

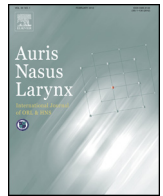


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## Closure of tracheoesophageal puncture with pedicled fascia flap of the sternocleidomastoid muscle

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### ABSTRACT

**Objective:** Closure of a tracheoesophageal puncture (TEP) formed during voice prosthesis implantation may sometimes be required. We report a new method of closure that we have termed the RESET method.

**Methods:** We used the RESET method for four patients. An initial incision was made at the mucocutaneous junction of the tracheostoma, and the trachea and esophagus were separated. The TEP was sectioned, and the tracheal and esophageal sides were sutured into separate layers. A pedicled fascia flap lifted from the sternocleidomastoid muscle was sandwiched between the trachea and the esophagus, and subsequently secured.

**Results:** The TEP was closed in all patients, and no complications were observed.

**Conclusion:** The RESET method, using a pedicled fascia flap with stable perfusion, is a simple, reliable method of TEP closure.

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## 1. Introduction

Standardized procedures have previously been established for restoring voice function after total laryngectomy by means of the creation of a tracheoesophageal puncture (TEP) and the implantation of a Provox device or other voice prosthesis. In around 5% of patients, however, TEP closure is required for a number of possible reasons, such as leakage around the prosthesis due to enlargement of the TEP, inadequate voice production by the prosthesis, or the patient no longer wishing to continue voice production using the prosthesis [1]. If closure becomes necessary, reported methods include natural closure after prosthesis removal or closure by simple suture without dividing the esophagus from the trachea, and separating the esophagus and trachea prior to suturing and closure [2–12]. In addition to two-layer suturing [7], several techniques have been reported for separating the esophagus and trachea, including two-layer tracheal esophagoplasty and tracheal

advancement, sandwiching part of the sternocleidomastoid (SCM) muscle body between the two, and sandwiching free subcutaneous tissue harvested from the femoral region (the three-layer technique) [8–12].

We have obtained good results by lifting pedicled fascia from the SCM muscle, located laterally to the tracheostoma, and sandwiching it between the separately sutured trachea and esophagus. This low-invasive surgical technique could restore the trachea and esophagus to a state close to that prior to prosthesis insertion and, therefore, we have named it the RESET method, i.e., REstore tracheoesophageal puncture by Sandwiching pedicled SCM fascia between Esophagus and Trachea.

## 2. Materials and methods

We used the RESET method to perform TEP closure in four patients. Two patients had undergone total laryngectomy for laryngeal carcinoma, and two had undergone pharyngo-laryngo-esophagectomy for hypopharyngeal carcinoma and free jejunal reconstruction. Both patients with hypopharyngeal carcinoma had received radiotherapy. All four patients had undergone Provox 2 (Atos Medical AB, Hörby, Sweden) implantation. Three patients had been using the prosthesis for voice production for some time

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**Table 1**  
Patient clinical characteristics.

No.	Age (years)	Sex	Tumor	Therapy	Neck dissection	Radiation	Age of fistula (month)	Indication for closure	Follow up after closure (month)
1	74	F	LC T3N0M0	TL	Unilateral	No	19	Disuse	19
2	63	M	HPC T4bN2cM0	TLPE + FJT	Bilateral	Yes	48	Salivary leak	13
3	79	M	HPC T4aN0M0	TLPE + FJT	Bilateral	Yes	61	Disuse	12
4	70	M	LC T4aN0M0	TL	Bilateral	No	9	Disuse	2

Abbreviations: LC: laryngeal cancer; HPC: hypopharyngeal cancer; TLPE: total laryngopharyngoesophagectomy; FJT: free jejunal transfer.

after the TEP operation, but requested removal of the prosthesis and TEP closure owing to changes in their living environment or the acquisition of esophageal speech. The other patient required TEP closure after developing repeated aspiration pneumonia due to enlargement of the TEP, despite attempts to control the leakage by wearing a ring and other measures (Table 1). In all four cases, surgery was performed after having confirmed that the TEP had failed to close despite waiting conservatively for closure for three weeks to two months after prosthesis removal.

