characteristics of the patients, the indications for insertion, the durations of tube usage, and the outcomes and complications of it.

Case presentation

A total of seven patients were identified who underwent SBT insertion. Five were male and two were female and the patients were multiracial (4 Malay, 1 Chinese, 1 Siamese, and 1 Indian) with an age range of 29–76 years old (Table 1).

Mister A and Mister B were diagnosed with laryngeal malignancy and underwent TL surgery. Post-operatively, the surgical wound did not heal well and developed into PCF after 5 days, with the persistent saliva leakage worsening the wound-healing process. The patient was fed

through a nasogastric (NG) tube and managed with frequent dressings and medical therapy to reduce salivation, but it failed to heal the fistula. After 3 weeks, the decision for SBT insertion was made. Both patients were able to eat orally after day 2 post-insertion tube size 10, and their necks were dry. Mister A was discharged home on day 4 with regular outpatient dressing, and the fistula healed completely after 1 month. There was no fistula recurrence after SBT was removed or even after he completed radiotherapy (RT) treatment. Mister B's neck fistula became smaller and dry after 1 month of SBT usage; unfortunately, he died from respiratory distress related to hospital-acquired pneumonia (HAP).

A 29-year-old lady (Miss C) with uncontrolled diabetes mellitus (DM) presented with an extensive neck abscess with parapharyngeal, retropharyngeal, and anterior mediastinal extension. Incision and drainage were done, followed by two neck wound desloughings afterward due to a dirty and sloughy wound with poor healing that was complicated by PCF. She was on NG tube feeding for almost 3 weeks before the SBT size 10 was inserted, and on day 3 post-insertion, she was able to eat orally and was discharged home 1 week later with an outpatient dressing. The PCF and neck wound were completely healed after 1 month, and the SBT was removed with no fistula recurrence.

A 73-year-old lady (Madam D) was diagnosed with laryngeal malignancy and underwent TL surgery, and the wound was healing well post-operatively. She completed RT treatment with no sign of recurrence and was in good health until this year, after 7 years of completed treatment, when she complained of a new, non-healing wound superior to the neck stoma with food particles and saliva coming out of it. A biopsy taken from the neck wound confirmed a stoma recurrence and the decision for SBT insertion was made and was planned for life-long usage. She was able to eat orally after day 3. Currently, she has almost completed the palliative chemotherapy treatment and has been using the size 10 tube for 4 months with good oral intake and a dry neck wound (Fig. 2).

Mister E, a 75-year-old man with laryngeal cancer, underwent TL and was healing well after the operation. He had finished his RT treatment and was doing well with regular outpatient follow-ups. However, after 10 years of complete treatment, he presented with a salivary leak from the progressive unhealing wound above the neck stoma that failed to heal with medical treatment. Multiple attempts to repair the wound with skin grafts and pectoralis major muscle grafts have all failed, with the recent surgical finding of no suitable vessels for free tissue transfer. He had been on prolonged NG tube feeding for nearly 3 months when the decision to insert an SBT was made, and it was planned for life. He was able

Table 1 Characteristics of seven patients using SBT

Case	Gender/ Race	Age	Diagnosis	Indication	Tube size	Duration usage	Outcome	Complication
1	Mr. A, Male (Malay)	65	Post-TL for transglottic squamous cell carcinoma (SCC)	1. Persistent PCF post-TL surgery	10	1 month	1. Taking orally 2. Fistula resolved	Nil
2	Mr. B, Male (Indian)	76	Post-TL for hypopharynx SCC	1. Persistent PCF post-TL surgery	10	1 month	1. Taking orally 2. Fistula dry and smaller	Nil
3	Miss C, Female (Malay)	29	Extensive neck abscess with paralaryngeal, retropharyngeal, and anterior mediastinal extension	1. Persistent PCF post extensive drainage and multiple desloughing with poor wound healing	10	1 month	1. Taking orally 2. Fistula resolved	Nil
4	Mdm. D, Female (Malay)	73	Post-TL for hypopharynx SCC	1. Persistent large PCF secondary to tumour recurrence at the fistula site 2. Neopharynx stenosis	10	4 months, ongoing	1. Taking orally 2. Fistula dry	Nil
5	Mr. E, Male (Siamese)	75	Post-TL for hypopharynx SCC	1. Persistent large PCF post-radiotherapy 2. Neopharynx stenosis	10	6 month, ongoing	1. Taking orally 2. Fistula dry	Nil
6	Mr. F, Male (Chinese)	72	Post-TL for transglottic SCC	1. Large TEF post-radiotherapy 2. Neopharynx stenosis	10	3 years, ongoing	1. Taking orally 2. Fistula dry	Localised pressure necrosis of regional soft tissue and the issue was resolved after tube adjustment
7	Mr. G, Male (Malay)	62	Post-TL for transglottic SCC	1. Large TEF post-radiotherapy 2. Neopharynx stenosis	10,12	2 years, ongoing	1. Taking orally 2. Fistula dry	Loose-fitting tube displaced distally into the oesophagus, and the issue was resolved with a change to a larger size tube



