Scapular Free Flap Reconstruction of Pharyngoesophageal defects

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Abstract

* Scapular and parascapular free tissue transfer (SFTT) is a well described reconstructive option for the head and neck. Majority of reported outcomes are of reconstruction of oromandibular and midface defects. The aim was to describe one institution's experience with SFTT for reconstruction of PE defects. * This study was a retrospective review of patients undergoing SFTT for head and neck defects between 2009 and 2014 at a tertiary center. The cohort included patients undergoing reconstruction of PE defects with at least 6 months follow up. Seventeen patients (13 male and 4 female) met inclusion criteria. Surgical outcomes, speech, voice outcomes, swallowing outcomes, enteral feeding and tracheoesophageal puncture (TEP) usage were evaluated. * Two of 17 patients developed pharyngocutaneous fistulas (PCF) as inpatients. There was one major medical complication (pulmonary embolism) and 7 minor complications. Mean hospital length of stay was 15.7 days (SD 8.2). In post-operative setting, only one patient remained PEG-dependent, 11 patients supplemented oral intake with PEG feeds and 5 patients took nutrition solely by mouth. Four patients utilized written communication exclusively, 6 patients pursued TEP placement and 7 utilized electrolarynx. * The SFTT is a viable option for hypopharyngeal reconstruction. All scapula free tissue transfers remained viable for the duration of our review. Post-operative PCF rate were comparable to that reported after laryngectomy.

INTRODUCTION

Scapular/Parascapular free tissue transfer (SFTT) is a versatile tool in head and neck reconstructive surgery. Free flaps based off the subscapular system allow the surgeon to harvest a combination of soft tissue, bone, and muscle with limited donor site morbidity. Blood supply to the skin paddle is composed of skin perforators from the vascular pedicle allowing safe manipulation and contouring during flap inset.

The majority studies pertaining to SFTT report outcomes of reconstruction of oromandibular and midface defects.[1,2] Limited data has been published on pharyngoesophageal(PE) reconstruction with many studies focusing on radial forearm or anterolateral thigh free flap reconstruction.[3,4]

Complications from failed PE reconstruction can often be life threatening and delay adjuvant cancer treatment. Patients who develop pharyngocutaneous fistula (PCF) experience increased duration of hospital stay, are prone to infection, and risk carotid blowout. Moreover, many who develop fistula, have stricture and are gastrostomy tube (G-tube) dependent. SFTT has the potential to limit these complications due to abundant soft tissue and skin capable of reconstructing circumferential defects. Fasciocutaneous (FC) SFTT can also be designed to fill cervical skin defects and protect great vessels.

The objective of this study is to describe our institution's experience with SFTT for the reconstruction of PE deficits. This review will focus on surgical outcomes of PE defect closure, donor site morbidity, and speech and swallowing function.

METHODS

Patients:

A retrospective review was conducted of all patients undergoing SFTT for PE defects, between 2009 and 2014. All reconstructive procedures were performed by the senior author (JMS). Patients were included if they had documented follow up for at least 6 months with speech and language pathology (SLP) evaluation.

Data Collection and statistical analysis:

The following data elements were collected for each patient in the cohort: basic demographics, social history, defect classification, previous treatment, ablative procedure, donor site morbidity, salivary bypass tube use, and functional outcomes. Skin paddle dimensions, recipient blood vessels, and venous coupler sizing were collected. Surgical outcomes and complications were documented from flap donor site and reconstructive site. SLP data including voice outcomes, swallowing outcomes, enteral feeding usage, and tracheoesophageal puncture (TEP) usage were reviewed and descriptive statistics performed.

RESULTS

After review of a database of over 200 scapula free tissue transfer reconstructions conducted by the senior author (JMS) at our institution, 17 were included in the study (Table 1). All patients were left with total laryngopharyngectomy defects after ablation necessitating free tissue transfer reconstruction. Eighty-eight percent had already undergone primary chemoradiation (n=9) or radiation-alone (n=6).

