

Oropharyngeal, Hypopharyngeal and Cervical Esophageal Reconstruction: An Experience of Pedicle Flaps

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ABSTRACT

Objective: To review the experience of single-stage reconstruction following pharyngolaryngectomy and cervical esophageal defect with pedicle flaps in a tertiary care centre.

Study Design: Retrospective study.

Place and Duration of Study: Jinnah Burn and Reconstructive Surgery Centre, Lahore, from June 2007 to June 2017.

Methodology: All patients who underwent oropharyngeal, hypopharyngeal and cervical esophageal reconstruction with pedicled flaps were included.

Results: Thirty-two reconstructions were done, of which 16 (50.0%) were supraclavicular flaps, 12 (37.5%) were pectoralis major myocutaneous flaps (PMMF) and 4 (12.5%) platysma myocutaneous flaps (PMF). Among these, 24 (75%) were males and 8 (25%) females. The mean hospital stay was 18.75 \pm 5.45 days. Complications were noted in 12 (37.5%), salivary fistula being the most frequent found in 6 (18.75%). Wound dehiscence was noted in 4 (12.5%), partial flap necrosis and wound infection present in 1 (3.1%) each.

Conclusion: Oropharyngeal, hypopharyngeal and cervical esophageal reconstruction with pedicle flaps is still very useful and safe to perform, associated with minimal flap and donor site complications.

Key Words: Pharyngeal reconstruction, Pedicled flap, Supraclavicular flap, Pectoralis myocutaneous flap.

INTRODUCTION

Oropharyngeal, hypopharyngeal and cervical esophageal defects after cancer surgery, trauma and stricture are a constant challenge for reconstruction. This group of patients is difficult due to the disease associated morbidity and the functional and aesthetic defects.¹ Numerous flaps have been described including myocutaneous (pectoralis major, trapezius and latissimus dorsi), fasciocutaneous (deltopectoral, supraclavicular artery) and microvascular (radial forearm, anterolateral thigh, parascapular, abdominal, jejunal) flaps have been described. The selection of flaps for reconstruction depends on the type and location of the defect, patient characteristics and the experience of the surgical team.¹⁻¹² Pharyngeal defects are mostly due to cancer surgery, trauma and benign diseases like corrosive stricture.¹ The fundamental goals of any reconstruction of a pharyngeal defect are to restore the integrity of digestive track for swallowing; to maintain phonation, either by conservation of larynx or by any rehabilitation technique in case of total laryngectomy; and to perform the

technique in a single surgical operation with minimum morbidity and mortality.^{2,5}

Trotter in 1913 was the first to use cervical skin flaps for surgical reconstruction of pharynx,⁴ and now there is the era of free vascularized flaps.⁷ Regional flaps are still a valid option for this reconstruction. In this study, the use of pedicled flaps for pharyngeal and cervical esophageal reconstruction in 32 patients is reported.

Although in this era of microvascular surgery, the free tissue transfer is the standard of care, but needs long operative time, potential risk of complete flap loss, difficulty of monitoring of buried flaps, need of major resources, difficulty to accommodate in busy surgery lists and, in case of previous radiation, difficulty to dissect out the appropriate donor vessels.¹³⁻¹⁵

The need of local flap remains as it is adjacent to the area of reconstruction, with minimal operative time, need of limited resources, and no need of extensive monitoring.¹⁶⁻¹⁸

The aim of this study was to review the outcome of reconstructive procedures for flap survival and the complications.

METHODOLOGY

The data of patients undergoing oropharyngeal, hypopharyngeal and cervical esophageal reconstruction was retrospectively analysed from June 2007 to June 2017 after approval of Hospital Ethical Committee. The medical records were reviewed and data were collected for the cause of pharyngo-esophageal defect, patient

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characteristics, location and size of the defect, the reconstruction method, complications of reconstruction and hospital stay. All patients with pharyngo-esophageal reconstruction, using pedicle flaps, were included in the study. The mean follow-up period was 24 months with a minimum of 6 months.

