

## **Chapter 117: Reconstruction of the Hypopharynx and Cervical Esophagus**

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In 1877 Czerny performed the first recorded pharyngoesophageal reconstruction, using local cervical skin flaps for repair. The literature on reconstruction of the cervical esophagus is extensive. It is not the intention of this chapter to analyze the historical perspectives of this form of surgery. Excellent reviews are listed in the suggested readings.

Early attempts at reconstruction of the hypopharynx and cervical esophagus included the use of local tissues, usually necessitating multiple procedures. Tissue-transposition techniques have been used increasingly during the past 30 years. In 1965 Bakamjian provided a breakthrough in this surgical area with the delineation of his tubed deltopectoral (DP) flap two-stage repair. This technique expanded and improved on the use of other chest flaps, which had been tried with various degrees of success. Refinements of the visceral transposition techniques, including transposition of the whole stomach and revascularized autografts of hollow segments, provided exciting advancements through the 1960s and 1970s. The advent of the pedicled musculocutaneous flaps led to yet another dramatic advance, since their remarkably good vascular supply allowed excellent coverage, and when tubed, they provided an effective one-stage reconstruction. The recent definition of free revascularized cutaneous autografts has provided even greater alternatives for the reconstructive surgeon.

This discussion deals with the standard “workhorse” methods of reconstruction, as well as “state-of-the-art” procedures. The many techniques of more historical interest are not considered in detail. The various options in reconstruction currently in favor are outlined in the box.

### **Options for reconstruction of hypopharynx and cervical esophagus**

#### ***Cutaneous flaps***

Local - cervical  
Regional - deltopectoral

#### ***Musculocutaneous flaps***

Pectoralis major  
Latissimus dorsi  
Trapezius

#### ***Visceral transposition***

Gastric “pull-up”  
Jejunal autograft  
Right colon  
Left colon  
Ileocolon

### *Free fasciocutaneous flaps*

Lateral thigh  
Radial forearm  
Scapular  
Parascapular.&

### **Partial Defects**

In some cases enough mucous membrane of the hypopharynx and cervical esophagus remains after resection to obtain a primary closure with approximation of the mucosal edges, usually over a nasogastric tube. Remembering that an overly tight closure will almost certainly lead to a stricture is important. If any question of adequate lumen diameter exists, an alternative method should be chosen. In certain partial laryngopharyngectomies, full mucosal coverage cannot be obtained, but a significant portion of the larynx is retained. In many of these cases, use of local tissue, including laryngeal perichondrium, or a flap or graft can facilitate primary closure, with reepithelialization occurring in the postoperative period.

In general, reconstruction following subtotal removal of the hypopharynx and the cervical esophagus can be achieved with modifications of the techniques used for reconstruction of circumferential defects. Pedicled musculocutaneous flaps provide excellent reconstruction of such subtotal defects. Preservation of a mucosal strip prevents the stenosis that complicates most of the circumferential anastomotic techniques.

### **Circumferential Defects**

#### **Cervical skin flaps**

The first attempt at reconstructing circumferential defects of the hypopharynx and cervical esophagus were carried out in the late nineteenth century with local tissues. In 1942, however, Wookey established the standard for reconstruction using cervical skin flaps. Over the years many authors have promoted variations of this technique. The techniques are all multistaged - usually requiring the creation of a pharyngostoma and an esophagostoma, followed by bridging of the defect in stages by advancement-rotation of local skin flaps. Fig. 117-1 illustrates an example of this form of reconstruction, with local cervical skin flaps used to create a neopharynx and a pectoralis major myocutaneous flap used to replace the cervical skin.

The morbidity associated with this technique results from compromised viability of the cervical skin flaps after radiotherapy, insufficient tissue length for extensive reconstruction, salivary soiling of the tracheostomy, and prolonged hospitalization caused by the many stages required. Late deglutition and frequent surgical complications are common. However, with judicious avoidance of the great vessels, combined with a planned pharyngostomy, few deaths usually occur.

