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Case Report

Tubed myocutaneous pectoralis major flap: A rescue option in esophagus reconstruction

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ABSTRACT

This article presents a complex case of total pharyngoesophageal defect reconstruction in a patient with recurrent supraglottic squamous cell carcinoma.

After failed attempts with free microsurgical techniques due to complications, a tubed myocutaneous pectoralis major flap was successfully employed. The procedure aimed to achieve alimentary continuity, speech, and swallowing functionality. Despite initial challenges and concerns about stenosis, the reconstruction of a total pharyngolarygectomy defect resulted in a good functional outcome, although minor deficits in neck mobility and aesthetic donor zone deformities were noted.

The case highlights the broad armamentarium of reconstruction techniques that plastic and aesthetic surgery teams must be trained, namely the myocutaneous pectoralis major flap which in selected cases can be the end solution.

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Introduction

Advanced primary Supraglottic Squamous Cell Carcinomas (SCC) have traditionally been treated with total laryngectomy, bilateral neck dissections, and postoperative radiotherapy (RT). However, preserving the larynx has become crucial in treating laryngeal cancer to enhance patients' quality of life.[1]

Currently, therapeutic options for these advanced lesions include surgical excision (partial or total laryngectomy) with bilateral neck dissections, followed by adjuvant RT or concurrent chemoradiotherapy (CRT); primary RT with surgical salvage, or concurrent CRT with surgical salvage.[2]

The primary goals of pharyngoesophageal reconstruction in such cases are to ensure alimentary continuity, protect vital structures such as the carotid artery, and restore functions such as speech and swallowing. Major complications after pharyngoesophageal reconstruction include flap necrosis, anastomotic strictures and fistulas.[3]

This article aims to present a case of reconstructing a pharyngoesophageal defect with a tubed myocutaneous pectoralis major flap in a patient previously treated with chemoradiotherapy, total laryngectomy, partial pharyngectomy, and bilateral neck dissection who later developed a pharyngocutaneous fistula with carotid artery blowout and reconstruction failure using a free jejunal flap.

Case report

Herein, we report a case of a 52-year-old male with recurrent supraglottic squamous cell carcinoma (SCC) (cT3cN1cM0). He was initially diagnosed 11 years ago with supraglottic SCC and underwent laryngeal preservation via chemoradiotherapy (CRT). After complete response to treatment, recurrence was detected 11 years later during routine follow-up.

As salvage treatment, total laryngectomy, partial pharyngectomy (due to tumour permeation), selective bilateral lateral neck dissection (levels II-IV), and tracheostomy were performed. A pharyngocutaneous fistula developed on the 7th postoperative day and was managed conservatively. On the 26th day, an emergent reintervention was needed due to a massive airway haemorrhage caused by a left common carotid artery blowout and complete destruction of the neopharynx. The common carotid artery was ligated, and a nasogastric tube was inserted for nutrition and protection.

Repair of the defect was performed with a jejunal free flap with microvascular anastomosis to the internal mammary vessels. Fig. 1a Subsequently, the flap flap failed due to multiple venous thrombosis (Fig. 1b).

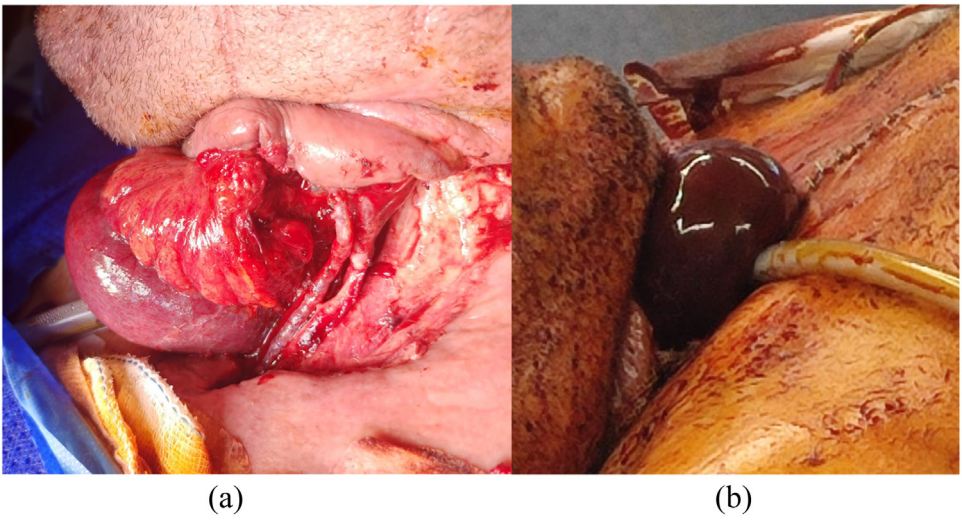

Figure 1. a and b: Jejunal reconstruction in the early postoperative course; after 4 days, the flap was visibly congested and not viable.