Data was entered and analysed in SPSS version 21.0. Mean + standard deviation (SD) was calculated for continuous variables like age and duration of hospital stay. Frequencies and percentages were calculated for categorical variables like gender, type of flaps used, and complications. Chi-square test was used to assess the significance for complications among type of flaps with $p < 0.05$, which was statistically considered as significant.

RESULTS

A total of 32 patients were included, with a mean age of 42.25 ± 13.05 years (ranging from 16-70 years), of which 24 (75%) were males and 8 (25%) females. Supraclavicular flap was used in 16 (50%) cases, pectoralis major myocutaneous flap in 12 (37.5%) and

platysma myocutaneous flap in 4 (12.0%) cases. Fourteen (43.7%) patients were smokers, and 9 (28.1%) were diabetics, whereas 10 (31.2%) patients had previous radiation therapy. Mean operation time was 142 minutes (ranging from 90 to 210 minutes). The maximum circumferential defect reconstructed was 10 cm. The demographic and clinical characteristics of patients are given in Table I.

All patients presented to us after primary surgery, 16 (50.0%) were operated for malignancy, 12 (37.5%) for corrosive stricture, and 04 (12.5%) for trauma.

All patients were followed up for long-term complications like stenosis, ranging from 6 months to 5 years with the mean follow-up of 2 years. The mean hospital stay was 18.75 ± 5.45 days (ranging from 15-45 days). Patients with complications stayed longer than the patients with uneventful recovery. Representative case pictures are shown in Figures 1 and 2.

Complications were noted in 12 (37.5%) patients, the most common being salivary fistula, in 6 (18.6%) cases. Partial flap necrosis occurred in 1 (3.2%) case, *i.e.* supra-

Table I: Etiology, location, size and type of defect and reconstruction with complications of flap.

Gender	Age	Etiology	Location of defect	Type of defect	Size of defect	Reconstruction	Complication
Male	48	Tumor	Hypopharynx and cervical esophagus	Anterior and lateral walls	7 cm	Pectoralis major myocutaneous	
Male	29	Corrosive	Hypopharynx	Circumferential	8 cm	Pectoralis major myocutaneous	
Male	52	Tumor	Hypopharynx and cervical esophagus	Circumferential	7.5 cm	Pectoralis major myocutaneous	Dehiscence
Female	40	Tumor	Hypopharynx and cervical esophagus	Anterior and lateral walls	6 cm	Supraclavicular flap	
Male	38	Trauma	Hypopharynx	Anterior and right lateral wall	5 cm	Pectoralis major myocutaneous	Fistula
Male	54	Tumor	Oropharynx, hypopharynx and cervical esophagus	Circumferential	10 cm	Supraclavicular flap	
Male	52	Tumor	Hypopharynx and cervical esophagus	Circumferential	8 cm	Pectoralis major myocutaneous	
Female	47	Tumor	Hypopharynx and cervical esophagus	Circumferential	6.5 cm	Supraclavicular flap	Partial Necrosis
Female	29	Corrosive	Hypopharynx	Circumferential	3 cm	Platysma myocutaneous flap	
Male	30	Corrosive	Hypopharynx	Circumferential	4 cm	Pectoralis major myocutaneous	
Male	29	Trauma	Hypopharynx	Anterior wall	5 cm	Supraclavicular flap	
Male	60	Tumor	Hypopharynx and cervical esophagus	Circumferential	10 cm	Supraclavicular flap	Fistula
Male	41	Corrosive	Hypopharynx	Anterior and lateral walls	8 cm	Supraclavicular flap	
Female	32	Corrosive	Hypopharynx	Circumferential	3.5 cm	Platysma myocutaneous flap	Infection
Male	70	Tumor	Hypopharynx and cervical esophagus	Circumferential	7 cm	Pectoralis major myocutaneous	
Male	44	Trauma	Hypopharynx	Anterior and lateral walls	3.5 cm	Platysma myocutaneous flap	Dehiscence
Male	62	Tumor	Hypopharynx and cervical esophagus	Circumferential	6.5 cm	Supraclavicular flap	
Female	16	Corrosive	Hypopharynx	Anterior and lateral walls	4 cm	Supraclavicular flap	
Male	46	Tumor	Hypopharynx and cervical esophagus	Circumferential	5.5 cm	Supraclavicular flap	
Female	27	Corrosive	Hypopharynx	Anterior and lateral walls	5 cm	Supraclavicular flap	Fistula
Male	48	Tumor	Hypopharynx and cervical esophagus	Circumferential	7 cm	Pectoralis major myocutaneous	
Male	40	Corrosive	Hypopharynx	Anterior and lateral walls	4cm	Supraclavicular flap	
Male	49	Tumor	Hypopharynx and cervical esophagus	Circumferential	7 cm	Pectoralis major myocutaneous	Dehiscence
Female	26	Corrosive	Hypopharynx	Anterior and lateral walls	4 cm	Supraclavicular flap	
Male	29	Corrosive	Hypopharynx and cervical esophagus	Circumferential	5 cm	Supraclavicular flap	Fistula
Male	36	Corrosive	Hypopharynx	Anterior and lateral walls	5 cm	Supraclavicular flap	
Male	57	Tumor	Hypopharynx and cervical esophagus	Circumferential	8 cm	Pectoralis major myocutaneous	Fistula
Male	35	Trauma	Hypopharynx and cervical esophagus	Anterior wall	5 cm	Supraclavicular flap	
Male	53	Tumor	Hypopharynx and cervical esophagus	Circumferential	8 cm	Pectoralis major myocutaneous	Dehiscence+ Fistula
Female	23	Corrosive	Hypopharynx	Circumferential	3cm	Platysma myocutaneous flap	
Male	51	Tumor	Hypopharynx and cervical esophagus	Circumferential	7cm	Pectoralis major myocutaneous	
Male	59	Tumor	Hypopharynx and cervical esophagus	Circumferential	9cm	Supraclavicular flap	



