

# Prophylactic Use of the Pectoralis Major Flap to Prevent Anastomotic Leak in the Reconstruction of a Total Laryngopharyngoesophagectomy Defect Combined With Gastric Pull-Up After Chemoradiotherapy

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**Abstract:** Total laryngopharyngoesophagectomy defects after surgical ablation for laryngopharyngeal carcinoma with involvement of the cervical esophagus represents a challenge to the reconstructive surgeon. Complicating an already challenging operation is when surgical ablation occurs after failure of primary chemoradiation requiring the surgeon to operate and reconstruct in an irradiated field limiting potential reconstructive options. Due to the advanced stage at diagnosis, some studies have shown that while traditional management with radiotherapy may be considered as an initial treatment modality, often times this has failed to provide sustainable improvement in survival with reported high local recurrence rates. With relatively high local recurrence rates following radiotherapy, movement towards aggressive surgical resection is favored in some institutions. Despite this movement, primary treatment with chemoradiation is still commonly used as a primary modality opening up the opportunity for residual or recurrent disease leading the surgeon to perform salvage surgery to eradicate disease after primary treatment failure. With advanced ablative surgery comes the challenge to find an ideal reconstructive option that will optimize functional outcomes which has shown to be particularly challenging when operating in a post-radiated field with a higher risk for pharyngocutaneous fistulas. The authors present a case where reconstruction of such a defect after local failure with primary chemoradiation was successful using a single stage reconstruction with the gastric pull up technique in combination with a pectoralis major myocutaneous flap. As the risk of anastomotic leak is significantly higher in patients following radiation, this method showed utilizing a prophylactic muscle flap at the time of reconstruction may further bolster the repair and prevent anastomotic leak.

**Key Words:** Anastomosis, gastric pull up, laryngectomy, leak, pectoralis flap, pharyngectomy

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## CLINICAL PRESENTATION

A 43-year-old female patient, otherwise healthy individual, presented to the emergency department with complaints of throat discomfort and pain. She was evaluated in the emergency room where a flexible fiberoptic laryngoscopy was performed showing an exophytic mass in the post cricoid area along with unilateral vocal fold paralysis. Further work up with CT scan was performed showing involvement of the mass of bilateral pyriform sinuses without involvement of the apex of the right pyriform sinus. The patient was taken to the operating room where a panendoscopy was performed. Biopsies of the mass were taken and consistent with moderately differentiated squamous cell carcinoma of the hypopharynx.

After further discussion with surgical, radiation, and medical oncology teams, the patient decided to undergo primary treatment with chemoradiation. The patient underwent an appropriate planned course of chemoradiation with no major complications. She was doing well and had resumed oral feeds until 5 months post treatment when she began noticing weight loss, throat pain, and dysphagia.

A post-treatment CT scan was performed which showed a vague lesion in the postcricoid area with questionable inferior extension. She was taken back to the operating room for further evaluation with another panendoscopy. Results from the panendoscopy showed a friable lesion in the postcricoid region which was biopsied positive for squamous cell carcinoma. Upon further examination, the mass was noted to have extension into the cervical esophagus which was further biopsied and positive for squamous cell carcinoma. After prior treatment with chemoradiation, the patient and treatment teams agreed upon surgical management with total laryngopharyngoesophagectomy with a gastric pull up combined with pectoralis major flap for reconstruction given the inferior extent of the malignancy and need to perform a salvage operation. The stage of the recurrent malignancy was noted to be T3N0M0.