The use of local cervical flap reconstruction, with or without other forms of reconstruction, should always be kept in mind, especially for salvage of a failed reconstruction.

## **Tubed deltopectoral flap**

Bakamjian's introduction in 1965 of the tubed DP flap for a two-staged reconstruction of the pharyngoesophagus was a milestone in head and neck reconstructive surgery. This technique became the standard for reconstruction of the pharyngoesophagus for more than a decade. It is presented largely for historical interest and is no longer used by most otolaryngologist - head and neck surgeons. Fig. 117-2 illustrates a tubed DP flap brought up for an end-to-end closure with the pharyngeal defect. The proximal esophagus is then closed end-to-side into the tubed DP flap. This provides a continuous salivary fistula down the tubed pedicle onto the anterior chest. At the second stage, the distal end-to-side anastomosis is taken down and converted into an end-to-end anastomosis, and the stump of the DP flap is replaced on the chest wall.

This form of reconstruction necessitates two procedures and thereby prolongs hospitalization. Deglutition is delayed. The incidence of postoperative complications is significant (11% to 17%), although not as frequent as with cervical or other chest-skin flap reconstruction. Distal anastomotic stricture, a frequent complication with almost all forms of circumferential pharyngoesophageal reconstruction, is particularly common with this technique. Very low mortality is associated with this procedure (11% to 17%).

## **Musculocutaneous flaps**

In the late 1970s, the musculocutaneous flaps largely replaced the DP flaps in head and neck reconstruction. By 1980 I, and others, had used the pectoralis major musculocutaneous flap (PMF) for tubed one-stage reconstruction of the hypopharynx and cervical esophagus (Fig. 117-3). Significant advantages included a superior blood supply, a donor site outside of the radiation fields, and single-stage reconstruction. When a pharyngostomy was required, it could be planned and placed away from the tracheostomy.

The limitations imposed by the bulk of these flaps were quickly realized, however, especially in women with large breasts or in men with well-developed pectoralis major muscles. Tubing bulky flaps was extremely difficult and limited the tailoring of the flap at the distal anastomosis deep in the root of the neck behind the trachea. Attempts to solve this problem included the incorporation of random segments of skin with the PMF and skin-grafted pectoralis major muscles. Trapezius and latissimus dorsi myocutaneous flaps have also been used without real advantage over the pectoralis major technique.

I, as well as others, have experienced fewer postoperative complications of flap necrosis with PMF than with DP or cervical flap reconstruction. The incidence of postoperative fistulas remains high, but with the rich vascular supply to the PMF, most of these are self-limiting and require only conservative wound care. Stenosis, especially at the distal anastomosis, remains a significant problem because of the necessity of an annular closure. Other limitations include significant hair bearing of the skin in many male patients and an awkward anastomosis to the cervical esophagus because of bulk. Mortality is very low with this form of reconstruction.

## **Visceral transposition (Fig. 117-4)**

Various forms of visceral transposition, including the stomach and the left and right sides of the colon, have been incorporated for pharyngoesophageal reconstruction for many years. The test of time has identified the transposition of the entire stomach pedicled on the right gastric and gastroepiploic arteries as the superior choice. Microvascular surgical techniques have provided the use of free autografts of jejunum, colon, and ileocolon. Of these, the free jejunum is the only option exercised by most surgeons.

### ***Stomach pull-up***

The transposition of the whole stomach for reconstruction of the pharynx and esophagus was first reported in 1960. Many surgeons employ this as a primary mode of reconstruction. A two-team approach with simultaneous dissection in the abdomen, thorax, and neck has shortened the operative time. Long-term studies have demonstrated progressive improvement in mortality and morbidity during the last decade. A total esophagectomy is performed, the preferred route being through the posterior mediastinum in the esophageal tract (Fig. 117-5).

Removal of the total esophagus provides unlimited inferior dissection and lessens the surgeon's concern about distant submucosal nests of cancer spread ("skip lesions"). Superior resection can be as high as the nasopharynx, and the pedicled stomach can be anastomosed to other tissue if further resection and reconstruction are required.

