

Circumferential Pharyngoesophageal Reconstruction and Total Larynx Preservation with Extra-anatomical Free Flaps

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Summary: Reconstruction of total circumferential pharyngeal defects following caustic or stenosing lesions of the pharynx present major challenges with respect to minimizing surgical morbidity and restoring functional deficits. With recent advances in microvascular free tissue transfer, the options for pharyngeal reconstruction have multiplied in order to maximize swallowing and voice. There is long experience in the reconstruction of the pharynx and the cervical esophagus in oncological patients after total pharyngolaryngectomy, but there are not many publications concerning circumferential pharyngeal reconstruction preserving the larynx. Here, we discuss 2 new techniques for total circumferential pharyngeal reconstruction respecting swallowing and voice by means of extra-anatomical bypasses (visceral or fasciocutaneous), upholding the larynx in its original placement. (*Plast Reconstr Surg Glob Open* 2018;6:e2008; doi: 10.1097/GOX.0000000000002008; Published online 19 November 2018.)

INTRODUCTION

The reconstruction of total circumferential pharyngeal defects presents major challenges with respect to minimizing surgical morbidity and restoring functional deficits, but there are not many publications concerning circumferential pharyngeal reconstruction preserving the larynx. Here, we discuss 2 ideas for total circumferential pharyngeal reconstruction by means of extra-anatomical bypasses.

CASE 1

A 32-year-old female patient presenting with mental disorders had consumed a glass of bleach. Computed tomography (CT) scan showed the thickening of the esophageal, gastric, duodenal, and jejunal mucosa and active bleeding of the gastric antrum. Endoscopy showed epiglottitis, erythema from the esophagus to duodenum, hypopharyngeal synechia, and retraction of the border of epiglottis. Urgent surgery consisted in a tracheostomy, gastrectomy, resection of thoracic esophagus, and esophageal stoma.

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Two weeks after a circumferential hypopharyngectomy and a free tubular radial flap was done. The larynx and trachea were left intact. The flap was anastomosed to the piriform sinus superiorly and coursed laterally in the right side of the neck. Its length was 20 cm. The distal end was sutured to the skin of the supraclavicular area. It served to avoid retraction of the radial flap and collected saliva until the second surgical step was undertaken 2 months later (Fig. 1).

Isoperistaltic left transverse colon interposition on a left superior mesenteric artery pedicle was done via a retrosternal approach. The distal end of the radial flap was released and then anastomosed to the colonic flap (Fig. 2).

CASE 2

A 46-year-old male patient complained of progressive dysphagia after a meal. During the gastroscopy, a foreign object was found and extracted with no apparent complications. Nonetheless, the patient continued to complain of the same symptoms. A CT scan was performed, showing gas and phlegmonous changes in the retropharyngeal region and the mediastinum. Esophageal perforation led to acute mediastinitis. The patient underwent

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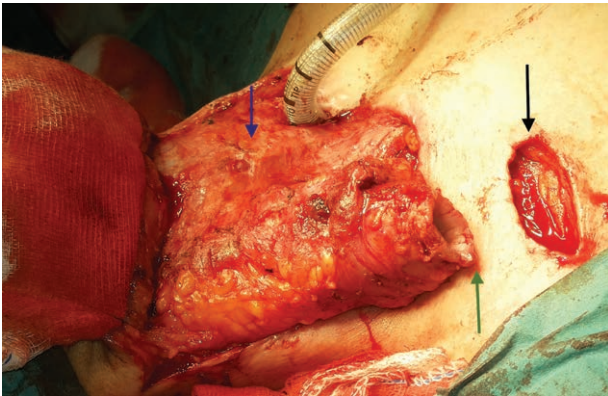


Fig. 1. The distal end of the radial free flap ready to perform the anastomosis to the colonic flap. The radial flap is marked with a green line, at the right side of the anterior part of the neck. The lumen of this tubular flap can be observed (green line). The distal end was previously sutured to the skin of the supraclavicular area to drain saliva (black line). A blue line is marking the larynx.

