

Pectoralis major flap in the reconstruction after salvage laryngectomy

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Introduction

Patients undergoing salvage surgery are more prone to developing pharyngocutaneous fistulas, the fistula rates reported are as high as 70%.

Aim of the study

The aim of this study was to present our experiences with patients undergoing reconstruction with a pectoralis major flap.

Methods

We describe the surgical steps we employed during the reconstruction after salvage laryngectomy in 14 consecutive patients.

Discussion

This flap will give the patient the advantages of early oral feeding, good tracheostomy care, short hospital stay, and protection against catastrophic vascular blowouts.

Keywords:

flaps, laryngectomy, pectoralis major, reconstruction

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Background

Laryngectomy is used increasingly as a salvage procedure after radiotherapy or chemoradiotherapy. The development of organ preservation protocols and primary chemoradiotherapy for patients with advanced laryngeal cancer resulted in organ preservation rates of 64% and survival rates similar to those seen in patients offered laryngectomy followed by radiotherapy [1].

Patients undergoing salvage surgery are more prone to develop pharyngocutaneous fistulas because of injuries to the tissue microvasculature, resulting in myointimal fibrosis, endarteritis and worsening of atherosclerosis, which leads to a hypovascular, hypocellular and hypoxic environment, reducing healing capacity and increasing the risk for fistula formation, its severity and duration. In the setting of salvage surgery, the reported rates of fistula development are as high as 70% [2].

In an attempt to prevent or reduce the incidence of salivary fistulas, some authors have advocated the routine use of nonirradiated flaps to reduce the morbidities associated with salivary fistulas in salvage laryngectomy patients, even when there is enough mucosa for a primary closure procedure. Placement of a vascularized tissue that was out of the field of radiation may improve the healing capacity in such settings [3].

In this article, we describe the surgical steps used by us during reconstruction after salvage laryngectomy and present our experience with patients having reconstruction with pectoralis major muscle flap (PMF).

Surgical technique

Laryngeal and neck resection are performed in the standard way, taking extra care to preserve branches of

the superior and inferior thyroid vessels supplying the residual pharyngeal tissues. Care is also taken to clear the field from any devitalized tissues and secure haemostasis.

A primary tracheo-oesophageal puncture is created at this stage, because of the difficulties in performing a secondary puncture once the PMF overlies the neopharynx. A size 14–18-feeding tube is inserted through the tracheo-oesophageal puncture to avoid any pressure on the pharyngoplasty suture line Fig. 1.

Pharyngoplasty is then carried out in three layers: first by meticulous suturing and inverting the mucosal edges using 3–0 vicryl extra luminal sutures, followed by enforcing the repair by suturing the overlying buccopharyngeal fascia and finally by suturing the cut edges of the thyropharyngeus and cricopharyngeus muscles over the repaired pharynx.

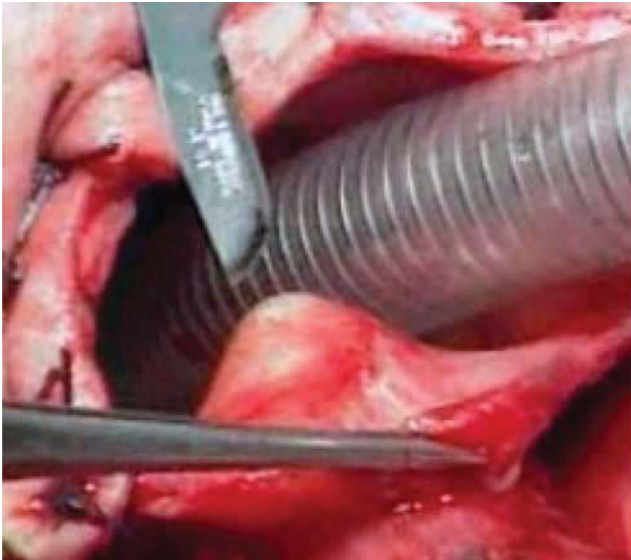
Any terminal branches of the recurrent laryngeal nerves are cauterized to prevent pharyngeal spasms, and a lateral primary myotomy of the inferior pharyngeal constrictor is carried out to facilitate swallowing and phonation Fig. 2.

The neck wound is then covered by swabs soaked in normal saline, and the anterior thoracic wall is prepared for harvesting the PMF.