All patients had a preoperative diagnosis of squamous cell carcinoma—involving the glottis (n=6), supraglottis (n=5), oropharynx (n=2), nasopharynx (n=2), hypopharynx (n=1), and oral cavity (n=1). Mean follow-up after surgery was 19.1 months with 6 month follow up.

Operative notes dictated by the primary operative surgeon (JMS) of all reconstructions were reviewed. All patients underwent microvascular reconstruction with a fasciocutaneous SFTT in a circumferential/tubed (n=11) or partially-tubed (n=6) fashion. All patients were positioned in lateral decubitus for harvest (Figure 1), and donor sites closed primarily (Figure 2). Flap pedicles were based off the subscapular or circumflex scapular artery and veins. Recipient arteries included facial (n=5), superior thyroid (n=4) and transverse cervical (n=6) arteries. The external jugular vein (n=7) or branches off the internal jugular vein (n=9) were used. An implantable doppler was coupled to the recipient vein for postoperative monitoring. Mean skin paddle size was 152.2cm^2 (SD 56.2cm^2, range 67.5-242cm^2) and average ischemia time was 4 hours (range 2:57-4:50). Majority of hypopharyngeal reconstruction was completed prior to starting microvascular anastomosis. Salivary bypass tubes were placed at the time of surgery in 14 patients.

All patients were admitted to the surgical-trauma ICU for hourly flap checks. Flap survival rate was 100%. Donor site morbidity comprised two post-operative hematomas requiring drainage and wound vac placement. There was no wound infections or dehiscence. Post-surgical complications included two hematomas (one neck, one chest) and two cases of wound dehiscence (one at flap edge, one at stoma).

Two patients developed PCF as inpatients (11.7%). One fistula was closed with pectoralis flap successfully, and other with packing and use of a wound vacuum device. There was one major complication (pulmonary embolism) and 7 minor complications (Table 2). Mean hospital length of stay was 15.7 days (SD 8.2, range 8-36 days). Ten out of 17 patients received post-adjuvant therapy (chemoradiation, chemotherapy- or radiation-alone).

Speech outcomes in the outpatient setting were reviewed and are detailed in table 3. Pre-operatively, nutritional status was generally poor with only 7 patients able to fulfill nutritional needs via oral intake. In the postoperative setting, one patient remained PEG-dependent, 11 supplemented with PEG feeds, and 5 were taking solely by mouth. Four patients required esophageal dilation in the operating room. In many cases, swallowing outcomes were affected by pre-operative swallowing dysfunction including trismus and multi-level swallowing difficulty. Swallowing outcomes often worsened after adjuvant treatment.

Voice outcomes varied significantly among patients in the cohort (Table 3). Four patients remained with only text/written speech for communication, 6 patients pursued TEP placement and were progressing with

voice rehabilitation, 7 patients utilized an electrolarynx with varying degrees of success.

DISCUSSION

Dos Santos first published on the anatomy of the subscapular system and introduced the scapula free flap[6]. Since its original description, few series have focused on the fasciocutaneous iteration of the SFTT. Yoo et. al. detailed their experience in 60 patients with only 29 requiring fasciocutaneous free flaps[7]. Only one patient required hypopharyngeal reconstruction. Another series of 130 patients had only four patients requiring fasciocutaneous flaps[8].

The utilization of non-radiated, vascularized tissue for closure of post-laryngectomy defects has become standard of care. The scapular/parascapular free flap is a safe and reliable option for hypopharyngeal reconstruction. Eighty-eight percent of our patients had failed non-surgical treatment.