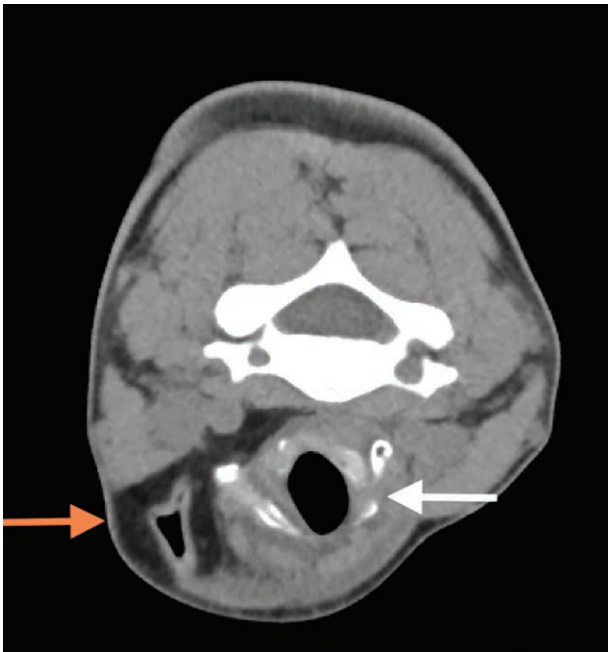


Fig. 2. CT scan of the neck after reconstruction in case 1 showing the larynx (white line) and the lumen of the radial (tubular) free flap (orange line).

resection of the perforated hypopharyngeal segment, and terminal esophagostomy, jejunostomy, and posterolateral thoracotomy were performed. Three months later, a cervical esophageal reconstruction with a jejunal free flap was done. The flap was anastomosed proximally to the oropharynx and distally to the esophagus. The patient's hyoid bone was left in place upholding the larynx in its original placement to ensure that the tongue base and laryngeal elevation were normal, aryepiglottic and thyroepiglottic muscles pull down the epiglottis (Fig. 3). The course of the jejunal segment was lateral to the larynx and parallel to the remaining cervical pharynx like in first case (Fig. 4).

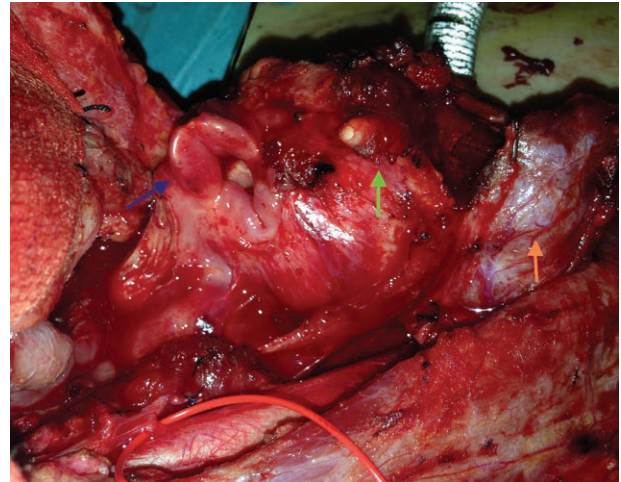


Fig. 3. Resection of the hypopharynx and preservation of the larynx showing lateral displacement in the second patient. Later on we left the patient's hyoid bone in place to ensure that laryngeal elevation was normal. Epiglottis (blue arrow) and hyoid bone (green arrow) and distal part of the hypopharynx (orange line).

RESULTS

Both patients showed no complications after surgeries and began swallowing 3 weeks later. They showed good phonatory function without respiratory complications such as bronchoaspiration [see video, **Supplemental Digital Content 1**, which displays the second patient swallowing water and showing maintenance of voice. We can observe a bulky structure at the right lateral aspect of the neck corresponding to the reconstructed pharynx (jejunal flap), <http://links.lww.com/PRSGO/A920>].

DISCUSSION

The prevalence of injuries caused by the ingestion of corrosive substances is mostly related to suicidal intentions in adult patients.¹ Caustic ingestion leads to severe systemic consequences and especially damages the upper digestive tract. Alkalis cause full thickness injuries due to liquefactive necrosis, saponification, and blood vessel thrombosis. Emergency surgery is essential to resect all injured organs.²

Reconstructive surgery must be performed once the scarring process is over, and optimal timing for it is reported to be after 2 months.^{3,4}

In the first case, reconstructive algorithm was based on the following considerations: the patient had issues with salivary flow control and was a good candidate for laryngeal preservation. However, a single reconstructive procedure with coloplasty was risky due to the extent of the injuries and subsequent resection. Stenosis of the superior extremity of the colon⁵ requires resection and inseting of a new pedicled colon flap or a free flap.⁶ We were concerned about these complications, and preferred to ensure results with 2 regulated surgeries. Since microvascular flaps protect the airway and improve ability to swallow,⁷⁻⁹ hypopharyngeal reconstruction was achieved with a radial free flap, externalized distally (a colostomy bag