### 3. Surgical technique

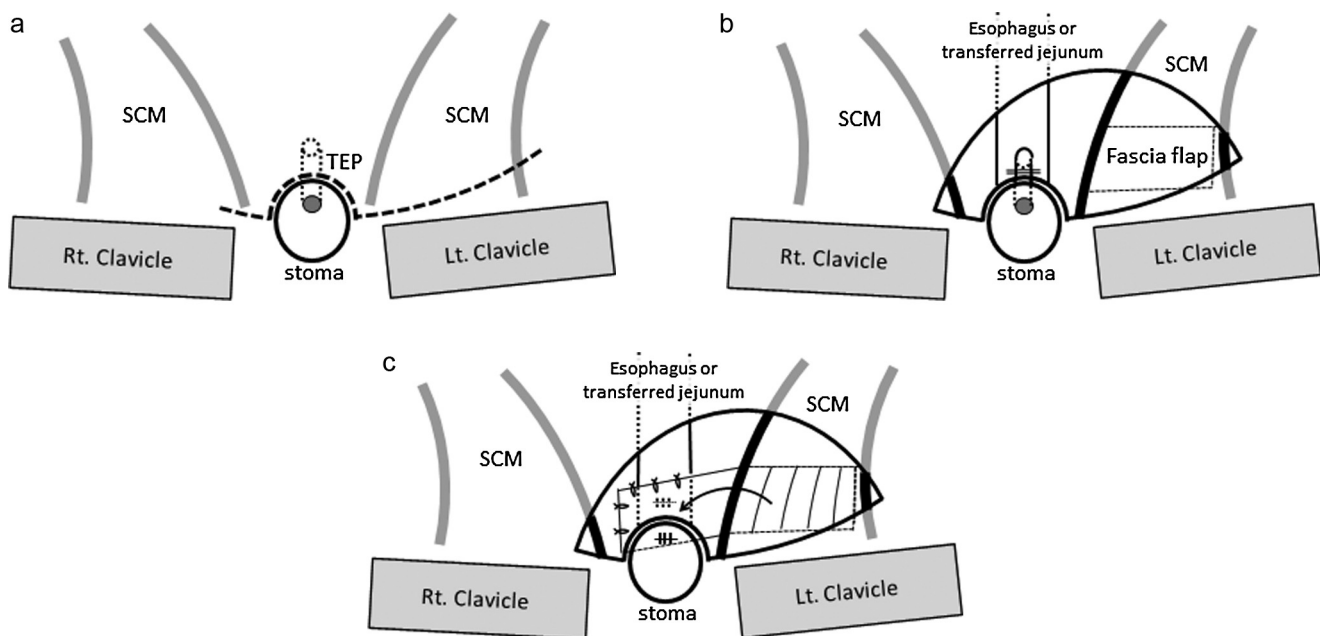
Surgery was performed under general anesthesia, with intubation via the tracheostoma. The diameter of the selected endotracheal tube was as small as possible without permitting leaks. An incision was made from the 9 o'clock to the 3 o'clock direction in the mucocutaneous junction cranial to the tracheostoma, and was connected to a collar incision on both sides. A skin incision as far as the lateral border of the SCM muscle was made on the side from which the muscle fascia was to be harvested, with a skin incision of 2–3 cm on the opposite side (Figs. 1a and 2a). When choosing which

side to use for harvesting the fascia, the side that had not undergone cervical lymph node dissection was prioritized. If dissection had been performed on both sides, the side with fewer adhesions between the platysma and SCM muscles was determined by palpation to check the slippage between the skin and muscle.

The first step was to detach the trachea from the esophageal wall or the transferred jejunal wall, and to identify the TEP fistula. The fistula was sectioned in the middle, and 4-0 Vicryl was used to insert a single-layer, inverted, interrupted suture for each layer (Fig. 1b).

Next, the fascia was detached from the surface of the SCM muscle and elevated, and a rectangular fascia flap was created with the medial margin of the SCM muscle forming a wide pedicle. The fascia flap was 2–3 cm wide, and of the length required to cover the sutured fistula and reach the tracheal cartilage on the opposite side. The elevated fascia flap was inverted medially and secured with 4-0 Vicryl sutures to the area surrounding the sutured fistula and the opposite tracheal cartilage (Figs. 1c and 2b).

In patients with damaged fascia of the SCM muscle due to cervical lymph node dissection, the connective tissue between the platysma and SCM muscle was elevated and used in the same way.



**Fig. 1.** The schema of the surgical technique. These figures show the sternocleidomastoid muscle fascia harvested from the left side. (a) The skin incision is made as represented by the dotted line, and the trachea is detached from the esophageal wall or the transferred jejunal wall to identify the tracheoesophageal puncture fistula. (b) The fistula is sectioned in the middle, and 4-0 Vicryl is used to insert a single-layer, inverted, interrupted suture for each layer. The fascia is detached from the surface of the sternocleidomastoid muscle. (c) The elevated fascia flap is inverted medially and secured with 4-0 Vicryl sutures to the area surrounding the sutured fistula and the opposite tracheal cartilage.

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