

Tubed Anterolateral Thigh Free Flap for Pharyngoesophageal Reconstruction

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Summary: Caustic ingestions can severely injure the upper and lower aerodigestive tract, resulting in detrimental mucosal changes both acutely and chronically. Injuries are most severe following alkaline ingestion. Esophagectomy is often recommended in patients with high-grade esophageal injuries to mitigate the risk of perforation. Esophageal reconstruction after these injuries is often delayed, and staged, allowing adequate tissue stabilization before further manipulation. Here, we report on a 25-year-old woman who presented with a high-grade caustic esophageal injury following the ingestion of an alkaline drain cleaner. She underwent an emergent thoracic esophagectomy, gastrectomy and a cervical salivary esophagostomy. Post-operatively, she developed supraglottic and hypopharyngeal strictures, but maintained a functional larynx. She subsequently underwent a staged, extrathoracic total esophageal reconstruction using an anterolateral thigh (ALT) myocutaneous free flap with laryngeal preservation. Although serial esophageal dilatations and trans-oral laser procedures for pharyngeal strictures were required, she was able to maintain the ability to swallow. (*Plast Reconstr Surg Glob Open* 2020;8:e3046; doi: [10.1097/GOX.0000000000003046](https://doi.org/10.1097/GOX.0000000000003046); Published online 28 September 2020.)

INTRODUCTION

The incidence of caustic ingestions is unknown, which is likely due to underreporting. Adult presentations are often part of a suicide attempt and are more severe due to the use of stronger corrosive agents. Several factors contribute to the severity of the injury; the pH and concentration of the corrosive agent, the volume ingested, and the length of time in contact with the tissue¹. Alkaline substances are thought to result in rapid and more extensive transmural tissue damage through the process of liquefactive necrosis. In comparison, acidic substances cause coagulative necrosis, often associated with less severe injury¹. Surgery is reserved for transmural necrosis and/or perforation, and can include laryngopharyngectomy, esophagectomy and/or gastrectomy. The optimal timing for esophageal reconstruction following caustic injuries is debatable. The most commonly used reconstructive technique is colonic interposition, which can be fraught with multiple complications². Here, we report on a caustic

ingestion in a young woman, which necessitated an emergent esophagogastrectomy and cervical salivary esophagostomy. She subsequently underwent an extrathoracic staged total esophageal reconstruction, with laryngeal preservation, using a free ALT flap. This is the first report in the literature of total esophageal reconstruction using an ALT flap with laryngeal preservation.

CASE

A 25-year-old woman presented with an intentional caustic ingestion as part of a suicide attempt. She was intubated on the scene and transferred to our center for evaluation. Esophagogastroduodenoscopy performed 8 hours post ingestion, demonstrated frank necrosis of the stomach and esophagus to the level of the proximal esophageal margin, graded as 3B³ (Fig. 1). She underwent emergent partial esophagectomy, total gastrectomy and jejunal (J)-tube placement. Despite the proximal esophagus being severely damaged, a cervical esophagostomy was created to manage the patient's saliva. Her recovery was complicated by an esophagocutaneous fistula, and cervical esophageal stenosis requiring multiple dilations. She also developed hypopharyngeal and supraglottic strictures, which were managed initially with tracheostomy, and then with transoral laser surgery. She maintained functional cricoarytenoid units with functional swallowing and normal voicing ability.

On discharge the patient underwent an extensive psychiatric assessment and was eventually cleared for surgery.

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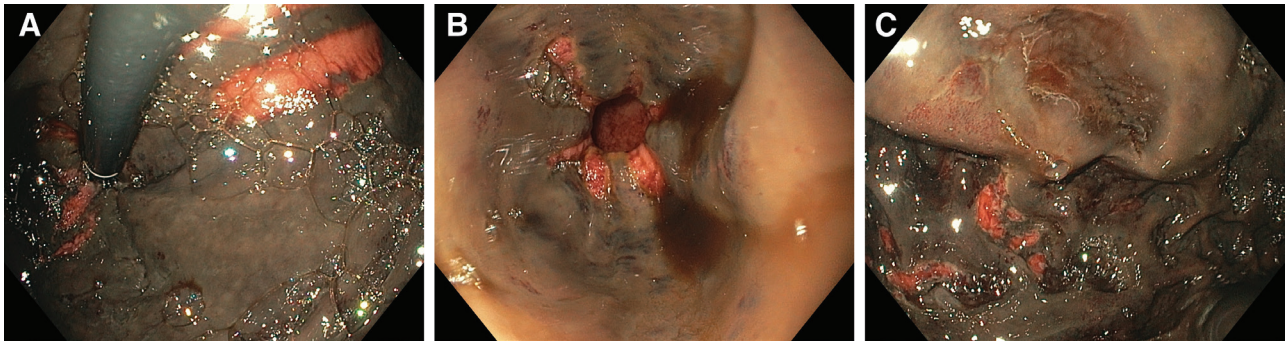


Fig. 1. Esophagogastroduodenoscopy findings 8 hours post ingestion injury demonstrating frank necrosis at the level of the body (A), fundus (B), and pylorus (C) of the stomach, graded as 3B with impending perforation.

