



Versatility of Supraclavicular Artery Pedicled Flap in Reconstruction after Laryngectomy

Shaji Thomas, Deepak Janardhan*, Bipin T Varghese, Shirish Patil and Sandeep Suresh

Department of Head and Neck Surgery, Regional Cancer Centre, India

Abstract

Aim: Defects of laryngopharyngeal resections pose challenging situations, when it comes to reconstruction with aesthetic and functional rehabilitation. Though options from local flaps to free flaps exist, even in this era of free tissue transfer; the ideal reconstructive option varies with surgeon's expertise and infrastructure.

Materials and Methods: Patients undergoing laryngectomy in our institution, requiring patch reconstruction of neopharynx, or suture line augmentation or pharyngocutaneous fistula closure were included.

Results: A total of six patients were included, two required patch neopharyngeal reconstruction, three neopharynx suture line augmentation and one Persistent Pharyngocutaneous fistula closure.

Conclusion: Supraclavicular Artery pedicled Flap is a versatile, reliable and revolutionary flap in the armamentarium of head and neck reconstructive surgeon, when meticulously harvested.

Keywords: Supraclavicular flap; Neopharynx closure; Local flap

Introduction

Reconstruction of laryngopharyngeal defects with pedicled flaps especially with Myocutaneous pectoralis major flap remains to be the workhorse in most high volume tertiary centers against free flaps, even in the present era. The advent of Veterans affair trial concluding the organ preservation protocol, the numbers of upfront laryngectomies have reduced over the past decade, and indications for the same have been limited to T4a disease and Post chemoradiation recurrences and residual disease. The incidence of pharyngocutaneous fistulas range from 30% to 80%, and more with salvage scenarios which makes this technique even more important in the present era.

To assess the reliability of Supraclavicular flap in augmentation of neopharyngeal reconstruction or augmentation of suture line or repair of pharyngocutaneous fistulas with SCAF (Supraclavicular Artery Pedicled Flap).

Methods

Patients with primary Hypopharyngeal or laryngeal cancers undergoing total laryngectomy with or without partial pharyngectomy, or those with pharyngocutaneous fistula repair in post laryngectomy, at our institution from June 2017 to June 2019 were included in the study after informed consent. SCAF was harvested from contralateral side as the ipsilateral neck dissection would have hampered the supraclavicular artery. The flap is then transferred to the defect site tunneled under the skin after deepithelializing the portion in transit.

Technique of harvesting

A pedicled cutaneous fascial flap is supplied by the supraclavicular artery which is a branch of the transverse cervical. Less frequently the origin of the supraclavicular artery is the suprascapular artery. The transverse cervical artery is located 4 cm to 5 cm above the sternoclavicular joint, whereas the supraclavicular artery branches at the distance of 6 cm to 8.5 cm from the aforementioned joint. This artery is located in the triangle which is limited inferiorly by the clavicle, medially by the sternocleidomastoid muscle and laterally by the external Jugular vein. The diameter of the supraclavicular artery is 1.1 mm to 1.5 mm. Harvesting of the flap requires marking a cutaneous island located in a space limited by the clavicle anteriorly, the trapezius muscle posteriorly and the deltoid muscle laterally. The maximum size of the flap was 24 cm long and 8 cm wide. The dissection of the flap is carried out subfascially from the distal end towards the neck and the vascular pedicle.

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*Correspondence:

Deepak Janardhan, Department of Head and Neck Surgery, Regional Cancer Centre, Trivandrum, Kerala, India, Tel: +91-9961319859, E-mail: dr.deepakjanardhan@gmail.com

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Figure 1: Planning contralateral flap design after completing laryngectomy with perforator marked in the triangle formed medially by posterior border of sternomastoid muscle, inferiorly by the clavicle and laterally by the external jugular vein.



Figure 4: Intraoperative placing of SCAF for Neopharyngeal Augmentation of suture closure line after tunneling it underneath the remnant flap.



Figure 2: Flexible Esophagoscopy view of SCAF used as neopharyngeal reconstruction, 4 months after completion of treatment.



Figure 5: Hinge technique and neopharynx augmentation in persistent Pharyngocutaneous fistula Post Salvage laryngectomy.



Figure 3: SCAF harvested from contralateral side after laryngectomy and de epithelialized for augmenting suture line.

The cutaneous island along with the pedicle can be transferred underneath the skin of the neck (tunnel), thus avoiding additional incisions in the neck. The deficit is closed primarily by undermining and mobilizing the surrounding skin (Figure 1).

Results

A total of 6 cases were enrolled in the study of which two were salvage cases. Two were malignancies of the pyriform fossa (T4a). Following laryngectomy with partial pharyngectomy, the pharyngeal defect was reconstructed with patch SCAF which means that the SCAF was used to form a part of the circumference of the neopharynx (Figure 2).

