

CASE REPORT

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# Troubleshooting recalcitrant tracheoesophageal prosthesis site leak with internal mammary artery perforator flap: a case report

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## Abstract

**Background:** An enlarged tracheoesophageal puncture (TEP) site is a grave complication of voice prosthesis rehabilitation.

**Case presentation:** We report a case of periprosthetic leakage with an enlarged tracheoesophageal fistula causing aspiration, not responding to conservative management and primary closure. Internal mammary artery perforator (IMAP) flap was subsequently used in the management. The flap was successfully taken up at the recipient site with no leak post-operatively as confirmed by barium swallow, thereby preventing further aspiration.

**Conclusion:** Though minor degrees of TEP leak usually respond to conservative management, the recalcitrant ones require active intervention which one should be aware of.

**Keywords:** Tracheoesophageal fistula, Periprosthetic leakage, Voice prosthesis

## Background

Currently, there are four main methods of voice rehabilitation for laryngectomy patients: esophageal voice, electrolarynx, pneumatic artificial larynx, and tracheoesophageal shunt prosthesis. Among these, vocal rehabilitation by voice prosthesis has represented the gold standard for the last two decades [1]. Nonetheless, the procedure may be associated with complications both at the time of placement and later [2]. Valve failure can interfere with respiration, swallowing, and speech. Internal prosthetic leakage may result in aspiration pneumonia and dehydration, and repeated valve replacement may lead to either tracheoesophageal fistula stenosis or insufficiency [3]. The other frequent problem in patients with a voice prosthesis is periprosthetic leakage. It develops in

up to 30% of patients [4, 5]. Depending on the severity of fistula enlargement, treatment ranges from conservative approaches to invasive procedures [4, 5]. IMAP flap is a versatile and reliable flap and in this report, we describe the utility of the internal mammary artery perforator (IMAP) flap in managing a difficult TEP site leak.

## Case presentation

Fifty-three-year-old male, known case of Glottic squamous cell carcinoma clinical stage c T4a c N0 M0, had undergone Total Laryngectomy with partial pharyngectomy and right hemithyroidectomy with bilateral selective neck dissection of levels II–IV along with cricopharyngeal myotomy, a primary tracheoesophageal prosthesis insertion and neopharynx formation by primary closure under general anesthesia in June 2020. He was a known hypothyroid and hypertensive. The prosthesis used was Provox Vega size 8 mm. He received post-operative adjuvant treatment in the form of radiotherapy. The patient was doing well during the follow-up visit