One year later she underwent the first phase of reconstruction, involving a transoral laser left hypopharyngectomy and partial supraglottic laryngectomy to remove scar tissue and facilitate the flap inset into the pharynx. Next, she underwent a cervical esophagectomy with laryngeal preservation. This involved identification of both the left superior and recurrent laryngeal nerves with circumferential dissection to allow for rotation of the larynx and completion of the esophagectomy. The integrity of both superior and recurrent laryngeal nerves was maintained, conserving laryngeal function. Esophageal reconstruction was performed using a left ALT myocutaneous free flap (Fig. 2). The length of the flap harvested exceeded 30cm. Microvascular anastomosis was then completed; a left saphenous vein graft was required for the anastomosis of the left superior thyroid artery to the lateral femoral circumflex artery of the flap. The venous anastomosis was to the left external jugular vein. The tubed flap was tunneled anterior to the sternum subcutaneously and an esophagostoma was created in the epigastric region just below the xiphoid process. The proximal end of the flap was sewn to the left hypopharynx, and a proximal salivary bypass stent was inserted proximally. Postoperatively, she developed several small esophagocutaneous fistulas in the low neck and suprasternal area without a septic response, all of which were closed successfully with local cutaneous rotational flaps. Due to recurrence of the hypopharyngeal and supraglottic strictures, she also required several hypopharyngeal dilations to maintain swallowing and a second transoral laser procedure to stabilize the airway.

Two months later, she underwent a laparotomy and the myocutaneous free flap was anastomosed to a limb of the jejunum. Omentum was mobilized and wrapped

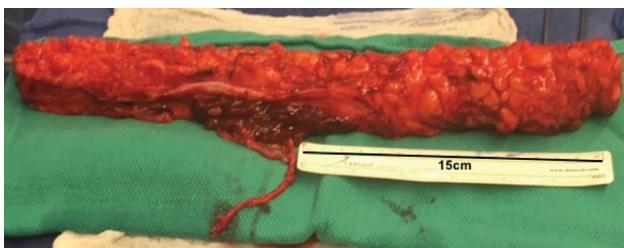


Fig. 2. Intraoperative photograph of harvested ALT flap, measuring greater than 30cm in total length.

circumferentially around the anastomosis site to prevent a leak. Postreconstruction she was decannulated and started on an oral diet, eventually tolerating full fluids. She had a modified barium swallow assessment (Fig. 3), which demonstrated a persistent stricture in the hypopharynx, with patent flow distally.

DISCUSSION

Multiple techniques have been described for reconstructing the esophagus. Delaying reconstructive efforts by at least 6 months is advocated due to the development

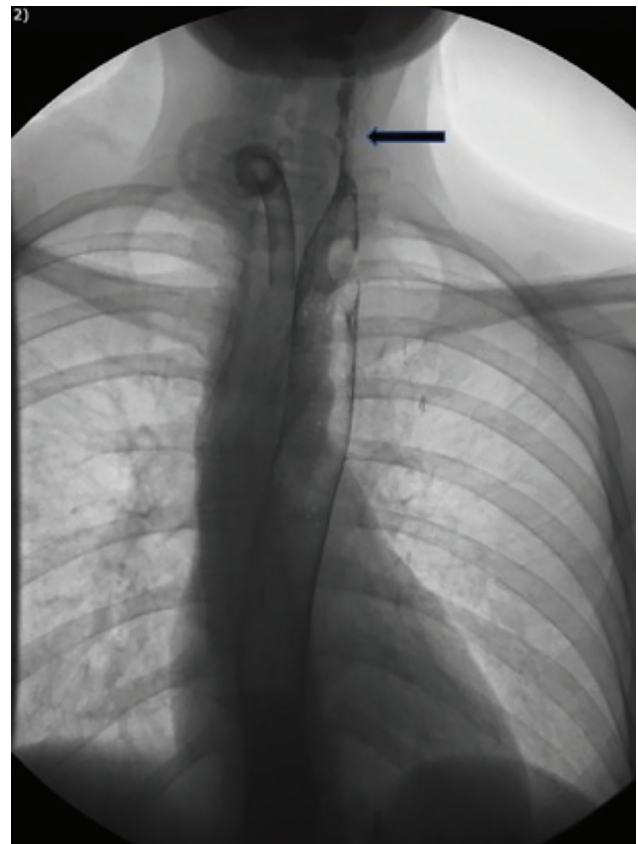


Fig. 3. Barium swallow assessment three months post second stage reconstruction illustrating an intact ALT flap, with no leaks. The arrow denotes a hypopharyngeal stricture.