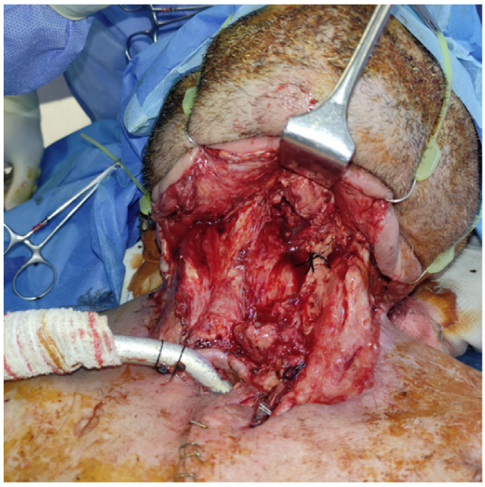

Figure 2. Pharyngoesophageal defect in the neck.

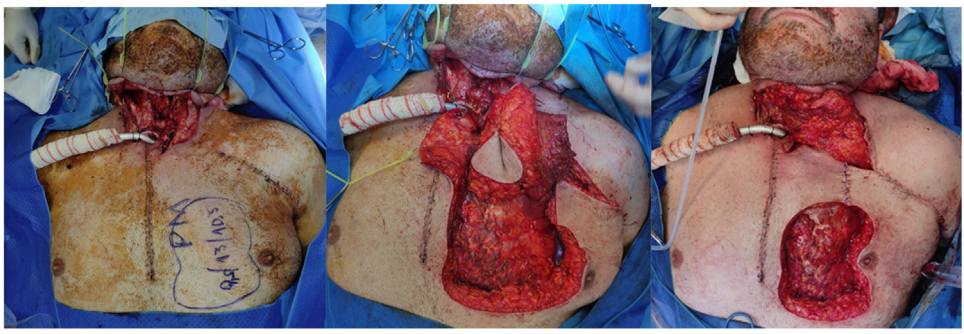

Figure 3. a) design of the flap, b) tubing of the flap and transfer to the cervical region, c) inset of the flap at the neck.

As a salvage procedure, to reconstruct the phayngoesophageal defect (Fig. 2) a tubed pedicled myocutaneous pectoralis major flap was performed. The flap was drawn and harvested as usual with a trapezoid shaped skin flap with dimensions of 9.5 cm (corresponding to the height of the defect) x 10.5 cm - 13 cm (length of circular defect to tube). The thickness of the pectoralis major skin was 3 cm. A much wider muscle base was taken so that when the flap was rolled into a tube, the muscle could be sutured to form a second outer layer. The pectoralis major flap was then tubed in a vertical manner with interrupted PDS 3/0 with intraluminal knots. The tubed flap was then transposed into the defect, placing the seam posteriorly against the prevertebral fascia. Distal and proximal anastomosis were accomplished. The proximal native portion of the esophagus was cut in an oblique fashion (spatulated) to increase the diameter of the distal anastomosis and to minimize the risk of developing a stricture. All sutures were done without tension. Figs. 3a, b and c Finally, the donor area was not possible to close in a direct fashion, and the defect was covered with a Split Thickness Graft (SSG) from the thigh.

At the 6-month follow-up, the patient exhibited good velopharyngeal competence and a patent aperture to the neoesophagus at the level of the proximal junction. The esophageal transit study revealed a left shift of the neopharynx with permeability in the proximal pharynx-flap junction with adequate permeability and discrete stenosis in the distal anastomosis between the flap-esophagus junction. No fistulas were noted. Figure 4 Oral intake (liquid and solid) with a near-normal diet was possible without dysphagia, and a stable weight (BMI 27.5 kg/m^2) was achieved. There was one episode of

Figure 4. Esophageal transit study.

Figure 5. Photographs of the neck and donor zone sites after 1 year.

food impaction, successfully managed by upper GI endoscopy and no reports of aspiration pneumonia. The patient underwent speech rehabilitation using an artificial electronic larynx. No permanent defect was noted with the ligation of the common carotid artery. As for morbidity, we report limited neck mobility (mainly extension and lateral rotation of the neck) and cosmetic deformity in the scar of the skin graft. Figure 5

Discussion

Total pharyngolaryngectomy and bilateral neck dissections post CRT yield a complication rate of 67.5 % (including fistula, wound complications, dysphagia, bleeding, pharyngeal stenosis, and stomal stenosis),[4] being the most common pharyngocutaneous fistula (incidence of 23 % to 34 %).[5]

Initial management of fistulae involves conservative measures such as pressure dressings and antibiotic therapy, but complications can persist until spontaneous closure occurs. In our case, a pharyngocutaneous fistula led to carotid artery blowout, requiring multidisciplinary life safe procedures and further reconstruction.[6]

The ultimate goals of pharyngoesophageal reconstruction are to provide a safe wound and a conduit that assists alimentary continuity, swallowing and speech.[4]

Jejunal free flap reconstruction of the defect, the standard choice for reconstruction, posed challenges due to previous radiotherapy, neck dissection, and vessel complications.[7,8] In the absence of viable neck vessels for microvascular anastomosis, the internal mammary internal vessels were chosen as the vessels source. Our patient subsequently had venous thrombosis of the jejunal flap, leading to flap failure and a depleted neck.