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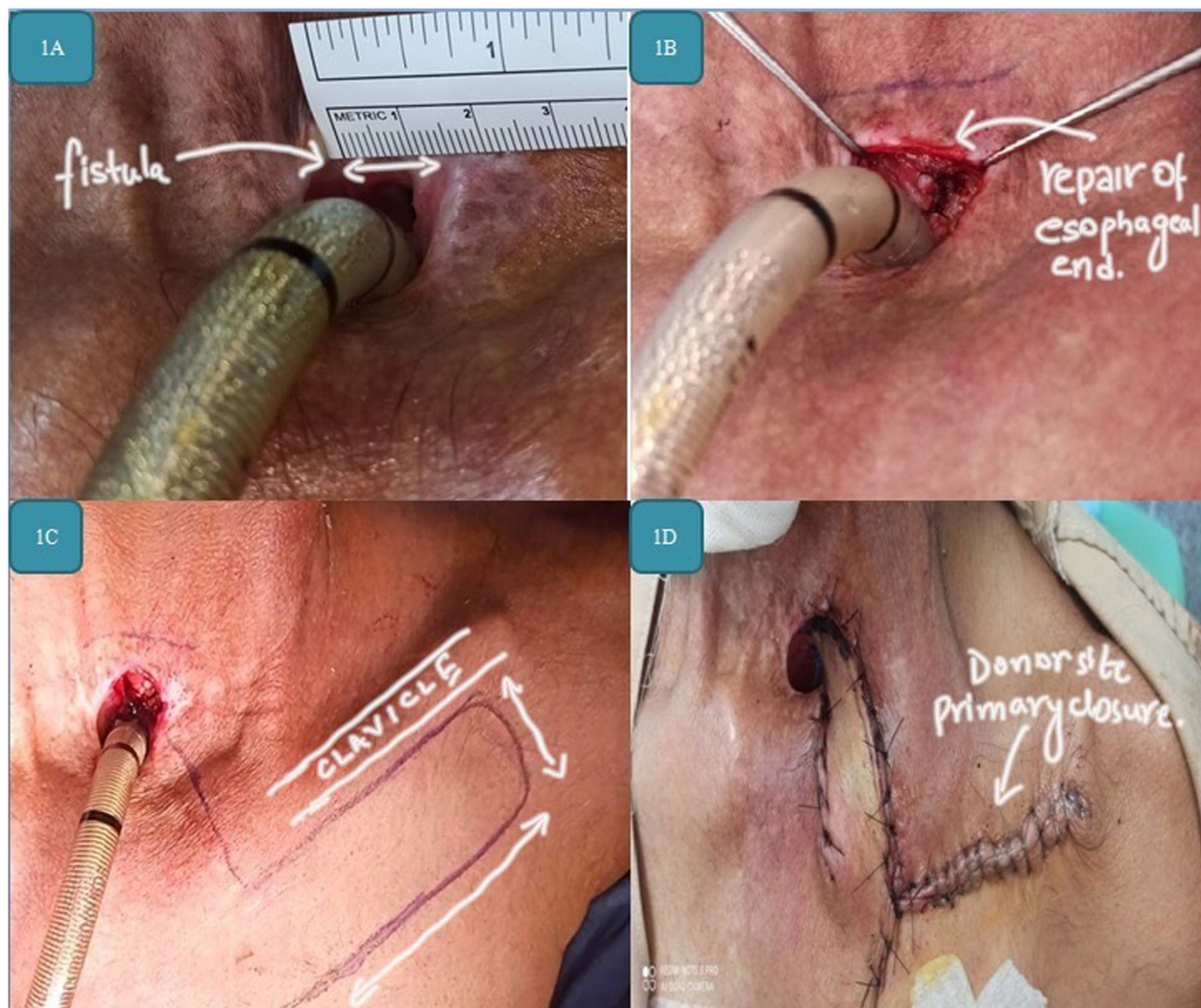
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until about 14 months after treatment completion when he started developing periprosthetic and transprosthetic leakage. Sequential algorithmic management was carried out, first with conservative measures like deep cleaning of the prosthesis and reallocating it. This was followed by replacement of the prosthesis with a smaller size. Even after this when the seal could not be achieved, an attempt was made to shrink the fistula by removing the prosthesis and placing a cuffed tracheal cannula to prevent aspiration. The size of the fistula was around 10 mm as shown in Fig. 1A. The patient was started on anti-reflux medications simultaneously. However, when all attempts at conservative management failed, we sought surgical management in the form of closure of the tracheoesophageal fistula. Before proceeding with the final plan of TEP site repair, disease-free status was confirmed, the patient

was euthyroid on medications, willing for surgery, and to undergo other forms of speech rehabilitation. First purse string sutures were applied, and when that failed the fistula was closed primarily in two layers. After about a week, the patient again presented back with a leak and persistent aspiration.

#### Technique

A plan was made for a loco-regional pedicled flap with the internal mammary artery-based perforator (IMAP) flap. Based on the pre-operative Doppler probe localization the first IMA perforator was found to be the dominant one. After measuring the size of the defect (Fig. 1A), a peristomal circular incision was made, the party wall and tracheoesophageal fistulous tract were localized, resected and the esophageal end was closed in two layers



**Fig. 1** A Size of the fistula. B Primary esophageal closure. C Flap designing. D Flap inset

using simple inverting sutures (Fig. 1B). To reconstruct the defect of the posterior tracheal wall, the IMAP flap was harvested. The flap was designed as shown (Fig. 1C). Dimensions taken were  $7 \times 3$  cm. The superior limit was just below the clavicle and the inferior was at the level of the first rib. The distal end of the flap was decided by the reach and the arc of rotation and width was decided in a manner to facilitate primary closure of the donor site, taken in this case around 3 cm. The flap was then elevated in the subfascial plane exposing the fibers of the pectoralis major. Proximally it was elevated about 1 cm from the mid-point of the sternum. To accommodate the bridge of skin, a drop-down incision was given from the stoma connecting the donor site of the flap. The flap was rotated upwards taking care to preserve the superficial veins at the pivot joint to maximize the venous outflow. The inset was done in two layers. The donor site closed primarily. (Fig. 1D) Post-operatively, the patient was kept on nasogastric tube feeding for 1 week, following which a Barium swallow was done (Fig. 2A). It confirmed the absence of any leak, following which the patient was started on oral feeds. At present, the patient is doing well (Fig. 2B) and is undergoing speech rehabilitation with the help of an electrolarynx.

