

Clinical Paper  
Reconstructive Surgery

# Use of a folded extended vertical lower trapezius island myocutaneous flap to repair large pharyngocutaneous fistulae developing after salvage total laryngectomy

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Z.-q. Huang, B. Zhou, W.-l. Chen, J.-l. Zhong, Y. Wang: Use of a folded extended vertical lower trapezius island myocutaneous flap to repair large pharyngocutaneous fistulae developing after salvage total laryngectomy. *Int. J. Oral Maxillofac. Surg.* 2018; xxx: xxx–xxx. © 2018 International Association of Oral and Maxillofacial Surgeons. Published by Elsevier Ltd. All rights reserved.

**Abstract.** The purpose of this study was to evaluate the outcomes of surgery involving the use of folded trapezius flaps to repair large pharyngocutaneous fistulae (PCFs) developing after salvage total laryngectomy. Folded extended vertical lower trapezius island myocutaneous flaps (TIMFs) were created to repair large PCFs that developed after salvage total laryngectomy in eight patients. The maximum fistula dimension was  $4.5 \times 3.0$  cm and the minimum was  $2.0 \times 1.8$  cm. The skin paddle of the extended vertical TIMF ranged from 5 cm to 9 cm in width and 10 cm to 23 cm in length. The inner lining ranged from  $3 \text{ cm} \times 3 \text{ cm}$  to  $6 \text{ cm} \times 6 \text{ cm}$  in dimension and the outer lining from  $6 \text{ cm} \times 5 \text{ cm}$  to  $16 \text{ cm} \times 9 \text{ cm}$ . The folded flaps provided both inner mucosa and outer lining. All flaps survived. No fistula recurrence or stricture developed. After 6–24 months of follow-up, six patients showed no evidence of disease, one was alive with disease, and one had died of local recurrence at 20 months. The folded flap was very reliable and is well-suited for repairing large PCFs, even early large PCFs and those featuring carotid artery rupture.

**Key words:** pharyngocutaneous fistula; cutaneous fistula; laryngeal neoplasms; laryngectomy; trapezius flap; transverse cervical vessels.

Accepted for publication 22 May 2018

A pharyngocutaneous fistula (PCF) is the most common major complication developing after laryngectomy, especially salvage

total laryngectomy or laryngectomy in previously irradiated patients with laryngeal or hypopharyngeal cancer. The incidence rate

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of PCF after primary laryngectomy and salvage laryngectomy has been reported to be 22.6% and 44.6%, respectively<sup>1</sup>.

The prophylactic use of temporoparietal fascia free flaps and pectoralis major muscle flaps or salivary bypass tubes may reduce the incidence of PCFs after salvage total laryngectomy<sup>2-4</sup>. The standard therapy is conservative management, and if this is not successful, surgical closure. Conservative management consisting of debridement, collagen patch packing<sup>5</sup>, sealing of the fistula with a prosthesis<sup>6</sup>, and/or negative-pressure wound therapy<sup>7</sup> can be effective in patients with small fistulae. Closure using a flap is indicated when a fistula fails to close in response to conservative measures.

PCFs have been closed using a wide variety of flaps, ranging from pedicled flaps to submental flaps<sup>8</sup>, supraclavicular flaps<sup>9</sup>, temporoparietal fascial flaps<sup>10</sup>, deltopectoral flaps<sup>11</sup>, free microsurgical flaps incorporating radial forearm flaps<sup>12</sup>, internal mammary artery perforator flaps<sup>13</sup>, and anterolateral thigh flaps<sup>14</sup>. Some authors have described the repair of PCFs after total laryngectomy using an endoscopic approach<sup>15</sup>, a double-layer single-stage technique<sup>14</sup>, and placement of a free jejunal patch flap and a deltopectoral flap to surgically treat a large PCF<sup>16</sup>. The use of a folded supraclavicular flap to repair large oropharyngocutaneous fistulae has been reported previously from the authors' institution (Sun Yat-sen University)<sup>17</sup>, and a folded trapezius flap was found to be optimal for the reconstruction of major through-and-through defects developing after salvage surgery<sup>18</sup>.