A subsequent new salvage reconstructive surgery was required. Other free flaps such as anterolateral thigh or radial forearm flaps were unsuitable due to the absence of suitable recipient vessels for free tissue transfer (using the contralateral donor site neck vessels was deemed unsafe being already exposed to radiotherapy). A visceral transposition was deemed inappropriate given the recent jejunum flap harvest.

It is well established in the literature and clinical practice that the use of regional flaps (such as the pectoralis major flap) is an excellent option for the closure of defects in the cervical neck covering partial hypopharynx defects, but is discouraged in circumferential total pharyngolaryngectomy.[9]

The pectoralis major myocutaneous flap was first described in 1968 by Hueston.[10] The pectoralis major muscle's primary blood supply derives from the perforating vessels from the pectoral branch of the thoracoacromial artery, with secondary contributions from the lateral thoracic artery and parasternal perforators from the internal mammary artery. A skin paddle of sufficient size to close the pharyngeal defect is designed over the inferior medial portion of the muscle. The pectoralis major muscle and its investing fascia are elevated, and the flap is then transposed over the clavicle into the neck through a widely undermined subcutaneous tunnel. Closure of the donor site can often be accomplished primarily, although a skin graft may be needed for larger defects. The pectoralis myocutaneous flap has an adequate pedicle length to rotate into pharyngeal and adjacent tonsil and base-of tongue defects.[11]

The use of the pectoralis major flap to close the hypopharynx pouch and not re-establish the upper digestive conduct was not an acceptable solution to the patient, so our team proposed the use of the flap as a tubed flap.

The major pectoralis myocutaneous flap seems to be disfavored in the setting of total hypopharyngeal defects because of anastomotic problems, particularly fibrotic stricture formation at the distal anastomosis. Stricture formation after pectoralis major flap is reported to be between 13 % and 35 %.[12-16] Additionally, it is considered to be too thick and difficult to form into a tube and is not considered an effective alternative for total or near-total defects.[6]

However, the reconstruction of total pharyngeal-esophageal defects continues to be a problem area, with only moderate success achieved with the other techniques described.[17]

Several modifications to limit the problems associated with the reconstruction of total pharyngeal-esophageal defects were proposed:

- This flap can be harvested as a myofascial flap, which thereby avoids the often excessively bulky subcutaneous tissue that makes the tubing of the myocutaneous flap difficult.[6]
- Alternatively, the pectoralis flap can be partially tubed 270° around and closed to the prevertebral fascia that has been grafted.[6]
- To reduce the risk of narrowing at the distal anastomosis, the esophagus can be transected obliquely[18] or the tongue in groove technique in the suture of proximal and distal anastomosis[19] or making an interdigitating anastomotic line produced by making vertical slits on the skin edge.[20]

Some procedures to reduce the risk of stenosis in our case were performed:

- The flap width was between 10.5 and 13 cm. This is wider than the 7–8 cm suggested in the literature,[21] but as the patient was stout, a higher diameter of the tube matched the diameter of the proximal pharynx defect and the oblique distal defect in the esophagus.
- The proximal and distal skin paddles were designed in a curvilinear fashion to adapt better to the anastomotic sites. A much wider muscle base was taken so that when the flap was rolled into a tube, the muscle could be sutured to form a second outer layer.
- The proximal portion of the esophagus was cut in an oblique fashion (spatulated) to increase the diameter of the distal anastomosis and minimize the risk of developing a stricture.

- Placing the longitudinal seam posteriorly against the prevertebral fascia that will again hopefully contain a leak should the patient develop one.
- PDS was used in all anastomotic sites. The knots were placed inside the lumen, and careful attention was given to inverting the skin edge and mucosa as much as possible. PDS is a monofilament absorbable suture material with the advantage of high tensile strength and maintaining its integrity in the face of infection, possibly minimizing the risks of abscess and fistula formation.[22]

It is important to note also that our patient did not undergo postoperative radiotherapy, which was an important cause of stenosis reported by Schuller et al.[17]

Conclusion

Despite initial complications, our case demonstrates successful total pharyngoesophageal reconstruction using a tubed myocutaneous pectoralis major flap. As a salvageable procedure, alimentary continuity, swallowing and speech without dysphagia was achieved. Although, there were some limitations on cervical and shoulder motion and the scar on the skin grafted areas in the thoracic region.

Stenosis after a circumferential pharyngoesophageal defect reconstruction was prevented through a skin paddle in trapezoidal shape and adequate dimensions and precise inset of proximal, distal and posterior anastomotic sites.

This case report shows a successful reconstruction of a total pharyngoesophageal defect reconstruction with a tubed myocutaneous pectoralis major flap, after the complications and failure of microvascular techniques.

Declaration of competing interest

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi: 10.1016/j.jpra.2024.02.011.

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