This procedure allows the shortest hospitalization time of all forms of cervical esophageal reconstruction. The patient can usually be discharged 3 weeks after surgery, with successful deglutition. With only one visceral anastomosis (usually above the level at which the patient's oral secretions collect), postoperative infection, fistula, and stenosis are markedly reduced.

The shortcomings of the procedure are largely dictated by the extensive nature of the surgical invasion. With abdominal and thoracic, as well as head and neck, entry required, some candidates for reconstruction may not be medically fit for this procedure. In many patients with carcinomas of the hypopharynx, a degree of pulmonary and cardiovascular compromise is expected. This must be seriously considered in light of the recorded rates of postoperative complications in the chest and abdomen. Regurgitation is a frequent postoperative problem in spite of the mandatory pyloromyotomy performed at the time of surgery. Necrosis of the transposed stomach is rare, although anastomotic leaks can occur. Significant anastomotic breakdown can be devastating if the serosa of the stomach has not been plicated to the prevertebral fascia at various sites. Anastomotic stenosis rarely occurs. Perioperative mortality rates are higher with this form of reconstruction than with any of the other commonly employed techniques.

### ***Jejunal autograft***

Revascularized jejunal autografts were first proposed for reconstruction of the hypopharynx and cervical esophagus in 1958; in the last decade many series have been reported. The technique is shown in Fig. 117-6. The jejunal segment, although distensible, has

a better muscular component than the often patulous colon and provides a caliber match for cervical esophageal reconstruction. The autograft can be opened along its antimesenteric border, providing a patch graft, if a subtotal reconstruction is desired. The vascular pedicle, although of limited length, is of moderate diameter, which allows for easy microanastomosis.

The downside of this procedure, as with any visceral transposition, involves the necessity of abdominal surgery. This provides a small but significant increase in morbidity and mortality. The literature records a postoperative complication rate often in excess of 30%. The rate of graft necrosis is significant and constant. Donor vessels in the neck may pose a problem after a radical neck dissection. Anastomotic strictures, especially at the distal anastomosis, are frequent, and fistula formation is on the same order as with the stomach pull-up. This technique has the advantage of a one-stage reconstruction with provision of a mucosa-lined tube of good dimension and the relative advantage of visceral reconstruction without thoracic entry.

### *Colon transposition*

Colon has been incorporated as either a pedicled graft of the right or left side of the colon or a revascularized autograft of colon or ileocolon. The pedicled procedures have been carried out since the early part of this century, with several large series presented during the past 2 decades. With the use of the posterior mediastinal tract, total esophagectomy can be performed with the advantage of any skip lesions being resected. The colon can provide a visceral alternative to a stomach pull-up or jejunal graft in the face of prior gastric surgery or portal hypertension.

Colon transposition has fallen out of favor, and the literature points to significant morbidity and mortality with these procedures. The need for abdominal surgery with abdominal, as well as cervical, anastomoses of the viscera increases complications. Achieving adequate pedicle length may be a problem, especially in patients with previous abdominal disease, and necrosis of the distal colon is common. Either pedicled or as a free autograft, the colon can become very distended and pendulous. These patients usually require longer hospitalizations than do those with the previous two types of visceral transposition, with an attendant delay in successful deglutition.

### **Revascularized free fasciocutaneous flaps**

No currently available reconstructive technique offers restoration of a neopharynx with coordinated muscular activity (peristalsis) and a mucosal lining. At best we can hope to achieve an adynamic epithelium-lined conduit that allows the passive transfer of oral secretions and food. The ideal current technique would therefore demand (1) a donor site that provides an epithelium-lined tube; (2) a tube that is thin and pliable to allow staggered circumferential closure to avoid stenosis, especially at the lower anastomosis (Fig. 117-7); (3) an easily accessed donor site that does not require repositioning of the patient; (4) a donor site distal from the head and neck to accommodate simultaneous two-team surgery; (5) a substantial vascular pedicle to facilitate the reconstruction and reduce the risk of flap necrosis and fistula formation; (6) minimal hair-bearing skin; (7) minimal donor morbidity, and (8) a technique that the surgeon can perform without assistance. Such a technique is currently available (Figs. 117-8 and 117-9).

