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CASE REPORT
Reconstructive

T-shaped Pectoralis Major Musculocutaneous Flap for Reconstruction of an Extensive Circumferential Pharyngeal Defect

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Summary: In the era of free-flap transfer, the pectoralis major musculocutaneous flap still plays a unique role in head and neck reconstruction. We report on a patient with a recurrent hypopharyngeal carcinoma after total pharyngolaryngectomy and adjuvant chemoradiotherapy in whom defects included a circumferential defect of the oropharynx and the entire tongue. The defects were successfully reconstructed with a T-shaped pectoralis major musculocutaneous flap whose skin island included multiple intercostal perforators from the internal mammary vessels. This flap design is effective for reconstructing circumferential pharyngeal defects in vessel-depleted neck. *(Plast Reconstr Surg Glob Open 2014;2:e129; doi: 10.1097/GOX.0000000000000074; Published online 3 April 2014.)*

The pectoralis major musculocutaneous flap has been a workhorse in head and neck reconstruction since first report by Ariyan[1] in 1979. However, the utility of this flap is limited by its unstable blood supply and the high rate of partial necrosis of the skin island, and transfer of free flaps has recently become the most common method for head and neck reconstruction.[2] In particular, circumferential pharyngoesophageal defects are reconstructed almost exclusively with free enteric or fasciocutaneous flaps today.

Detailed angiographic studies have recently been performed to clarify the 3-dimensional vascular anatomy of the pectoralis major musculocutaneous flap.[3,4] In particular, the intramuscular vascular network between the pectoral branches of the thoracoacromial vessels and the intercostal perforators of the internal mammary vessels are of great interest to reconstructive surgeons.[3–5] In this report, we describe the successful reconstruction of a circumferential pharyngeal defect with a total glossectomy via transfer of a T-shaped pectoralis major musculocutaneous flap that included intercostal perforators from the internal mammary vessels.

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CASE REPORT

A 68-year-old man with hypopharyngeal squamous cell carcinoma had undergone total pharyngolaryngectomy, bilateral neck dissection, and transfer of a free jejunal graft. Postoperatively, he had received cisplatin-based adjuvant chemoradiotherapy (66 Gy) because of extracapsular lymph-node involvement.

Fourteen months after the first operation, the tumor was found to have recurred at the oral resection margin and to have extensively invaded the tongue base. Wide resection of the tumor resulted in a 5-cm-long circumferential oropharyngeal defect and a total glossectomy defect (Fig. 1). To reconstruct these defects, a pectoralis major musculocutaneous flap

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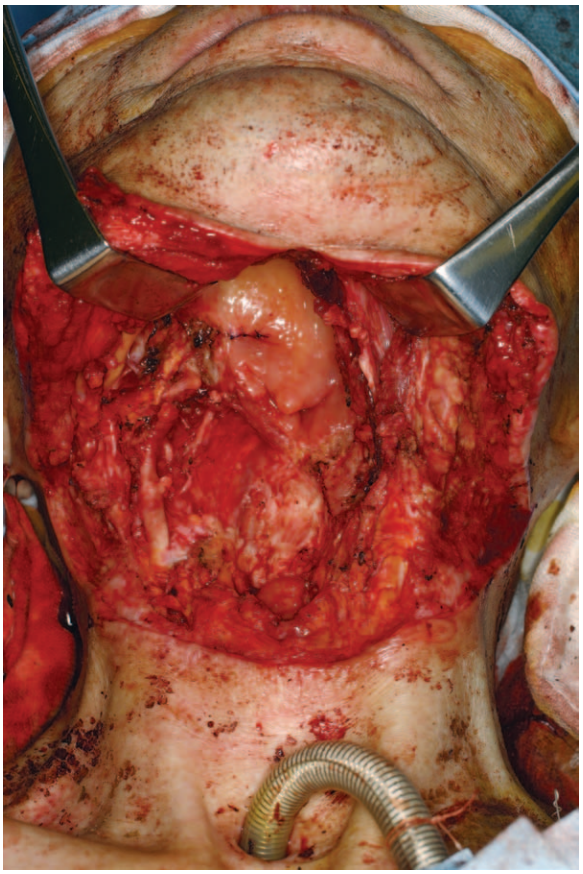

Fig. 1. The defect after tumor excision.

