

Supraclavicular Artery Island Flap in Head and Neck Reconstruction.

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April 05, 2024

Abstract

Objective: Share our practices for the use of the supraclavicular artery island flap (SCAIF) in head and neck reconstruction. **Methods:** A retrospective review was conducted from October 2017 to June 2020 on patients who had undergone SCAIF reconstructions of head and neck defects in our hospital. The following data were collected: Age, gender, primary disease, type of surgical defect, flap harvest time, flap dimensions, length of hospital stay, complications and clinical outcomes. **Results:** Nine patients had undergone SCAIF reconstruction and three of them also had undergone pectoralis major myocutaneous flap reconstruction simultaneously. All patients were male with the average age of 60.56 ± 11.27 years. Four reconstructions were performed to repair anterior neck skin defects or fistulae related to previous treatment. The SCAIF was used in three patients to repair defects following hypopharyngeal resection or total laryngectomy. Two reconstructions were performed to repair defects following salvage surgery of recurrent head and neck tumor. The average flap harvest time was 31.78 ± 4.55 mins. The average flap size of was $15.22 \pm 0.63 \times 5.89 \pm 0.74$ cm. The average length of hospital stay was 37.67 ± 18.48 days. No complete flap loss or major complications occurred during their stays in hospital. Two patients had partial necrosis of the distal portion of the flap. One patient developed fistula. No donor site complications and compromised shoulder function were observed. **Conclusions:** The SCAIF can be successfully used for reconstruction of head and neck defects with good cosmetic outcomes and limited morbidity.

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Five succinct key points

1. We successfully performed 9 SCAIF reconstructions for head and neck defects in our hospital.
2. No complete flap loss or major complications occurred.
3. Three patients also had undergone pectoralis major myocutaneous flap reconstruction at the same time.
4. There were no in-hospital deaths, and all patients were discharged home with good outcomes.
5. A typical case was provided with detailed figures.

Key Words : Supraclavicular artery island flap, head and neck cancer, reconstruction surgery

The head and neck have complex anatomical structures, which play important roles in function and appearance. Thus, making reconstruction of head and neck defect become a huge challenge for surgeon. Free tissue transfer (FTT) continues to be the primary method for reconstruction for head and neck defects. However, FTT requires proficiency in microvascular anastomosis. It also takes more time and more cost. So, it remains necessary to inquire on methods which is safer and more cost-effective. In recent years, the supraclavicular artery island flap (SCAIF) has emerged as a dependable source of reconstruction, which has better skin color match and has many advantages in reliability and versatility. We introduced the SCAIF flap into our department in 2017 and have successfully performed 9 SCAIF reconstructions for head and neck defects. Here, we want to share our experience and discuss the key technical aspects, hoping to improve the efficiency of reconstruction.

Materials and Methods We retrospectively evaluated a total of 9 patients who had undergone SCAIF reconstruction for head and neck defects in our hospital between October 2017 and June 2020. Once identified, the following data were collected: Age, gender, primary disease, type of surgical defect, flap harvest time, flap dimensions, length of hospital stay, complications of both reconstruction site and donor site, and clinical outcomes. The total follow-up duration was at least 3 months.

The reporting methods we used is retrospective medical chart review.

Data Analysis Statistical analysis was performed using SPSS 19.0. Data were expressed as the mean \pm standard deviation.

All the work didn't involve the use of animal or human subjects. This was a retrospective medical chart review and there is no identification of patients.

Results

All patients were male with the average age of 60.56 ± 11.27 years (range: 40-78 years). A total of nine patients had undergone supraclavicular artery island flaps reconstruction for head and neck defects and three of them also had pectoralis major myocutaneous flap reconstruction at the same time. Four reconstructions were performed to repair anterior neck skin defects or pharyngo-cutaneous fistulae related to primary surgery or radiation. The SCAIF was used in three patients to repair defects following hypopharyngeal resection or total laryngectomy. Two reconstructions were performed to repair defects following salvage surgery of recurrent head and neck tumor. The average flap harvest time was 31.78 ± 4.55 mins (range: 25-40 minutes). The flap size ranged from 15-16 cm \times 5-7 cm, with an average size of cm $15.22 \pm 0.63 \times 5.89 \pm 0.74$ cm. There was no complete flap loss during their stays in hospital. Two patients had partial necrosis of the distal portion of the flap. One patient developed pharyngo-cutaneous fistula one and a half months after surgery. Both complications were resolved with anti-infection and local wound care. The donor sites were primary closed with adjacent tissue advancement, and no skin grafting was used. Only one patient developed neck tightness sensation after surgery, which was resolved by physical rehabilitation. A widened scar was noted, but no significant donor site complications and compromised shoulder function were observed. The average length of hospital stay was 37.67 ± 18.48 days (range: 17-78 days). Two patients previously received radiation or chemoradiation for treatment of their disease. There were no in-hospital deaths, and all patients were