Baek described medial and lateral thigh flaps in 1983. These flaps, especially the lateral cutaneous thigh flap, are thin (less so in women) and pliable, with very little hair even in male patients. The vascular pedicle is long and of relatively large diameter, allowing for easy revascularization. The donor site is far removed from the head and neck, permitting a two-team approach to minimize operative time.

Fig. 117-8 illustrates the elevation of the lateral cutaneous thigh flap with its vascular pedicle consisting of the third perforating branch of the profunda femoris artery and its attendant venae comitantes. The vascular pedicle may be as long as 15 cm, and if an anastomosis to vessels in the contralateral neck is required, the saphenous vein may be taken for additional length. The donor site can be closed primarily. The thin, pliable flap permits careful contouring, which is particularly useful in the difficult distal anastomosis. This flap can be used to repair both circumferential and subtotal pharyngeal defects.

Other free fasciocutaneous flaps providing appropriately thin and relatively hairless skin with long vascular pedicles of significant diameter have been described. The radial forearm flap (Fig. 117-9) could provide such a donor, but the cosmetic donor deformity created by a skin-grafter forearm may be considered a relative limitation by some surgeons. The scapular and parascapular cutaneous flaps based on the cutaneous branches of the circumflex scapular artery are other options (Fig. 117-10). However, the need for lateral positioning of the patient to harvest this flap precludes simultaneous surgery by two teams.

Although microsurgical skills are required, the considerable caliber of the vessels makes these microvascular anastomoses relatively simple. This technique has none of the morbidity and mortality associated with thoracic or abdominal invasion. With the donor site well away from the radiation fields, healthy skin is used. Skin is the body's most expendable organ, with no functional loss and minimal cosmetic defect left at the donor site. Muscle sacrifice is required with musculocutaneous flaps and must be considered when the most appropriate technique is being chosen.

Reconstruction of the largest pharyngeal defects can be performed with this one-stage-two-team approach with minimal morbidity.

### **Summary**

Reconstruction of the defect created by laryngopharyngectomy remains one of the greatest challenges to the head and neck surgeon. These patients are often medically compromised. Their collectively poor prognosis militates against surgical techniques that involve multiple procedures and prolonged hospitalization. Optimal reconstruction would limit financial and physical expense to the patient and expedite the patient's return to an independent life-style. The best reconstructive option for any given patient obviously depends on multiple factors, but, certain guidelines may be followed.

The relatively healthy patient who has disease spread into the proximal esophagus will usually benefit from a total esophagectomy, since caudad spread of disease beyond the clinically apparent tumor is common. Such a patient does best with a stomach pull-out, the best of the pedicled visceral transposition techniques - all of which carry an increased morbidity and mortality.

For those patients whose more cephalad disease can be encompassed by a laryngopharyngectomy, the options are greater and the outcome improved. My first choice for these patients is a free fasciocutaneous flap. It presents the least morbidity of any of the techniques discussed and offers relatively rapid one-stage surgery with a short hospitalization and early feeding. The donation of skin produces far less morbidity than is seen with visceral or musculocutaneous techniques.

If the patient is not a good candidate for a free fasciocutaneous flap because of obesity or previous surgery, my second choice is a free jejunal autograft. The morbidity is increased by the need to violate the abdomen, but this technique has proved to be a very reliable option. There is a greater risk of distal anastomotic stricture than with a thin and pliable free fasciocutaneous flap, which can be tailored at the distal anastomosis with the esophagus.

For those patients in whom less than a total laryngopharyngectomy is required and in whom a strip of pharyngeal mucosa remains, a free fasciocutaneous flap or a pectoralis musculocutaneous flap are equally good choices.