

Supraclavicular Flap as an Alternative for Reconstruction in Head and Neck Defects: Trips and Tricks on Technique

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Abstract

Reconstruction after oncological surgery in the head and neck area is challenging because both aesthetic and functional results are needed. Local flaps have been used along time to cover defects with acceptable results, but microvascular surgery development changed this paradigm. However, not all patients are suitable for this complex procedures; hence, local reconstruction is still an important tool in selected patients. For these reasons, we have changed our reconstructive algorithm during the past decade; whereas we used microsurgical free flaps for defects located in the head and neck anatomy in previous years, we now prefer local flaps when possible. Therefore, we present the case of a young patient with a highly recurrent basal skin tumor whose defect located in the parotid region and lateral skull base who was reconstructed with a supraclavicular artery island flap (SAIF). The aim of this paper is to highlight the technique, introduce some tips and tricks and summarize the benefits of this versatile flap.

Keywords: Supraclavicular Flap; Rotational Flaps; Head and Neck Surgery; Head and Neck Reconstruction

Introduction

Reconstruction after oncological surgery in the head and neck area is still considered to be a challenge for many surgeons, as good aesthetic and functional results are needed. For many years, local rotational flaps were used to cover defects with acceptable results, but with the development and evolution of free tissue transfer techniques, an important shift in the paradigm of reconstruction has occurred. However, rotational flaps remain a workhorse for many surgeons when patients are not suitable for microsurgical procedures or when local flaps fit the defects better. First described by Mütter [1] in 1842 and later by Pallua, *et al.* [2] in 1997, the regional flap is known for its reliability, the fact that it is easy to harvest and its low morbidity, and it is perfect for reconstructing the cervicofacial, skull base and pharyngolaryngeal regions [3,4]. For these reasons, we have changed our reconstructive algorithm during the past decade; whereas we used microsurgical free flaps for defects located in these areas in previous years, nowadays, we prioritize local flaps when possible. Therefore, we present the case

of a young man with a recurrent skin tumor whose defect located in the parotid and lateral skull base was reconstructed with a supraclavicular artery island flap (SAIF). The aim of this paper is to highlight the technique for fitting a flap properly on a defect.

Case Presentation

To demonstrate our surgical technique, we present the case of a 43-year-old man with a history of multiple operations due to a recurrent basal cell carcinoma located in the preauricular region. Magnetic resonance imaging revealed an infiltrating tumor of 2.0 cm x 3.8 cm x 1.2 cm compromising the inferior helical rim, the ear lobe, the deep parotid lobe and the cartilaginous anterior wall of the ear canal. The lesion was also in contact with the masseter muscle. A radical resection was performed, leaving a large defect of around 7 cm (Figure 1). First, the supraclavicular artery was identified with a handheld Doppler; an anatomic landmark for the location is a triangle formed inferiorly by the clavicle, medially by the external jugular vein and laterally by the posterior border of the

sternocleidomastoid muscle. This is a step that cannot be avoided, as this point is used as a pivot for rotating the flap into the defect (Figure 2). Following the total resection of the tumor (Figure 3), the skin paddle was designed using a sterile paper template, and it went no further than the deltoid tuberosity of the humerus. The flap was raised from the distal to the proximal direction in a sub-fascial plane, ligating the perforator vessels. After the anterior edge of the flap was harvested, the pedicle was individualized. Even though the dissection of the artery is not always necessary and may be dangerous, it was performed in this case to gain pedicle length. Note that neither the brachial plexus nor the spinal nerve is dissected. The nerve is simply identified by using neurostimulation. After these steps, the flap was hinged 180° without tension; before it was sutured to the skin defect, the vascularity of the tip and distal surface was assessed (Figure 4). The donor site defect was closed primarily, and a drain was left in the surgical lodge. The patient received radiotherapy after surgery due to the aggressive biology of the carcinoma. After a two-year follow-up, no recurrence has been described, and the aesthetic results are satisfactory to the patient (Figure 5).

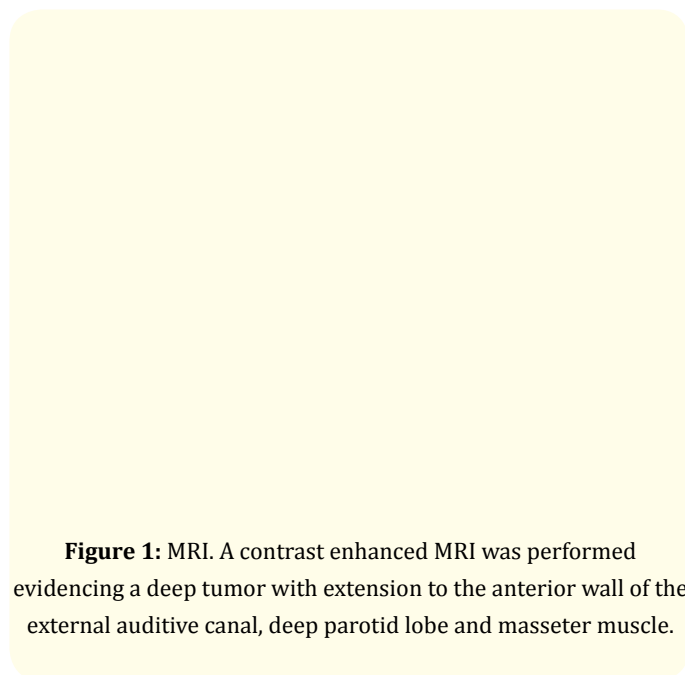


Figure 1: MRI. A contrast enhanced MRI was performed evidencing a deep tumor with extension to the anterior wall of the external auditory canal, deep parotid lobe and masseter muscle.