discharged home with good outcomes. Patient demographics are summarized in Table 1. A typical case is shown in Figure 1.

Discussion

The SCAIF has good color and texture match to the skin of the neck. With its proximity, thin skin paddle and arc of rotation, it has become a reliable and versatile source in complex head and neck reconstruction. The SCAIF was first described by Lamberty^[1] in 1979, but it got many criticisms because of its high incidence of distal flap necrosis. In 1997, Pallua^[2] performed detailed anatomical studies examining the vascularity of the SCAIF, which popularized its use for reconstruction. DiBenedetto further demonstrated its utility in reconstructing a variety of chest and facial defects^[3, 4]. In 2009, Chiu were the first to describe the use of the SCAIF in head and neck oncologic reconstruction^[5]. Subsequently, multiple studies highlighted the use of the flap for a variety of head and neck oncologic ablative defects, including partial and total pharyngectomy defects, posterolateral skull base defects, oropharyngeal defects, defects in mandible or parotid gland, neck skin defects or fistula after radiation, tracheal-stomal junction, and the establishment of digestive tract continuity, and so on^[6-9].

The SCAIF is based on the suprascapular artery, a branch of the transverse cervical artery in 93% of patients and the suprascapular artery in the remaining cases^[1]. The venous drainage is usually via the accompanying transverse cervical vein or subclavian vein. It is demonstrated that the vascular territory of the SCAIF ranges from 10 to 18 cm in width by 20 to 30 cm in length^[10, 11], which extends from the supraclavicular region to the shoulder cap. In our study all flaps were designed within the dimensions of the angiosome and showed excellent viability. Computed tomography angiography or vascular ultrasound was routinely performed preoperatively in our cases, so that we can determine whether the suprascapular artery is present or has been injured previously.

The most common complications of SCAIF were partial flap necrosis, donor site dehiscence, recipient site dehiscence, fistula, infection, and esophageal stenosis, etc^[12]. Minor complications occurred in two cases and were resolved with local wound care. No further surgical intervention was needed. The results were very acceptable for us. According to our review, the author thought that the necrosis of distal part of the flap and the development of fistula were possibly related to previous radical radiotherapy^[13], transverse cervical vessels injury and design of the skin paddle beyond the inferior aspect of the angiosome. Kokot^[14, 15] demonstrated that a flap length greater than 22-24 cm was significantly associated with flap necrosis. But other studies have demonstrated survival in flap lengths up to 41 cm^[16]. Therefore, for patients who had received radical radiotherapy or functional neck dissection (level IV or V lymph node) should be carefully evaluated preoperatively. During flap harvest, the vascular pedicle should be carefully protected. The creation of a soft tissue pedicle around the vascular pedicle may be extremely useful. Which can protect the flap vasculature by preventing kinking, partial compression, and undue tension^[3].

Unfavorable complications were not observed in our study. In this small series, only one patient developed neck tightness sensation after surgery, which was resolved by physical rehabilitation. All other patients were satisfied with their functional and aesthetic outcomes.

In our series, all the donor sites were primary closed with adjacent tissue advancement. But it is suggested that skin grafting should be performed when the defect is wider than 8 cm^[5]. A shoulder drain may be not necessary because the dead space is closed thoroughly. No compromised shoulder function was observed in our study. Some investigators also use the Penn Shoulder Score and Constant Shoulder Scale to measure the postoperative shoulder strength and flexibility^[17].

Due to the elimination of microvascular anastomosis, the majority flap harvest time was usually less than 1 hour. This may extremely decrease perioperative morbidity and reduce overall cost of care.

Conclusion

Our experience shows that the SCAIF is a thin, pliable, and versatile flap, which is quickly harvested, and has good color match for head and neck oncologic defects. This flap should be viewed as an important option

of the head and neck reconstruction.