Of the three patients with transglottic (T4a) cancers, two patients underwent stapler (TA-60) closure of neopharynx and one had hand sewn closure with 3-0 Vicryl. They had further augmentation done with SCAF from contralateral side (Figure 3,4). So this flap will be placed in between the mucosal closure and the skin flap so as to form a 4 layered closure of the post laryngectomy defect. First layer being mucosa, second layer of remnant straps, third layer is SCAF and fourth layer is platysma flap along with skin.

One patient who had undergone salvage laryngectomy had repair of persistent pharyngocutaneous fistula after performing a hinge flap technique of mucosal closure and SCAF was used for skin defect closure (Figure 5).

The average dimension of the flap used 16.7 cm x 6.15 cm, that was harvested in mean duration of 24.5 min. The average length of hospital stay was 4 days. Prophylactic neck strapping with crepe bandage was initiated on POD-4 and continued for 1 week. Oral soft diet was commenced only after checking for salivary leak by inspection, usually after 2 to 3 weeks. Adjuvant Radiation was initiated around 4 to 5 weeks after surgery for the patients who had undergone upfront surgery. Two patients had post op medical complications of Paroxysmal Supraventricular Tachycardia (PSVT) in one patient and Chronic Obstructive Pulmonary Disease (COPD) exacerbation with hypoproteinemia, pleural effusion in the other which required ventilator support of 9 days each. No Pharyngocutaneous leaks, stomal stenosis, shoulder dysfunction or flap failure were noted in

any of them during a mean follow up period of 20 months.

Discussion

Pharyngeal defects post total laryngectomy with or without partial pharyngectomy are challenging for reconstruction especially in this era of organ preservation where numbers have dwindled to lower side and majority being salvage scenarios. Statistics reveal that around 30% of chemoradiation organ preserved larynges require salvage and of the salvages 30% to 80% develops varying degrees of pharyngocutaneous fistulas [1-5]. Primary neopharyngeal closure has the possibility of stricture formation over the years. Hence, the role for a vascular tissue transfer in the form of either a free flap or pedicled local flap is the technique being practiced worldwide.

Pectoralis Major Myocutaneous (PMMC) flap being the workhorse in major centers with high case load due to its robust character; however the disadvantage is the bulk, donor site morbidity, hair growth and end tracheostomal narrowing. This led to the utilization of RFFF (Radial forearm free flap) as an alternative, for defect reconstruction. But, this is not feasible often, especially in high input centers with low resources, due to lack of availability of expertise and time concerns [7].

SCAF, though described by Toldt initially in 1903, [8] its clinical utility was reported by Mathes and Vasconez [9]. But with usage of PMMC flap, SCAF lost its fame until 1990s when Pallua et al. [6], study and refinement led to its resurgence with more reliability [10].

Of the local flaps, Supraclavicular flap is the best option due to its versatility, texture, pliability and minimal donor site morbidity [6]. More ever, small learning curve and need for quick reconstruction in debilitated and malnourished, as most of the hypopharyngeal carcinoma patients are, makes it an ideal flap for augmentation or tension free reconstruction of neopharynx [7,11].

SCAF is a fasciocutaneous flap, based on the perforator from the transverse cervical artery. Its origin is at the midpoint of the triangle formed by posterior border of SCM anteriorly, External jugular vein posteriorly and clavicle inferiorly. From this point it traverses across the mid third portion of clavicle and towards the shoulder joint. This can be mapped with a Hand held Doppler intraoperatively or prior and flap can be marked centering the same. Once the paddle is marked, the flap is elevated from distal to proximal in a subfascial plane over the deltoid up to the clavicle where the incision is deepened and flap is lifted off the clavicle in a subperiosteal plane. Back cuts are not needed in neopharyngeal reconstruction or augmentation, as reach is never an issue. Donor site is closed primarily as long as the width of the flap is less than or equal to 5 cm to 6 cm, as in all our cases.

Vascular anomalies, previous interventions like vascular access procedures or trauma at level 4 etc., limits utility of this flap [3,5]. However neck dissection warranting level 4 clearances especially in laryngohypopharyngeal cancers, still can consider utilizing this flap from contralateral side without affecting oncological safety as done in four of our cases.

The drawback of the SCAF from the author's point of view is that a major portion of flap needs de-epithelialization which is time consuming and a portion is lost during transit (Figure 2). Otherwise, the texture, pliability and reliability of SCAF are worth highlighting, so as to be considered equivalent to free flap. Moreover, with Doppler usage, the flap can also be islanded.

Conclusion

SCAF is a simplified alternative for reconstruction of laryngopharyngectomy defects, augmenting neopharyngeal closures and tackling pharyngocutaneous fistulas without significant donor site functional morbidity, especially in a high volume centre where the operative time is limited, also in centre where resources for a free flap are limited. In view of its shorter learning curve and ease to harvest without affecting the oncological safety, SCAF tends to be an ideal option in laryngectomy defect reconstruction or neopharynx augmentation.

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