The Sternocleidomastoid Myocutaneous Flap: A Laryngeal Preservation Option for Total Hypopharyngoesophageal Stenosis

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Abstract

Complete hypopharyngoesophageal (HPE) stenosis is rare and a challenging condition to treat. When endoscopic therapy fails, total laryngectomy with or without pharyngeal reconstruction is usually performed. We present a retrospective case series involving 3 patients with complete HPE stenosis who failed endoscopic repair and were gastrostomy dependent. All were managed successfully with the sternocleidomastoid myocutaneous (SCM) flap. A temporary fistula occurred in 1 patient. Hospitalization ranged from 5 to 15 days, patients resumed oral intake from 21 to 82 days postoperatively, and their gastrostomy tubes were removed from 28 to 165 days postoperatively. We suggest that the SCM flap is a laryngeal preservation option for reconstruction of complete HPE stenosis when endoscopic techniques fail. This flap allows HPE repair and reconstruction within the same surgical field, imposes no significant donor site morbidity, and affords good functional and cosmetic outcomes.

Keywords

sternocleidomastoid flap, myocutaneous flap, hypopharyngeal reconstruction, hypopharyngeal stricture, cervical esophageal stricture, esophageal reconstruction

The sternocleidomastoid myocutaneous (SCM) flap has been used for reconstruction of hypopharyngeal and cervical esophageal defects and stenosis but not for total stenosis, extensive hypopharyngeal involvement, or in the setting of prior radiation.

Patients and Methods

This study was approved by the Stanford Institutional Review Board and Research Compliance Office. Patients aged 18 years and older who underwent treatment for hypopharyngoesophageal stenosis in the Department of Otolaryngology–Head and Neck Surgery, Stanford University Medical Center between August 2003 and August 2018 were included in the initial database extraction. Three patients with complete HPE stenosis were treated with the SCM flap (Table 1).

Surgical Technique

A skin incision is made along the anterior border of the SCM, and an adequate skin paddle (usually 4 × 8 cm) is outlined (Figure 1). Sutures are placed to secure the skin to the muscle. Dissection proceeds medially along the anterior border of the SCM muscle. The pharynx, larynx, and cervical esophagus are identified and retracted medially. A generous incision spanning the inferior constrictor to the cervical esophagus is planned (Figure 2). A pharyngotomy is made at the level of the superior border of the thyroid lamina. An esophagotomy is made just below the level of

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the cricopharyngeus muscle. Blunt finger dissection is performed through both apertures until the intervening scar is broken up. Both the pharyngotomy and the esophagotomy incisions are connected to make 1 large opening. A nasogastric tube is placed and advanced into the hypopharynx. Then, 0.5 mm silastic sheeting rolled into a cylinder approximately 2 to 3 cm wide and spanning the length of the stenosis is prepared and slid over the nasogastric tube.

### Table 1. Patient Demographics and Outcomes.

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Age, y</th>
<th>Sex</th>
<th>Etiology</th>
<th>Defect Classification&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Preoperative VHI-10</th>
<th>Postoperative VHI-10</th>
<th>Preoperative EAT-10</th>
<th>Postoperative EAT-10</th>
<th>Complications</th>
<th>Further Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>58</td>
<td>Male</td>
<td>T2N2cM0 tonsillar carcinoma following CRT and left neck dissection</td>
<td>I-II</td>
<td>13</td>
<td>11</td>
<td>40</td>
<td>16</td>
<td>None</td>
<td>Single dilation 7 months postoperatively</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>Female</td>
<td>T1N1M0 carcinoma of piriform sinus following CRT</td>
<td>I-II</td>
<td>9</td>
<td>9</td>
<td>40</td>
<td>24</td>
<td>Minor fistula</td>
<td>Dilations at months 1 and 4 postoperatively</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
<td>Female</td>
<td>Zenker’s diverticulum following endoscopic repair</td>
<td>I-II</td>
<td>5</td>
<td>0</td>
<td>40</td>
<td>8</td>
<td>None</td>
<td>Dilation 16 months postoperatively</td>
</tr>
</tbody>
</table>

Abbreviations: CRT, chemoradiation therapy; EAT-10, Eating Assessment Tool–10 (10-item reliable and validated assessment tool for measuring dysphagia in adults); VHI-10, Voice Handicap Index–10 (10-item reliable and validated assessment tool for measuring dysphonia in adults).