The origin of the pectoralis major is divided into two or sometimes three portions. The smaller clavicular head arises from the medial third of the clavicle. The larger sternocostal (central) head has a broad origin from the sternum and cartilages of the first six ribs. The third (abdominal) portion originates from the aponeurosis of the external oblique muscle. The nerve supply is from the lateral (L5–L7) and medial (C8–T1) pectoral nerve [4].

The pectoralis major (PM) myocutaneous flap is supplied by three arterial systems. Yang *et al.* [5] have shown that

Figure 1



Primary tracheo-oesophageal puncture.

Figure 2



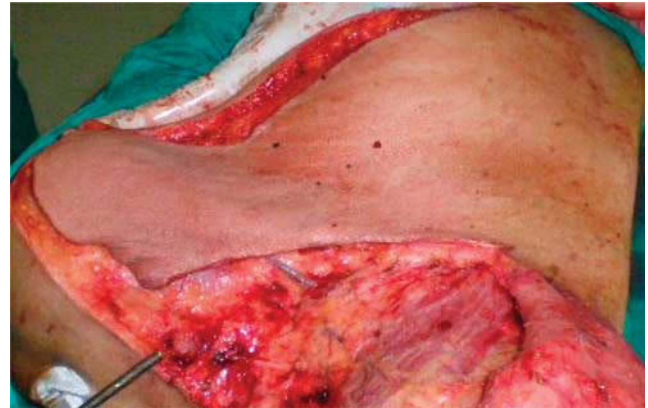
Recurrent laryngeal neuroectomy after pharyngoplasty.

the pectoral branch of the thoracoacromial artery is the main blood supply to the skin island overlying the upper part of the PM muscle. The anterior intercostal branches of the internal mammary artery supply the medial and lower part of the PM muscle. The lateral thoracic artery is the main blood supply to the lateral and lower part of the PM muscle and overlying skin.

The surgical technique we used aimed at harvesting two large pedicled flaps: the deltopectoral skin flap and a fasciomuscular pectoralis major flap. The skin flap will be resutured to its bed, to be used later only if there is a major wound breakdown, and the PMF will be mobilized to cover the pharyngoplasty and major neck vessels Fig. 3.

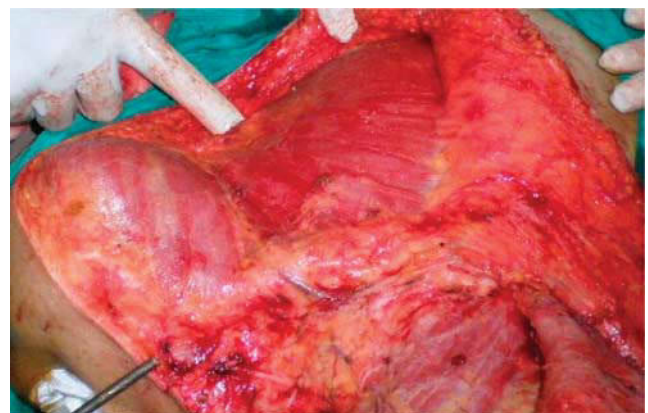
The skin incision is extended from the neck along the middle skin overlying the deltoid muscle and further caudally along the skin overlying the inferior border of

Figure 3



The deltopectoral flap.

Figure 4

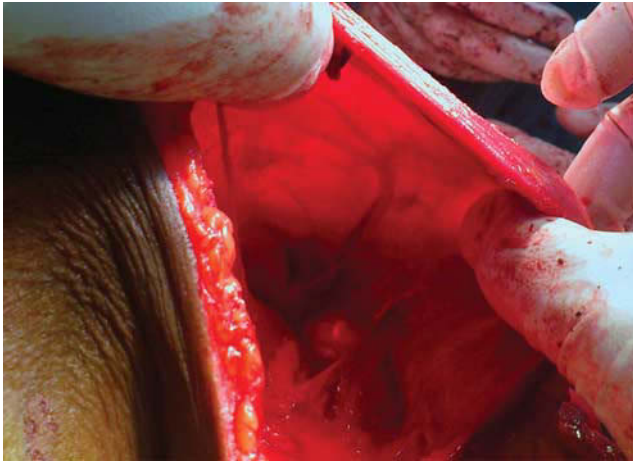


The deltopectoral flap elevated to expose the pectoralis major muscle.

the PM muscle. The skin and fascia are then elevated off the muscle by sharp dissection, taking care not to injure the perforating intercostal branches from the internal mammary vessel that supplies the skin flap Fig. 4.