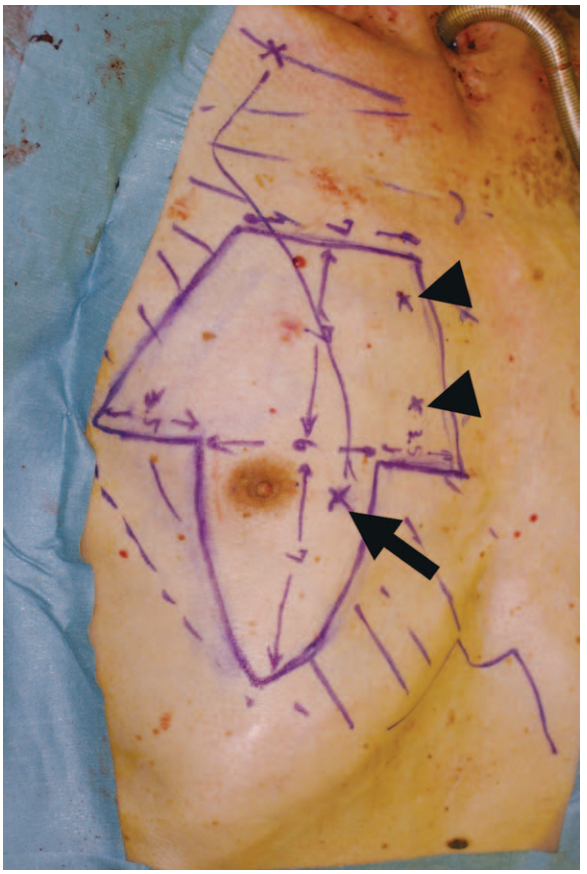

Fig. 2. Design of the skin island including the second and third intercostal perforators of the internal mammary vessels (arrow heads) and the IV-A perforator (arrow).

with a T-shaped skin island was harvested from the right side of the chest. This skin island was designed to include the second and third intercostal perforators of the internal mammary vessels into the edge of the horizontal arm of the T and to include the fourth intercostal (IV-A) perforator into the vertical stem of the T (Figs. 2, 3). The flap was transferred to the neck via the subclavicular route. The horizontal bar portion of the skin island was fashioned into a skin tube with a single layer of interrupted sutures (Fig. 4). The cephalad end of the tube was anastomosed with the oral stump of the jejunal graft, which had been transferred in the first operation. The tongue defect was then reconstructed with the vertical stem of the T-shaped skin island (Fig. 5). The donor site was closed with a meshed split-thickness skin graft.

The postoperative course was uneventful. A barium swallow examination on the 14th postoperative day showed no anastomotic leakage, and the patient began oral intake the same day (Fig. 6). Although a stricture at the distal anastomotic site required 4 bougienage treatments, the patient could tolerate oral feeding without the need for tube feeding. However, he died of a second recurrence of disease 13 months after the second operation.

DISCUSSION

The main vascular pedicle of the pectoralis major musculocutaneous flap is composed of the pectoral branches of thoracoacromial vessels. Ariyan[1] had described that the intramuscular course of these branches is along a line from the tip of the shoulder to the xiphoid process. Traditionally, the skin island has been designed on the basis of the estimated location of this pedicle. However, the blood supply of the skin island is unstable, and reported rates of partial flap loss are as high as 20–30%.[6–8] These high rates of flap loss can be attributed to the musculocutaneous perforators of the pectoral branch of the thoracoacromial artery being small and inconsistent.[9]

Kiyokawa et al[3] have suggested that the circulation of the skin island can be improved by including the IV-A perforator of the internal mammary vessels, which is located 1–2 cm medial to the areola. However, the IV-A perforator does not arise directly from the pectoral branches of the thoracoacromial vessels but receives its blood supply from the thoracoacromial vessels through intramuscular choke anastomosis.[4] Therefore, a skin island based on the

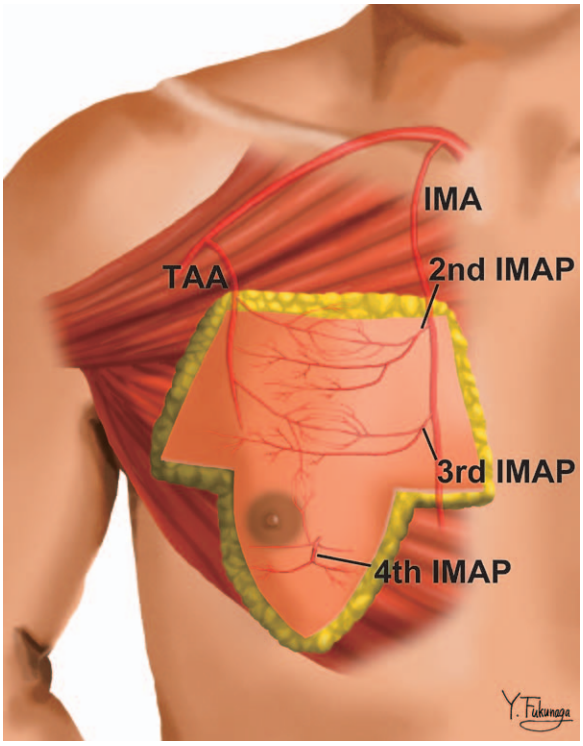

Fig. 3. Schematic drawing of the flap design. IMA, internal mammary artery; IMAP, internal mammary artery perforator; TAA, thoracoacromial artery.