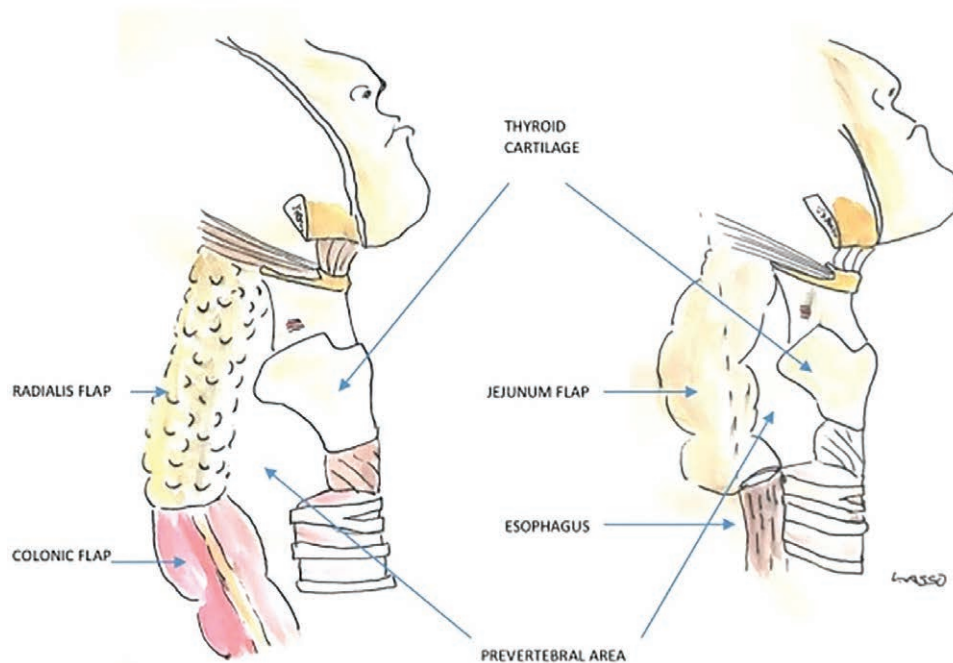


Fig. 4. Schematic representation of both techniques.



Video Graphic 1. See video, Supplemental Digital Content 1, which displays the second patient swallowing water and showing maintenance of voice. We can observe a bulky structure at the right lateral aspect of the neck corresponding to the reconstructed pharynx (jejunal flap), <http://links.lww.com/PRSGO/A920>.

collected the saliva) to avoid retraction of the flap until the second step was done.

Single coloplasty when the larynx is preserved can increase surgical morbidity, since the larynx may act as an anatomical barrier for colonic flap inseting, producing compression or ischemia of the flap. In these conditions (associated injuries of the digestive tract), the use of visceral flaps may pose a risk. The anatomical barrier was saved by means of a radialis free flap deflected laterally to the prevertebral fascia.

Most isolated pharyngeal injuries are iatrogenic,¹⁰ related to malposition of a nasogastric tube, endoscopy, or endotracheal intubation. According to this, the second patient presented a less extensive esophageal defect but had

related complications. A free jejunal flap was chosen for reconstruction as it has excellent wound healing properties and is associated with a low fistula rate. Postoperative swallowing function is better because the lubricated surface permits the smooth passage of food.^{11–13} Free jejunal transfer is a reliable option that depends on the security of the microanastomoses. In the second case, the damage mechanism did not involve the neck vascularization.

The use of microvascular flaps shows better protection of the airway and an improved ability to swallow with proper rehabilitation when the larynx is preserved.^{14–16} Location of flaps shall be far enough from the surgical remnants since they present collateral damages like fibrosis, tissue retractions, or vascular alterations. Visceral flaps may collapse when they are placed behind the airway although fasciocutaneous ones may hardly resist the retro-laryngeal inseting. Thus, the procedure seems to be safer when placing the flap in the lateral aspect of the neck.

Reconstruction of pharyngeal defects with free flaps¹⁷ is considered the first choice in oncological patients even if laryngeal preservation is performed.^{14,16} Moerman et al.^{18,19} published a case of circumferential esophageal reconstruction with a mobilized colon, sutured behind the arytenoids, and on the prevertebral fascia, preserving the larynx. He stated that it may be better to perform a total laryngopharyngectomy and colon interposition in cases where the pharyngeal remnant is borderline for primary closure.

CONCLUSIONS

When the larynx is preserved after circumferential hypopharyngectomy, tubular extra-anatomical free flaps can be an excellent indication for the functional reconstruction of the digestive tract and voice preservation.

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In memory of Dr Rosado.

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