This article presents the authors' experience using folded extended vertical lower trapezius island myocutaneous flaps (TIMFs) to provide both inner and outer

linings after the closure of major fistulae developing after salvage total laryngectomy.

## Patients and methods

Folded extended vertical lower TIMFs based on the transverse cervical veins (TCVs) were designed to repair large PCFs developing after salvage total laryngectomy in eight patients treated between October 2014 and May 2016 at the Department of Oral and Maxillofacial Surgery, Sun Yat-sen Memorial Hospital, Sun Yat-sen University, China. The Institutional Review Board of Sun Yat-sen University approved this study.

The population included one female and seven male subjects, with a mean age of 57.6 years (range 46–65 years). The primary lesion in all patients was stage II or III squamous cell carcinoma (SCC) of the larynx, and all of these patients had previously received radiation or chemoradiation therapy and had undergone salvage total laryngectomy at other institutions. Four of the eight patients underwent primary closure of the pharyngeal defects evident after salvage surgery using pectoralis major myofascial flaps (PMMFs). The PCF had occurred within 2–6 weeks after salvage total laryngectomy in all patients, and all closures failed after the application of conservative measures, including debridement, Xeroform gauze packing, and negative-pressure wound therapy. These therapies had been used to treat all patients without success (Fig. 1).

The duration of the fistula ranged from 5 to 18 weeks (mean 8.9 weeks). The maximum fistula dimension was 4.5 × 3.0 cm and the minimum dimension was 2.0 × 1.8 cm (mean 3.1 × 2.2 cm). The

skin paddle of the extended vertical TIMF ranged from 5 cm to 9 cm in width and 10 cm to 23 cm in length (mean 16.0 cm × 7.8 cm). The inner lining ranged from 3 cm × 3 cm to 6 cm × 6 cm in dimension and the outer lining from 6 cm × 5 cm to 16 cm × 9 cm (mean 4.8 cm × 4.6 cm and 10.3 cm × 7.8 cm, respectively). The folded flap provided both an inner (or pharyngeal) mucosa and an outer lining (or neck skin) (Table 1).

## Surgical technique

The surgical technique is illustrated using case 1 in Table 1 (Figs 2–7). Under general anaesthesia, the flap was elevated with the patient in the lateral prone position. An extended vertical lower TIMF based on the TCVs was elevated with the patient in the lateral prone position, and a skin paddle measuring 9 cm in width and 23 cm in length was created (Fig. 2). The pivot point of the flap was at the level of the thyrocervical trunk in the lower neck. A tunnel was created in the upper part of the trapezius muscle; the flap could then be dissected further, to the point of entrance of the transverse cervical artery (TCA), based on the thyrocervical trunk, to increase the length of the flap (Fig. 3). The flap was passed through the tunnel in the upper part of the trapezius muscle and the neck region. Once the carotid artery rupture had been ligated and surgical debridement of the fistula had been performed (Fig. 4), the foldable flap was created by removing a 1.5-cm-wide band of skin to repair the PCF (Fig. 5). The distal portion of the flap was turned to serve as the inner lining, and the medial portion then served as the outer lining or neck skin (Fig. 6). The patient exhibited no postoperative transient hemiplegia; he could manage a soft diet and exhibited normal speech. The appearance of the face and neck was acceptable, and no fistula recurrence or stricture developed (Fig. 7). However, he required a permanent tracheostomy. The patient was followed up for 18 months, at which time he was alive with no evidence of recurrence of laryngeal carcinoma.

## Results

All flaps survived, and no repair failed. The appearance of the head and neck was satisfactory, and no patient experienced any major complication. All donor sites were primarily closed without any wound-healing problems. All patients resumed an oral diet and eventually regained normal speech. No fistula recurrence or stricture developed. After 6–



Fig. 1. A 62-year-old male presenting with squamous cell carcinoma of the larynx had undergone salvage total laryngectomy and repair of the pharyngeal defect with a pectoralis major myofascial flap. A pharyngocutaneous fistula (PCF) and carotid artery rupture had developed after salvage total laryngectomy.

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