All scapula free tissue transfers remained viable for the duration of this review. This flap survival rate is comparable to the large retrospective series of radial forearm and anterolateral thigh (ALT) free flap reconstruction post-laryngectomy[9,10]. PCF developed in two patients in post-operative setting. Published PCF rates after laryngectomy vary widely. Yu et. al. reported a 8.8% PCF rate for PE defect reconstruction[11]. The majority of patients underwent free tissue reconstruction (92%) with higher rates of fistula in circumferential vs. partial defects (11% vs. 6%). These figures are comparable to our PCF rate of 11.7%.

Few patients had major or minor events during the inpatient hospital stay. One patient developed venous thromboembolism despite prophylaxis, which was treated without complication with therapeutic anticoagulation. Seven patients had minor hospital complications which responded to conventional treatments (table 2). This was comparable to other published results of PE defect reconstruction or SFTT[11,12].

SLP outcomes were followed closely pre- and post-operatively in our cohort of patients. Oral intake was reestablished in 94.1% of patients with five not requiring G-tube for supplementation. Several patients required supplemental nutrition due to multilevel swallowing dysfunction, debilitation due to adjuvant treatment, and cancer recurrence. Six patients were able to undergo TEP placement, and all had excellent voice outcomes as determined by SLP evaluation. The remaining patients are currently using electrolarynx or text/written communication.

Donor site morbidity was limited as all back wounds were closed primarily at the time of flap harvest with drain placement in surgical bed and incisional negative pressure therapy as needed.[13] Two patients developed back hematomas and were treated successfully at the bedside. Two other patients had minor wound dehiscence along the harvest site which healed without need for further intervention. All patients participated in inpatient physical therapy after surgery with no limits on weight bearing or range of motion. Other authors' experiences with SFTT donor site morbidity have also been quite favorable[12,14].

The ALT flap has become gold standard for free tissue transfer for its ability to harvest large fasciocutaneous flaps capable of having multiple skin islands. Also, concurrent harvest of the ALT flap during ablative surgery is more efficient compared to SFTT. On the other hand, SFTT is capable of creating large skin paddles without concern for closing under extreme tension. SFTT also has much more reliable anatomy with vascular pedicle not affected by atherosclerotic changes. The SFTT is a robust flap since blood supply to the skin paddle is not based on perforator dissection. Pedicle length is usually increased in ALT flap, but since the SFTT is versatile in terms of orientation, this advantage is limited in the neck.

Though our outcomes using SFTT are encouraging our study has a small sample size without a control group. Further studies will aim to prospectively compare outcomes between SFTT and other free flaps in PE defect reconstruction.

This study presents SFTT as a viable option for reconstruction of PE defects. It provides adequate soft tissue coverage with a reliable, large caliber vascular pedicle with minimal donor site morbidity. Functional outcomes regarding speech and swallowing with SFTT for post-laryngectomy defects are comparable to

other reconstructive options. Though this flap may not be the first option for reconstruction, it should be a consideration in complicated hypopharyngeal defects.

REFERENCES

1.Dowthwaite SA, Theurer J, Belzile M, et al. Comparison of fibular and scapular osseous free flaps for oromandibular reconstruction: a patient-centered approach to flap selection. JAMA Otolaryngol Head Neck Surg. 2013;139(3):285-92.

2.Valentini V, Gennaro P, Torroni A, et al. Scapula free flap for complex maxillofacial reconstruction. J Craniofac Surg. 2009;20(4):1125-31.

3.Morrissey AT, O'connell DA, Garg S, Seikaly H, Harris JR. Radial forearm versus anterolateral thigh free flaps for laryngopharyngectomy defects: prospective, randomized trial. J Otolaryngol Head Neck Surg. 2010;39(4):448-53.

4.Welkoborsky HJ, Deichmüller C, Bauer L, Hinni ML. Reconstruction of large pharyngeal defects with microvascular free flaps and myocutaneous pedicled flaps. Curr Opin Otolaryngol Head Neck Surg. 2013;21(4):318-27.

5.Hanasono MM, Lin D, Wax MK, Rosenthal EL. Closure of laryngectomy defects in the age of chemoradiation therapy. Head Neck. 2012;34(4):580-8.