Fig. 2 The neck stoma of Madam D is dry with the partly exposed tube

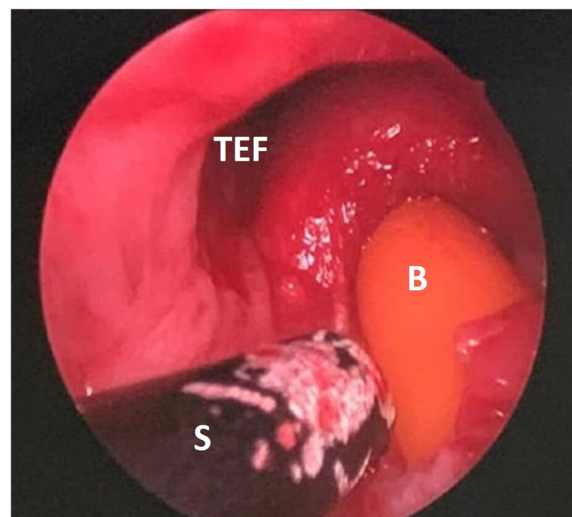


Fig. 3 A large TEF can be seen in the scope view, B- bougie dilator, S- suction

to eat orally after 1 week, and now he's been using the size 10 tube for nearly 6 months with a normal adult diet, a dry neck, and the same size PCF.

Mister F and Mister G had laryngeal cancer and underwent TL with TEF creation. Post-operatively, the wounds healed, and they were able to use a Provox voice prosthesis (VP) to communicate. One month after the completion of RT treatment, they complained of leaking saliva and food particles from the TEF, and the VP was found to be loose inside the fistula. The VP was removed, and they had to be fed through an NG tube. Both of them underwent more than four attempts of purse-string suturing around the TEF with VP in situ in an effort to manage the enlarged TEF, but post-operatively, the TEF continued to leak and the fistula gradually grew larger, with the latest finding of a massive fistula with huge tissue loss that was unrepairable (Fig. 3). During this time, they were on prolonged NG tube feeding for months, and the SBT was decided for the next management and planned for life.

The SBT size 10 insertion was uneventful, and both patients were able to resume oral feeding less than 1 week after insertion. Mister F complained of blood-stained saliva after 4 months, and his condition worsened when he experienced a sudden hematemesis episode. An examination under anaesthesia found a raw area over the neopharynx surrounding the upper end of the SBT, and the tube was removed (Fig. 4). He was left to heal for 3 weeks by feeding back through the NG tube. The same-size SBT was reinserted, and he has been using it for almost 3 years with no saliva leakage (Fig. 5) and is able to take orally.

After almost 2 months of usage, Mister G complained of dysphagia with throat discomfort, and from the scope noted the tube was displaced distally into the esophagus, which was upgraded to a larger size 12 tube. Currently, he has been using the tube for 2 years with good oral intake, a dry neck (Fig. 5), and is able to carry on with his normal pre-morbid activities.

Discussion

The PCF is the communication between the cervical skin and the digestive tract that causes saliva to leak onto the skin after swallowing. The most common cause of PCF is after resection of a head and neck malignant tumour, which is related to flap reconstruction or primary closure of a pharyngeal defect, occurring in between 3 and 65% of cases [4, 5]. Following radiation or chemoradiotherapy, haemoglobin less than 12.5 g/dL, advanced stage of the primary tumour, neck dissection technique, positive surgical margins, infections, and chronic obstructive pulmonary disease are all risk factors for PCF post TL [6]. The majority of PCF is treated conservatively, but some take much longer and may require the assistance of a multidisciplinary team and multiple additional surgeries for fistula closure. This will delay post-operative oral feeding, require a longer inpatient hospital stay, increase morbidity, reduce the patient's mental health, and overall will reduce their quality of life [7]. The long-term complications include secondary dysphagia from fibrosis and PES, which can lead to the requirement for further surgery to dilate the narrow lumen and or excise the stenotic segment with flap reconstruction [8].

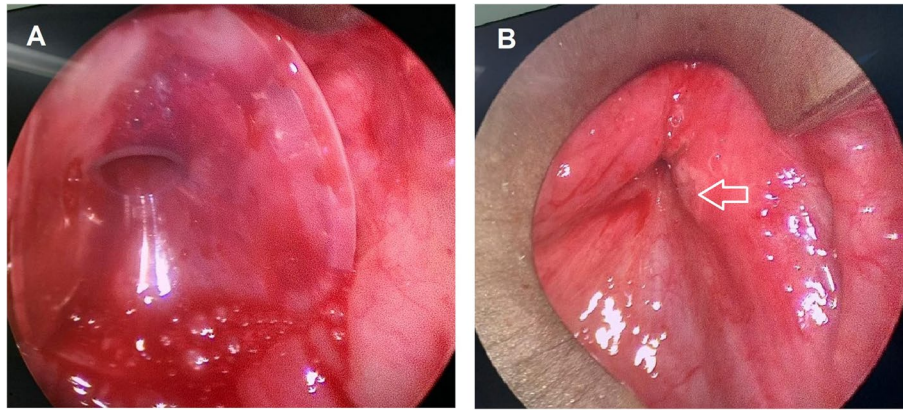


Fig. 4 Scope view showing the neopharynx with the upper end of the tube and evidence of bleeding (A). There is a raw area of ulcer (arrow) seen after tube removal (B)