In order to perform the procedure, first the neck was opened with an apron style incision to allow for excellent exposure and adequate skin laxity for creation of the stoma. Following opening, a laryngopharyngectomy was performed in the standard fashion after ensuring that no vertebral or paraspinous involvement was present (Fig. 1A). The specimen was sent to pathology and circumferential margins were taken to rule out residual malignancy. Following clearance of the margins, standard bilateral levels 2 to 4 neck

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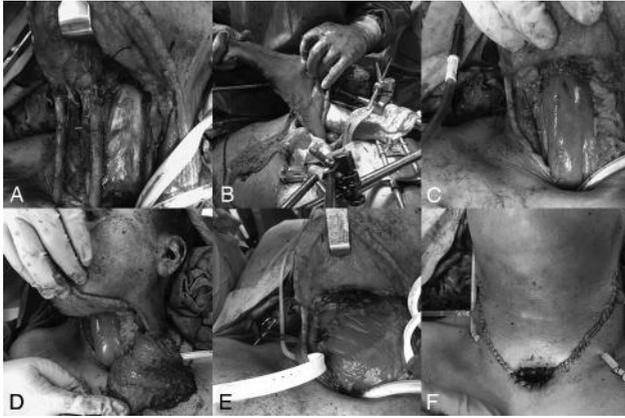
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**FIGURE 1.** A: Defect following total laryngopharyngoesophagectomy and bilateral neck dissection. B: Harvest of stomach from the abdomen before passage into the neck. C: Gastro-pharyngeal anastomosis in 2 layers following gastrostomy. E: Inset of pectoralis major muscle flap overlying the gastro-pharyngeal anastomosis. F: Completion of the procedure with closure of the neck and final contouring of the stoma.

dissections were performed to clear out drainage nodal basins from the lateral necks. Following the cervical portion of the resection, the stomach was mobilized in the abdomen and thorax. The esophagectomy was performed by stapling and oversewing the gastroesophageal junction. Figure 1B shows the stomach before passing it to the neck for anastomosis. The stomach was then prepared for passage and transferred to the neck. The gastropharyngeal anastomosis was performed following a gastrovertebropexy with a 2 layered closure (Fig. 1C). Following completion of this, a leak test was done which showed no leakage through the anastomosis signifying a strong water-tight closure. To further bolster the repair, a muscle only pectoralis flap was raised (Fig. 1D). The flap was then inset over the radiated area to improve vascularity and prevent anastomotic leak (Fig. 1E). Finally, the apron flap was redraped, neck incisions closed, and posterior wall of the stoma was sutured (Fig. 1F) to complete the operation.

Operative pathology revealed negative margins and no nodal disease. Postoperatively the patient did well, however did suffer from 2 episodes of pleural effusions, which were managed with chest tube placement and intervention from thoracic surgery. She was discharged 2 weeks following surgery and successfully passed her swallow evaluation at her 1-month postoperative visit. When the patient was seen in follow up 6 months following surgery, she had completely healed her wounds and continued to do well with no signs of recurrence.

## DISCUSSION

Based on the literature review and presented case, management of total laryngopharyngoesophagectomy patients remains a complex reconstructive dilemma that can be appropriately managed in a one stage primary reconstructive procedure without the need for free tissue transfer. As a reconstructive surgeon, it is vital to consider all viable reconstructive options before entering the operating room. Ideally, the best option would be one that will maximize oncologic and functional outcomes and minimize the patient's overall morbidity. To date, several reconstructive techniques have been suggested to meet the above requirements for treatment of laryngopharyngeal carcinoma with involvement of the cervical esophagus. These methods include myocutaneous pedicled flaps (pectoralis major, deltopectoral, latissimus dorsi), visceral transposition (jejunal autograft, colon autograft, gastric pull up), and free fasciocutaneous flaps

(anterolateral thigh, radial forearm, scapular).<sup>8</sup> When more extensive resection of the esophagus is warranted by advanced disease, the free jejunal flap and gastric pull-up are 2 well-accepted techniques that provide restoration of alimentary continuity with adequate swallowing outcomes.<sup>2,4,11</sup>

In 1959, Seidenberg introduced reconstruction of head and neck defects with the free jejunal flap. The procedure became widespread as the use of microvascular anastomosis techniques have grown in popularity.<sup>2</sup> The surgical procedure entails an abdominal stage performed by general surgery via an open laparotomy or by laparoscopy to remove a segment of Jejunum along with its main vascular supply.