6.Dos santos LF. The vascular anatomy and dissection of the free scapular flap. Plast Reconstr Surg. 1984;73(4):599-604.

7.Moukarbel RV, White JB, Fung K, Franklin JH, Yoo JH. The scapular free flap: when versatility is needed in head and neck reconstruction. J Otolaryngol Head Neck Surg. 2010;39(5):572-8.

8.Mitsimponas KT, Iliopoulos C, Stockmann P, et al. The free scapular/parascapular flap as a reliable method of reconstruction in the head and neck region: a retrospective analysis of 130 reconstructions performed over a period of 5 years in a single department. J Craniomaxillofac Surg. 2014;42(5):536-43.

9.Yu P, Hanasono MM, Skoracki RJ, et al. Pharyngoesophageal reconstruction with the anterolateral thigh flap after total laryngopharyngectomy. Cancer. 2010;116(7):1718-24.

10.Scharpf J, Esclamado RM. Reconstruction with radial forearm flaps after ablative surgery for hypopharyngeal cancer. Head Neck. 2003;25(4):261-6.

11.Selber JC, Xue A, Liu J, et al. Pharyngoesophageal reconstruction outcomes following 349 cases. J Reconstr Microsurg. 2014;30(9):641-54.

12.Gibber MJ, Clain JB, Jacobson AS, et al. Subscapular system of flaps: An 8-year experience with 105 patients. Head Neck. 2015;37(8):1200

13.Schmedes GW, Banks CA, Malin BT, Srinivas PB, Skoner JM. Massive flap donor sites and the role of negative pressure wound therapy. Otolaryngol Head Neck Surg. 2012;147(6):1049-53.

14.Ferrari S, Ferri A, Bianchi B, Varazzani A, Perlangeli G, Sesenna E. Donor site morbidity after scapular tip free flaps in head-and-neck reconstruction. Microsurgery. 2015;35(6):447-50

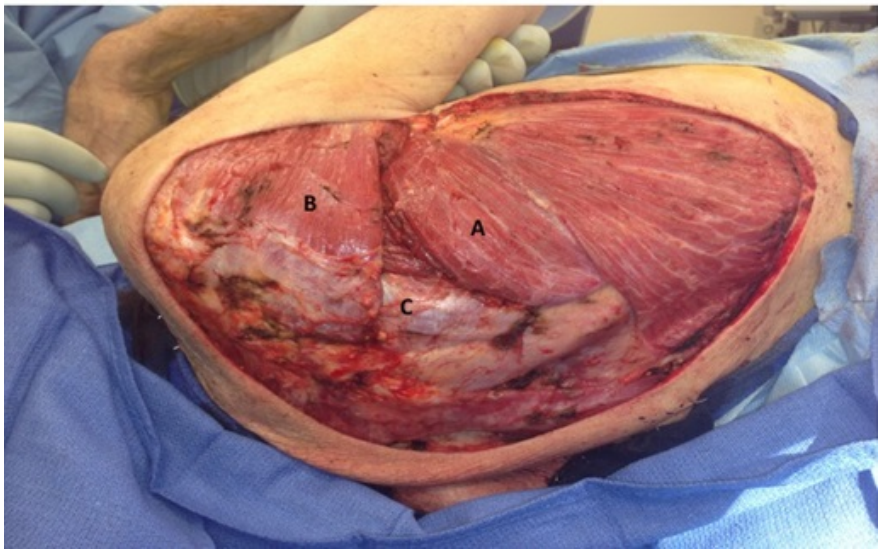
FIGURE LEGENDS

Figure 1: Scapular flap harvest - Positioning and Post-Dissection Anatomy

Teres Major Muscle B. Triceps Muscle C. Teres Minor Muscle

Figure 2: Donor Site Primary Closure

Left: Intra–operative photo Right: First post-operative visit photo



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