Fig. 5 The neck stomas of Mister F (A) and Mister G (B) are dry and clean

It is the gold standard for voice prosthesis (VP) insertion via TEF following TL surgery [9], but complications can arise up to 19% of the time, mostly because of the large puncture [10]. Radiation, poor nutrition, diabetes, smoking, and hypothyroidism can all affect the elasticity and integrity of the tissue, which increases the risk of developing an enlarged fistula. So far, there are still no clear guidelines on how to manage this complication. First-line therapy is conservative; however, if it fails, surgical intervention is necessary [10]. There are multiple surgical interventions suggested, including purse-string suture of the TEFs, modification of the VP to lessen periprosthesis leakage, and transplantation of a cartilage graft into the TEFs, which can be performed with respectable success rates. In addition, other methods including injections surrounding the fistula, closure with local flaps, myofascial flaps, free flaps, and fistula closure using a septal button have been proposed to overcome this difficulty [11]. A persistent larger TEF raises the risk of pneumonia and respiratory issues since it may cause fatal aspirations [10].

Persistent saliva contact with the wound's edges of a fistula, resulting in recurrent infection and micro-venous thrombosis, further damaging the tissue [5]. SBT helped in reducing saliva leaking over the fistula sites, improved wound healing, and concurrently resolved the neopharynx stenosis. No contraindications to SBT usage have been mentioned in other studies and reports so far [1]. There are no clear guidelines regarding the duration of tube usage. Gooi et al. described a case of persistent PCF post-RT in a patient who used the SBT for 30 months (2.5 years) and is now doing well and able to meet nutritional needs without complications [12].

SBT insertion and removal are simple and safe procedures and were done under general anaesthesia (GA); there have been no reports of any intraoperative surgical problems related to it. A few incidences of minor tube usage complications and cases of distal migrations without obvious implications were documented [13]. Only two cases were reported as a fatal complication of SBT, the first case was an arterio-esophageal fistula that occurred following TL due to a retro-esophageal

subclavian artery [14], and the second case was a distal migration of SBT led to intestinal perforation [15].

In this series, it was shown that the SBT can be used for different purposes of management, whether to manage the poor neck wound healing post-operation to fasten the healing process, which proved beneficial, or as a life-long conservative management of an unreparable neck fistula. The insertion of the tube is a minor procedure and was done under GA with no complications related to it. After insertion, patients were able to eat orally as early as day 2 post-insertion and were able to discharge home earlier. In healing fistula cases, we monitored the patient in our clinic weekly with a neck wound inspection and scope to assess the tube placement, local reactions, or granulation tissue formation around the tube until the neck wound completely healed. In cases of longer tube usage, we follow-up with a scope surveillance of two weekly visits for first 2 months, followed by a monthly review, and if well, three monthly reviews. We do advise the patient to walk-in to our clinic at any time if they have issues with the tube like hematemesis, vomiting, dysphagia, or pain. By far, only two minor complications were observed in this series in a long-term tube-usage patient, and we were able to manage them well. There was no infection related to all the tube-using patients. All our patients tolerated the tube well and were able to eat and live as normal with no limitations on their daily activities.

Conclusion

SBT is effective in managing the case of persistent PCF in post-operative patients by reducing the salivary leak and speeding up the wound healing process around the neck fistula. For long-term usage, SBT is well tolerated in the case of large PCF and TEF, particularly with massive skin loss that is unreparable with surgical intervention, and has been used for 3 years and counting with only minor complications. The best feature of SBT is that patients were able to continue oral intake as normal after insertion as early as 2 days postoperatively.

Abbreviations

SBT	Salivary bypass tube
PCF	Pharyngocutaneous fistula
TEF	Tracheoesophageal fistula
PES	Pharyngoesophageal stenosis
TL	Total laryngectomy
RT	Radiotherapy
NG	Nasogastric
VP	Voice prosthesis
GA	General anaesthesia

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Authors' contributions

Concept: ZY, NNMZ. Data collection: NNMZ. Data analysis: ZY, NNMZ. Writing: NNMZ, IM. Critical review: IM. All authors read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate

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Consent for publication

Written consent was obtained from all participants included in the study regarding the publication of their data and photographs.

Competing interests

The authors declare that they have no competing interests.

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