Figure 1: Seventy-year male presented with cervical esophageal fistula after laryngectomy and hypopharyngectomy. Defect was covered with double paddle myocutaneous pectoralis major flap.



Figure 2: Twenty-five-year female presented with jejunostomy loupe into the neck after esophagectomy, but could not join it with the cervical part of esophagus. So supraclavicular flap was tubed to act as a bridge.

clavicular artery flaps. After flap debridement, the defect was covered with myocutaneous pectoralis major flap. Dehiscence occurred in 4 (25.0%) cases. Stenosis was not observed in any case. The type of complications is shown in Table I.

DISCUSSION

Pharyngeal and cervical esophageal disorders lead to great morbidity which makes the reconstruction a challenge for the reconstructive surgeons. Debate is still going on for the most appropriate tissue for reconstruction to establish continuity between the oral cavity and the esophagus. Most pharyngeal defects present after tumor excision. The ideal reconstruction in

these cases is usually one-stage procedure with reliable and robust tissue for early functional recovery and ability to tolerate postoperative radiotherapy. The availability of tissue for reconstruction ranges from primary closure to free tissue transfers, but depends on the extent of defect, neck dissection, previous radiation and patient's general health.

Contemporary options for pharyngoesophageal reconstruction are pedicled flaps and free flaps (enteric and fasciocutaneous).¹ The most common fasciocutaneous free flaps for pharyngoesophageal reconstruction are the free radial forearm and the anterolateral thigh flap. Traditionally, for circumferential defects of hypopharynx and esophagus above the thoracic inlet, enteric flaps, i.e. free jejunal transfer have been used. For defects below the thoracic inlet, reconstruction has been done using gastric pull-ups. The free enteric flaps have been the treatment of choice over the fasciocutaneous flaps but the added morbidity of a laparotomy and intestinal anastomosis decreases their use. The additional advantages of fasciocutaneous flaps are less donor site morbidity, better trachea-esophageal speech quality, and comparable stricture (12-27%) and fistula rates (0-13%).^{1,19} All these flaps need long operative time, microsurgery facility and invasive monitoring for flaps and are prone to complete flap failure.¹³