The exposed PM muscle is then dissected off the thoracic wall by sharp dissection; branches from the lateral thoracic artery may have to be divided to allow the pedicle length of the PMF to reach the upper neck defect. While harvesting the PMF, the inferior border of the muscle is first incised, and dissection is carried out to lift the muscle off the thoracic wall. Identification of the pectoral branch of the thoracoacromial artery is the crucial step during the procedure; it is usually seen running from the level of the midclavicular part, perpendicular to a line joining the lower sternum to the acromial process. The vessels should be identified on the undersurface of the muscle before any further muscle incisions are carried out Fig. 5.

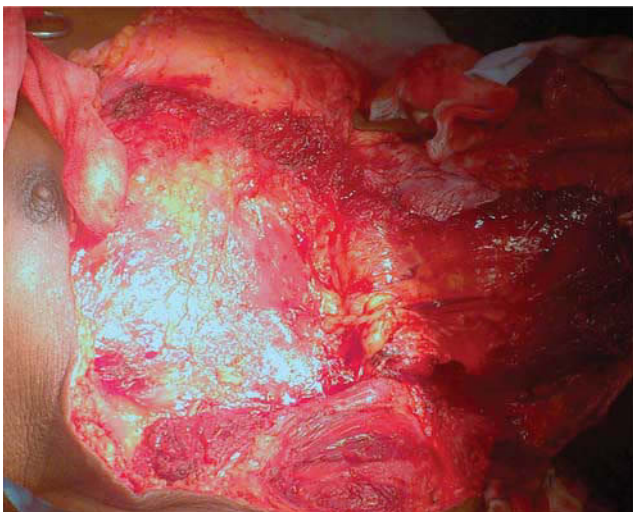
Muscle cuts are then made lateral and medial to the exposed vascular pedicle using Mayo scissors rather than electrocautery. The mobilized muscle flap can now be turned over to cover the neck wound while the vascular pedicle is under clear vision Fig. 6.

Figure 5

Identification of the vascular pedicle before muscle cuts.

Figure 6

Pectoral branch of the thoracoacromial artery.

Figure 7

The pectoralis major muscle flap rotated to cover the neck.

Care must be taken to ensure that the flap is not under any tension in its new position in the neck. Strict haemostasis is secured in the thoracic wound using ties, rather than electrocautery, on the bleeding points of the PMF. Care is also taken to avoid injuring the perforating intercostal branches or damage to the pleura. The deltopectoral skin flap is then returned to its original position and sutured in two layers.

The PMF is now used to cover the neopharynx, the carotid sheaths and the supratracheostomy region. Non-absorbable sutures are used to secure the PMF in the neck; the wound is irrigated and suction drains are inserted Fig. 7.

Discussion

The use of PMF in salvage laryngeal surgery is of great help in high-risk patients to minimize incidence of pharyngocutaneous fistulas and to allow primary skin wound healing. This flap will give the patient the advantage of early oral feeding, good tracheostomy care, short hospital stay and protection against catastrophic vascular blow outs. Of the 14 consecutive salvage laryngectomies performed at our institution between March 2011 and October 2012, only one patient developed pharyngocutaneous fistulas that eventually healed, there were no carotid artery blow outs and all patients had a well-healed tracheostomy and resumed oral feeding.

A comparative retrospective study using PMF for reinforcing the pharyngeal suture line in salvage laryngectomy patients showed no fistulas in patients for whom PMFs were used compared with 57% for those in whom primary closure was performed [6]. A study from Memorial University showed that rates of fistula occurrence reduced from 22.9 to 1% when PMFs were used routinely to salvage laryngectomies [7].

The reported rate of total flap loss was only 2.4% [8]; this is of great importance as total flap necrosis is the only complication that requires another flap. Follow-up in the neck region is more complicated because the flap can hide neck recurrences.

The pectoralis major myocutaneous pedicled flap is reliable and provides safe repair; the flap can be rapidly raised from the anterior chest wall, and no additional expertise in microvascular or abdominal surgery is needed. The main advantages reported are the ease of its technical aspects, the proximity of the head and neck region, and the possibility of obtaining a large amount of well-vascularized tissue. Furthermore, the low morbidity to the donor site and execution in a one-stage procedure has encouraged wider use of PMF flaps.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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