The segment of bowel is removed and used to close the remaining defect after ablation. The flap is both reliable and provides the ability for good swallowing outcomes with the advantage of having a low incidence of fistula and stricture formation.<sup>1</sup> Despite these advantages, the flap is known to be technically demanding requiring the success of 3 enteric anastomoses and 2 microvascular anastomoses and failure rates are directly associated with the microvascular transfer.<sup>2</sup> Another disadvantage to the use of this flap is its ability for reconstruction after total esophagectomy. Instances where intrathoracic esophageal resection or total esophagectomy is required, the free jejunal flap will not allow for adequate reconstruction length leading to the reconstructive surgeon to look for another modality for reconstruction.

Gastric pull up for reconstruction was first described by Ong and Lee and advancement in the technique developed from a thoracic esophagectomy to a transhiatal pull-through esophagectomy with gastric transposition into the neck.<sup>6</sup> There are several advantages that have been reported regarding the use of this flap including immediate restoration of swallowing and the use of well-vascularized tissue away from the radiation field. The technique allows for a single anastomosis in the neck and no requirement for abdominal or microvascular anastomosis. It has shown to have reliable flap viability along with the lowest rate of stricture of all contemporary flaps with greater than 90% flap success rate.<sup>5</sup> Arguably, one of the most important advantages this technique offers is the ability to adequately clear the inferior margin of the resection by removing the esophagus in its entirety.<sup>7</sup> It is well established that positive surgical margins result in increased loco-regional recurrence rates and overall decrease in survival. This technique offers a high likelihood of disease clearance and adds a certainty that skip lesions and second primary tumors of the esophagus have been adequately addressed.<sup>7</sup> This is important because most carcinomas of the upper aerodigestive tract are squamous cell carcinomas with a tendency to exhibit multicentricity and extensive submucosal spread and adequate resection is needed to improve survival.<sup>7</sup>

As shown in the presented case, reconstruction with the gastric pull with the addition of the pectoralis major myocutaneous flap was shown to provide an optimal surgical outcome. It provides the advantage of performing a single stage technique without the need for microvascular reconstruction which can be challenging in a previously radiated field. It is an ideal option for instances where microvascular reconstruction is not ideal and/or where concern for extensive esophageal involvement will necessitate the need for total esophagectomy.<sup>3,11</sup> Importantly, the use of a muscle flap to protect the anastomosis in a radiated field may confer significant advantage in the prevention of gastropharyngeal leakage.<sup>9,10</sup> Like every surgical option, this technique has both its advantages and disadvantages and appropriate discussion with the patient regarding the procedure is warranted. Discussions should entail the morbidity of the procedure, postoperative concerns, potential complications, and changes in quality of life. However, it is also important to highlight the potential benefits of the operation including resuming oral intake, reasonable quality of life, and disease-free survival.

## CONCLUSION

In summary, aggressive surgical resection of laryngopharyngeal carcinoma with involvement of the cervical esophagus mandates the use of an optimal reconstructive option that will ultimately maximize the patient's quality of life and provide desirable surgical oncologic outcomes. As seen from the above case, the combination of gastric pull-up with pectoralis major myocutaneous flap for total laryngopharyngectomy patients offer several advantages to the reconstructive surgeon particularly in cases where microvascular reconstructive techniques are not ideal and when extensive involvement of the esophagus requiring total esophagectomy or intrathoracic esophagectomy is employed. Given that the treatment for anastomotic leak hinges on the placement of a healthy vascularized muscle flap overlying the suture line, the currently presented technique advocates for the prophylactic placement of a muscle flap to further bolster the repair and prevent the deleterious effects of anastomotic leak particularly in a post-radiated neck. Although limited reports of this combined approach have been published, this case demonstrates it to be a desirable option and should be included in the armamentarium of any head and neck reconstructive surgeon particularly when faced with the additional challenge of performing salvage surgery after chemoradiotherapy.

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