Conflict of Interest

No conflict of interest exists in this manuscript.

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Table 1 Summary of Demographics, Flap Utilization, Size, and Complications.

Patients	Age	Defect	Flap	Flap Size (cm x cm)	Harvest time (min)	Complication and Outcome	Previous Radiation	Hospital Stay (days)	
1	62	Anterior neck skin defect related to pri- mary surgery or radiation.	SCAIF and PMMF	15.5 x 6.5	25	No Complication	Yes	25	25
2	61	Anterior neck skin defect related to pri- mary surgery or radiation.	SCAIF and PMMF	15 x 6	40	No Complication	No	78	78
3	72	Anterior neck skin defect related to pri- mary surgery or radiation.	SCAIF	15 x 5	35	No Complication	No	42	42

Patients	Age	Defect	Flap	Flap Size (cm x cm)	Harvest time (min)	Complication and Outcome	Previous Radiation	Hospital Stay (days)	
4	78	Pharyngo-cutaneous fistulae following previous surgery	SCAIF and PMMF	16 x 7	36	Partial necrosis of the distal portion of the flap, resolved with anti-infection and local wound care	No	53	53
5	40	Defect following hypopharyngeal resection	SCAIF	15.5 x 5	30	Neck tightness sensation, resolved by physical rehabilitation. Partial necrosis of the distal portion of the flap, resolved with anti-infection and local wound care	No	25	25
6	62	Defect following hy-popharyngeal resection	SCAIF	15 x 6.5	32	No Complication	No	31	31
7	51	Defect following total laryngectomy	SCAIF	15 x 6	28	No Complication	No	38	38

Patients	Age	Defect	Flap	Flap Size (cm x cm)	Harvest time (min)	Complication and Outcome	Previous Radiation	Hospital Stay (days)	
8	65	Defect following salvage surgery of recurrent head and neck tumor	SCAIF	15 x 5	30	No Complication	Yes	17	17
9	54	Defect following salvage surgery of recurrent head and neck tumor	SCAIF	15 x 6	30	No Complication	No	30	30

SCAIF (Supraclavicular Artery Island Flap), PMMF (Pectoralis major muscle flap)

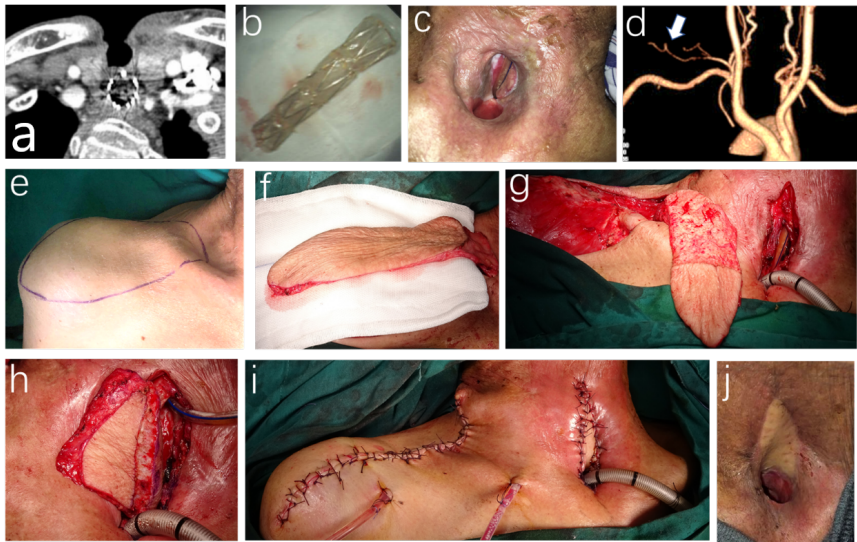


Figure 1. a, b, c. Neck skin defect and fistula occurred in the patient, who underwent esophageal stent implantation for esophageal stricture following total laryngectomy. d. The transverse cervical artery was shown by CT angiography (the white arrow). e. Design of the supraclavicular island flap. f. The flap was raised in

a subfascial plane. g. The proximal skin of the flap was removed. h, i. The proximal part of flap was used for repair pharyngocutaneous fistula and the distal part of flap was used for anterior skin reconstruction. The donor site incisions were closed primarily without the need for skin grafting. j. Five months after reconstruction, the skin defect healed well and the patient can resume oral intake.

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