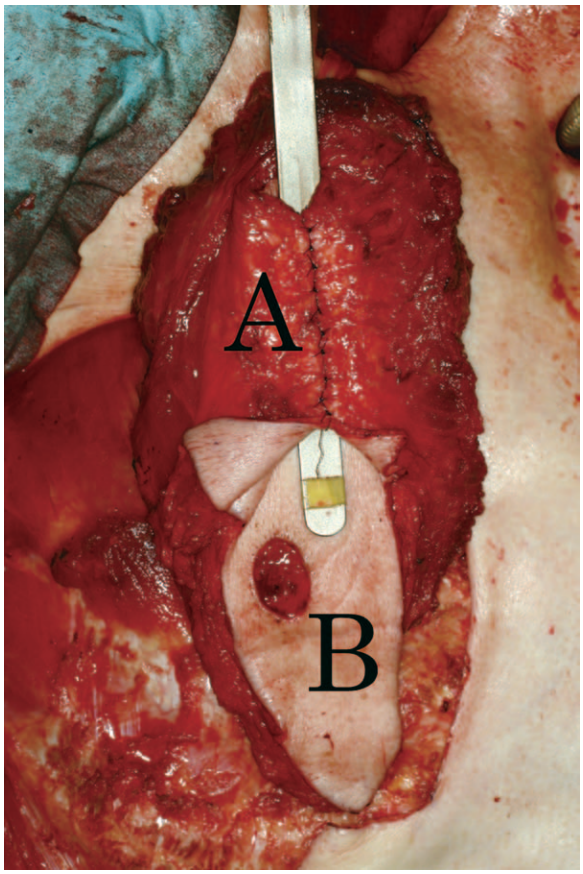

Fig. 4. The horizontal arm portion of the T-shaped skin island (A) was fashioned into a skin tube. The tongue defect was reconstructed with the vertical stem (B). The nipple and areola was de-epithelized.

Fig. 5. Immediate postoperative intraoral appearance.

IV-A perforator belongs to the second vascular territory fed by thoracoacromial vessels in the angiosome concept.[10] This is the main reason the size of the skin island is limited, and its marginal circulation is sometimes poor even when the island includes a IV-A perforator.

Rikimaru et al[4] have performed a injection study to investigate the 3-dimensional vascular network in the pectoralis major musculocutaneous flap. They found that the pectoral branches of the thoracoacromial vessels and the muscular branches of the first, second, and third intercostal perforating branches of the internal mammary vessels form a true anastomosis in the pectoralis major muscle. This finding indicates that a skin island including these intercostal perforating branches can be raised as the first vascular territory fed by the thoracoacromial vessels.[4,11] Accordingly, Rikimaru et al[5] have demonstrated that the circulation of the pectoralis major musculocutaneous flap can be stabilized by including the third intercostal perforator of the internal mammary vessels into the skin island.

Our design of a T-shaped pectoralis major musculocutaneous flap was based on the findings of Rikimaru et al.[4,5] A large, complexly shaped skin island can be successfully transferred if it includes the second and third intercostal perforators of the internal mammary vessels. Because the horizontal bar of a T-shaped skin island is designed along the course of these perforators, it can be rolled into a skin tube without the marginal circulation being compromised. Then, this T-shaped skin island's vertical stem, which is based on the IV-A perforators of the internal mammary vessels, can be used to

Fig. 6. A barium swallow examination performed 14 days after surgery.

reconstruct intraoral defects. With such a T-shaped skin island, a complex circumferential pharyngeal defect in combination with a total glossectomy can be reconstructed without fistula formation or wound breakdown. Although several bougienage treatments were required, our patient was finally able to tolerate oral intake without tube feeding. We believe that this flap design is effective for reconstructing complex circumferential pharyngeal defects in a vessel-depleted neck.

CONCLUSIONS

T-shaped pectoralis major musculocutaneous flap including multiple intercostal perforators from the internal mammary vessels can be a versatile option for reconstructing circumferential pharyngeal defects in vessel-depleted neck.

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