of strictures that can render the reconstruction futile² and to ensure the psychiatric conditions are stabilized. The choice of reconstructive modality is dependent on the extent of the defect, the status of surrounding tissue and donor site availability.⁴ Colonic interposition flaps are most commonly utilized due to the adequacy of blood supply to the left colon and its ability to transport food effectively.⁵ However, it has several risks including bowel obstruction, anastomotic leaks, flap necrosis and dehiscence.⁶ Several other techniques have been described, which include gastric pullup, colopharyngeal anastomosis and ileopharyngeal anastomosis.^{2,4}

Local and free tissue transfers have long been used in esophageal reconstruction. Local flaps, such as the pectoralis major myocutaneous flap and sternocleidomastoid island flap, have been described for small cervical esophagopharyngeal defects.⁷ Free tissue transfer is advocated for large and complex defects. In general, free flaps are associated with fewer cardiopulmonary complications compared to bowel mobilizing procedures, which have lower stricture and fistula rates.⁴ The radial forearm free flap is commonly used, with well-described techniques that allow for laryngeal preservation.⁸ The ALT free flap is a workhorse in complex head and neck reconstruction. It has a robust blood supply and pliable skin, as well as limited donor site morbidity due to primary closure. It has been reported to have lower stricture rates (11%) compared to the radial forearm free flap (18%) in esophagopharyngeal reconstruction.^{9,10}

In our patient, the defect included the cervical and thoracic esophagus, as well as the stomach. This is the first case describing the use of an ALT flap to reconstruct a total gastroesophageal defect following a caustic ingestion, with anastomosis to the jejunum. Rand et al¹¹ reported on using a parascapular free flap in a 2-stage reconstruction of a total esophagectomy and partial gastrectomy defect in a 52-year old man. The major disadvantage of using a free flap from the subscapular system lies in the difficulty of utilizing a two-team approach. Similar to Rand et al,¹¹ we chose to tunnel our flap subcutaneously, rather than in the posterior mediastinum. This has several advantages; it is more easily accessible and avoids operating in a scarred field where leaks can be fatal. In our patient, who required a gastrectomy as part of her initial surgery, preservation of the colon provided length to her to gastrointestinal tract and avoided dehydration and chronic diarrhea. The subcutaneous approach allowed for early identification of leaks and ease to locally control them.

Roughly half of all young patients who undergo emergency surgery for caustic injuries die within 10 years.

Malnutrition, operative complications, late morbidity and suicide stand as the leading causes of death. Unfortunately, our patient's complex psychosocial issues led her to take her own life two years after her injury, despite active engagement of her psychiatrist. This highlights the importance of ongoing multidimensional support in this patient population.

CONCLUSIONS

This is the first case report utilizing an ALT free flap to reconstruct a total gastroesophageal defect, with laryngeal preservation, following caustic ingestion. This highlights the versatility of this free flap in complex head and neck reconstructions.

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REFERENCES

1. De Lusong MAA, Timbol ABG, Tuazon DJS. Management of esophageal caustic injury. *World J Gastrointest Pharmacol Ther.* 2017;8:90–98.
2. Chirica M, Bonavina L, Kelly MD, et al. Caustic ingestion. *Lancet.* 2017;389:2041–2052.
3. Zargar SA, Kochhar R, Mehta S, et al. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. *Gastrointest Endosc.* 1991;37:165–169.
4. Kim Evans KF, Mardini S, Salgado CJ, et al. Esophagus and hypopharyngeal reconstruction. *Semin Plast Surg.* 2010;24:219–226.
5. Cha HG, Jeong HH, Kim EK. Microsurgical options after the failure of left colon interposition graft in esophagogastric reconstruction. *Arch Craniofac Surg.* 2019;20:134–138.
6. Yasuda T, Shiozaki H. Esophageal reconstruction with colon tissue. *Surg Today.* 2011;41:745–753.
7. Ananthakrishnan N, Nachiappan M, Subba Rao KS. Island pectoralis major myocutaneous flap for pharyngo-oesophageal strictures prior to oesophagocoloplasty. *J R Coll Surg Edinb.* 2001;46:202–204.
8. Agrawal A, Husein OF, Schuller DE. Esophageal reconstruction with larynx preservation using forearm-free flap. *Laryngoscope.* 2008;118:1750–1752.
9. Chen WF, Chang KP, Chen CH, et al. Outcomes of anterolateral thigh flap reconstruction for salvage laryngopharyngectomy for hypopharyngeal cancer after concurrent chemoradiotherapy. *PLoS One.* 2013;8:e53985.
10. Murray DJ, Novak CB, Neligan PC. Fasciocutaneous free flaps in pharyngolaryngo-oesophageal reconstruction: a critical review of the literature. *J Plast Reconstr Aesthet Surg.* 2008;61:1148–1156.
11. Rand RP, Lin EY, Wood DE. Total esophageal reconstruction using a tubed parascapular free flap. *Ann Thorac Surg.* 2001;72:267–270.