This study suggests that regional flaps are still valid options for hypopharyngeal and cervical esophageal reconstruction associated with low morbidity, and offering comparable results with the free flaps. In comparison to free flaps, the regional flaps are easy to harvest, technically less demanding and are desirable in patients with advanced age, extensive disease, comorbidities or poor nutritional status. Furthermore, the radial forearm flap has significant donor site morbidity, and the anterolateral thigh flap skin paddle is usually thick especially in females and difficult to tube.²⁰

For the reconstruction of the circumferential pharyngolaryngectomy defects, double paddle myocutaneous pectoralis major flaps and tube was made by joining the two paddles, were used. The folding of this flap for the reconstruction of circumferential defect is difficult and resulted in more complications than for reconstruction of non-circumferential defects. In females, the breast tissue results in less reliable skin paddle and the resulting loss of contour of breast and scar are unacceptable for female patients. In one case, jejunal pull-up was done to reconstruct after corrosive stricture of pharynx and cervical esophagus, but the cervical part got necrosed; later, the defect was reconstructed with tubed supraclavicular flap. Four cases presented with post-laryngectomy/post-radiotherapy pharyngeal fistulas as a manifestation of tumour recurrence. Wide excision and reconstruction was done with pedicle flaps. The most important observation in our study was that the complication rate was not too high, despite performing

the procedures in severely disease-compromised patients. The percentage of satisfactory results in regional flaps was 95%.

Mamoon *et al.* reported 21% fistula rate with no flap loss in his series of 14 reconstructions with pectoralis major myocutaneous flap.¹⁶ Lakhera *et al.* recommended the use of patch pharyngoplasty by pectoralis major flap for the defect up to 3.5 cm.²¹ In their series, the fistula rate was 27.1%. Murray *et al.* reported in a study the overall fistula rate of about 13% in all fasciocutaneous flaps, with 16.4% in the anterolateral thigh flap and 14.4% in radial forearm flap patients.³ Yu and Robb reported a fistula rate of 33%; and after their technique modification; fistula rate decreased to 8%.¹¹ In the other large series, the overall fistula rate ranged from 8 to 22% for free jejunal flaps.^{9,11,20,22} Richmon *et al.* reported the fistula rate for pectoralis major flaps range from 0-47%.²³ In this study, fistula rate was 18.6%. According to a study by Chang *et al.*,¹² 65% of all fistulas closed spontaneously, which is consistent with the rate cited in other reports.^{23,24} In this study, all fistulas were managed conservatively.

Szudek *et al.* noted 37% complication rate in platysma myocutaneous flap with increased rate of infection when used for the pharyngeal reconstruction.²⁵

Liu *et al.* suggested supraclavicular flap as ideal flap for pharyngeal reconstruction for being thin, easy to harvest, fold on itself, and good for circumferential defects with minimal donor site morbidity.¹⁵

The stricture formation after pectoralis major flap reported by Mamoon *et al.* was 29%.¹⁶ While in fasciocutaneous flaps, it varies considerably between 5-40%.²⁶⁻²⁸ Murray *et al.* reported the overall stricture rate of 16.3% in all fasciocutaneous flaps and 11.9% rate in anterolateral thigh flaps.³ While in jejunal flap, it has been reported ranging from 15-22%.^{20,22} Yu and Robb reported 12% fistula rate in circumferential defects reconstructed with anterolateral thigh flap,¹¹ but in this study none of the patients developed stricture.

These series suggest that despite minimal complication quoted with free microsurgical reconstruction, yet the pedicled flaps are useful alternative in selected cases, and are quick to perform with lesser secondary procedure requirement. In this study, the pectoralis major flap is better in male patients with non-circumferential reconstruction with previous neck dissection or radiation to neck. Similarly, the platysma myocutaneous flap is better for small defects with no previous trauma or radiation to the donor area. The supraclavicular flap is better for circumferential defects in either gender.

CONCLUSION

In the light of the above considerations, pedicled flaps have comparable results with free fasciocutaneous flaps

with overall high success rate. The pedicled flap is one-stage operation with quick flap raising, reliability; and is ideal for patients with significant medical history and old age. The pedicled flap with low complication rate and less donor site morbidity makes these flaps, in authors' opinion, a valid option for reconstruction of oropharyngeal, hypopharyngeal and cervical esophageal defects.

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