<sup>a</sup>Urken classification of pharyngoesophageal stenosis: zone I, cervical esophagus; zone II, hypopharynx, zone III, oropharynx; and zone IV, thoracic esophagus.²

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**Figure 1.** Planned incisions for exposure and flap creation. © Megan Marshall.

**Figure 2.** Pharyngotomy made and flap prepared. © Megan Marshall.

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The tube is then advanced into the stomach, the stent is secured to the nasogastric tube with 3-0 prolene suture, and the tube is then stitched securely to the nasal septum to prevent accidental dislodgement (Figure 3). The insertions of the SCM flap at the sternum and along the clavicle are divided and the flap transposed to the site of reconstruction. The skin paddle is sutured circumferentially into the pharyngoesophagotomy site and secured with interrupted 4-0 vicryl suture. A second muscle layer closure is performed with 2-0 vicryl suture (Figure 4). The wound is closed in a layered fashion over a closed suction drain and a tracheostomy is placed.

As all patients had preexisting gastrostomy tubes, the patients were fed on postoperative day 1 in this manner. Patients are given intravenous cefazolin and metronidazole for 3 days, then switched to augmentin and flagyl for a total of 14 days. Ondansterone is used for control of nausea. Patients are allowed to ambulate without restriction. Drains are removed per standard protocol. Patients maintain the nasogastric tube for 2 to 3 weeks, after which the stent and tube are removed under general anesthesia.

Concurrent esophagoscopy is performed (see Supplemental Figure S5, available in the online version of the article). Granulation tissue is removed, and the neopharynx can be dilated as needed. Patients subsequently undergo a modified barium swallowing study to assess swallowing function and rule out aspiration (see Supplemental Figure S6, available in the online version of the article). All 3 patients required subsequent dilations to maintain luminal patency: patient 1, single dilation at 7 months postoperatively; patient 2, dilations at months 1 and 4 postoperatively; and patient 3, single dilation at 16 months postoperatively.

Results

All 3 patients presented with the inability to tolerate oral intake or swallow saliva and were gastrostomy dependent. Hospital stay ranged from 5 to 15 days. After 21 to 82 days following surgery, all patients achieved oral intake, and their G tubes were removed from 28 to 165 days after the first surgical intervention. A fistula occurred in 1 patient. This resolved within 1 week (Table 1). Swallowing studies were negative for aspiration postoperatively. Vocal fold motion was normal postoperatively. Patients were followed for a minimum of 18 months, during which all patients maintained oral alimentation.

Discussion

Complete HPE stenosis can be addressed in a number of ways (see Supplemental Table S1, available in the online version of the article).1,2 Both superiorly and inferiorly based SCM muscle flaps have been used, with superiorly based flaps regarded more favorably.3,4 Although the SCM muscle is highly vascularized, muscle necrosis has been described in 33% of SCM muscle, and partial skin necrosis is reported in 21% to 50% of cases.4,5 Although effects of radiotherapy on flap viability are not clear, Ariyan3 found no significant impact on flap viability in patients who underwent prior radiotherapy or modified neck dissection.

Several maneuvers are important for a successful SCM flap procedure. In harvesting, while elevating and transferring the flap, it is helpful to suture the skin paddle to the muscle fascia to maintain the many small musculocutaneous perforators that are important for skin paddle perfusion. In addition, during dissection and transfer of the flap, traction must be placed on the muscle, not on the skin.3 Preserving 2 of the 3 major arterial contributions to the muscle (occipital, superior thyroid, or suprascapular
arteries) can reduce the risk of flap necrosis. We also believe stent placement for 14 to 21 days reduces risk of adhesion and restenosis.

Conclusions

The SCM flap offers an easily accessible, reliable, and safe technique for the reconstruction of complete HPE stenosis in patients with normal laryngeal function who are not manageable with the rendezvous procedure. Restoration of oral alimentation with laryngeal preservation offers an alternative to more radical procedures, such as laryngectomy and laryngopharyngectomy.

Author Contributions

Hassan Paknezhad, design, data analysis and interpretation, drafting, final approval of version to be published, agrees to be accountable for all aspects of the work; Nicole A. Borchard, design, data analysis and interpretation, drafting, final approval of version to be published, agrees to be accountable for all aspects of the work; Gordon K. Lee, design, data analysis and interpretation, drafting, final approval of version to be published, agrees to be accountable for all aspects of the work; Edward J. Damrose, design, data analysis and interpretation, drafting, final approval of version to be published, agrees to be accountable for all aspects of the work.

Disclosures

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Supplemental Material

Additional supporting information is available in the online version of the article.

References