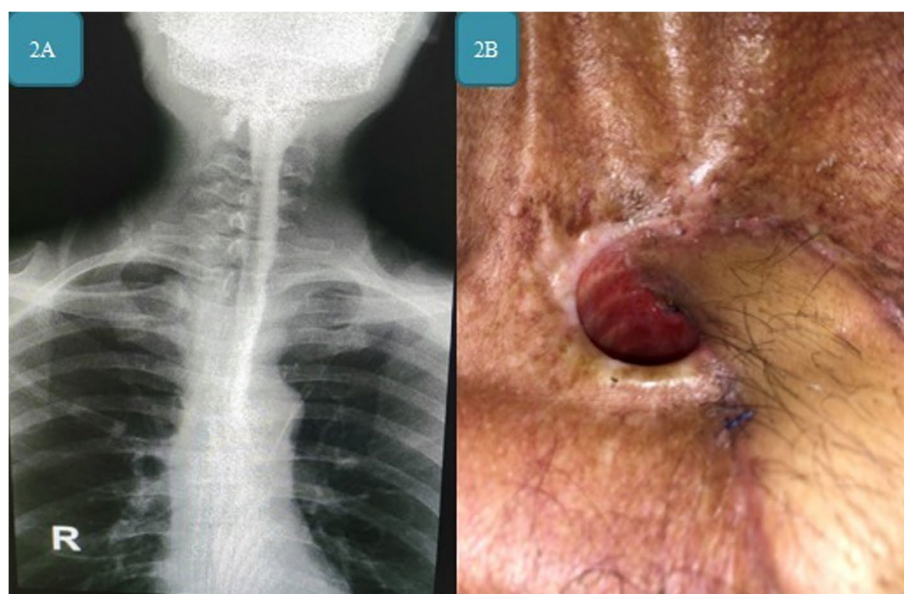
## Discussion

The most recent refinement in flap reconstruction has been the advent of perforator-based flaps. The term “perforator flap” was first introduced by Koshima in 1989 for paraumbilical flaps harvested as free flaps [6]. However,

pedicled perforator flaps for head and neck reconstruction have rarely been an option owing to the lack of perforator flaps in this region. The deltopectoral flap, first described in the 1960s by Bakamjian, fulfills much of the properties fundamental to perforator flaps [7]. A variation of the classic deltopectoral flap is the IMAP flap. A significant advantage of this flap is that primary closure of the donor defect is possible with no issues related to flap viability. There are a few case reports describing the use of this flap in the closure of circumferential pharyngeal defects and for tracheostome and anterior neck reconstruction. To our knowledge, this is the first report describing this particular use of the flap.

This flap is particularly helpful in patients where local options are best avoided due to prior radiotherapy. A thin and pliable fasciocutaneous flap, it is well suited to anterior neck defects, especially suited for tracheostomy reconstruction where bulky muscle from pectoralis major or latissimus dorsi flaps may obstruct the tracheostome. In addition to this, it may avoid the need for complex and prolonged free-flap reconstruction in selected patients.

IMAP flap is based on a single IMAP vessel as an island and hence, it is more maneuverable due to an increased arc of rotation. The added benefit of primary closure of the donor site enables this flap to be used in situations where a deltopectoral flap would not be used due to the additional morbidity of a skin graft. Anatomical studies have shown that the IMAP vessels are located 13 to 14 mm (mean) from the lateral border of the sternum. Although perforators are usually present in the first five



**Fig. 2** A Post-operative barium swallow. B Follow-up visit



intercostal spaces, the second IMA is the most constant and reliable [8], though in our case it was the first perforator that was dominant. Mean arterial diameter ranges from 0.85 mm as seen in cadaveric dissections to 1–1.5 mm in live dissections [9]. Preoperative handheld Doppler devices can usually confirm the presence of these vessels, although it tends to be less reliable in predicting the course or size of these vessels.

In our case, the patient had persistent intractable TEP site leak not responding to conservative management which finally settled with this flap cover, which was relatively very easy to harvest, less time consuming, robust flap with minimal donor site morbidity. It therefore cannot be over-emphasized that with a problem so commonly occurring with the use of voice prosthesis, a simple solution like this for recalcitrant cases should be more often sought after rather than resorting to other complex forms of reconstruction.

## Conclusion

In a post-irradiated field, IMA is a versatile flap providing a single-stage reconstructive option with an arc of rotation well suited for covering not only anterior neck skin defects but also providing a definitive solution to an enlarged TEP fistula.

## Abbreviations

IMA: Internal mammary artery perforator; TEP: Tracheo-esophageal puncture.

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## Authors' contributions

VG- manuscript report writing, SP- manuscript writing and guidance, CAS – operating surgeon and AT- guidance. All authors read and approved the final manuscript.

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## Availability of data and materials

All data generated or analyzed during this study are included in this published article.

## Declarations

### Ethics approval and consent to participate

Prior to reporting ethical committee clearance was obtained from the Institutional Ethics Committee, AIIMS, New Delhi.

### Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

### Competing interests

The authors declare that they have no competing interests.

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