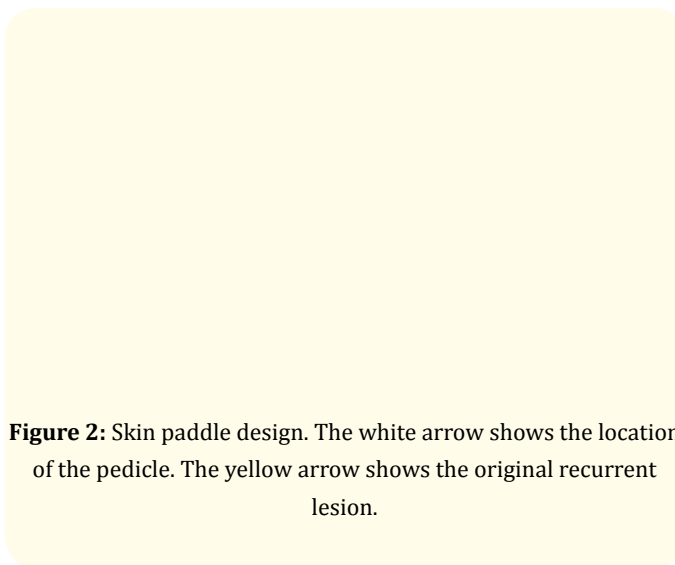


Figure 2: Skin paddle design. The white arrow shows the location of the pedicle. The yellow arrow shows the original recurrent lesion.

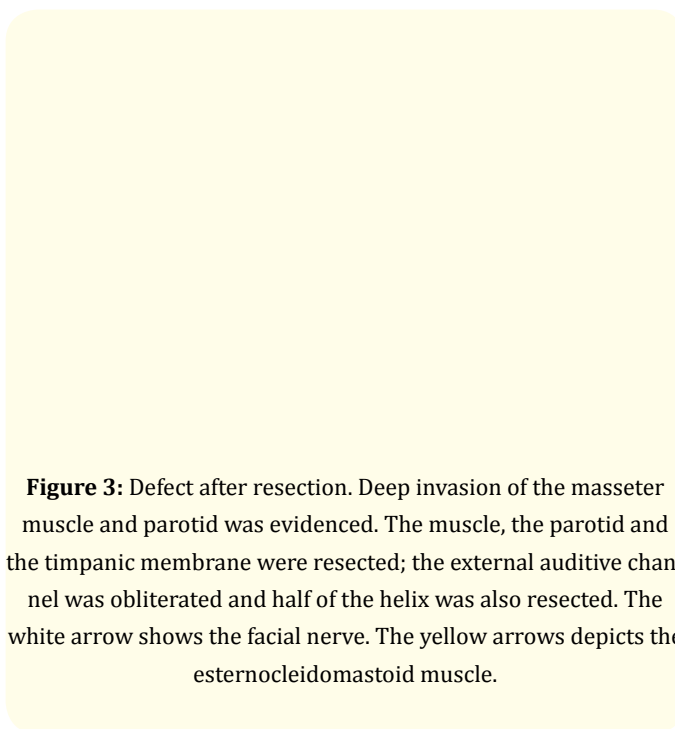


Figure 3: Defect after resection. Deep invasion of the masseter muscle and parotid was evidenced. The muscle, the parotid and the tympanic membrane were resected; the external auditory channel was obliterated and half of the helix was also resected. The white arrow shows the facial nerve. The yellow arrows depict the sternocleidomastoid muscle.

Figure 5: Long-term results after 2-year follow up after local adjuvant radiation therapy.

Discussion

The supraclavicular artery island rotational flap is a well-described pediculated fasciocutaneous flap. In 2000, Pallua, *et al.* [2] made substantial advances in the technique thanks to the development of a better understanding of the vascular anatomy. The supraclavicular artery originates from the transverse cervical artery, 3 - 4 cm from the origin at the thyrocervical trunk, and also less commonly from the subclavian artery [3,5,6]. Two veins compose the venous drainage system: the transverse cervical and the external jugular veins. The takeoff of the supraclavicular artery is used to measure the length of the skin paddle. For the purpose of avoiding necrosis and achieving primary skin closure, its length should not be more than 22 cm and should be wider than 8 cm [3,6,7].

This type of flap has multiple advantages due to its versatility, reliability and easy harvesting technique [3,4,7]. The skin in this area is ideal for reconstructing the cervicofacial and lateral skull base regions due to its color match and texture. The skin paddle is thin and easy to manipulate. It can completely restore the facial and cervical contour, and the skin color is very similar. Interestingly, Emerick, *et al.* [4] described some technique modifications for gaining thickness during the harvesting of the flap, as adequate thickness is necessary for filling lateral face and neck defects; the main modification was gaining thickness by folding the distal tip of the flap. Another advantage of this type of flap is the low rate

of postoperative complications associated with it; in terms of donor-site complications, hematoma and wound dehiscence are the most commonly described. Infection is less frequent and is usually related to mucosal reconstruction [3,6,8,9]. Furthermore, some authors have reported complaints about tightness in the shoulder area but without functional limitations [7,10]. Herr, *et al.* [10] in his study assessed prospectively shoulder function following the harvesting of the flap, concluding that the impact on shoulder function and quality of life is limited. Even though the number of patients is a limitation of this study, it was the first study to evaluate this issue. Other complications described are partial or total skin paddle necrosis; total loss is extremely uncommon (0 - 5.6%), and it is generally related to aggressiveness towards the pedicle rather than to distal vascular insufficiency [6]. The rate of salivary fistula is about 6 - 16% [7]. Chiu, *et al.* [9] described major complications in pharyngeal reconstruction. They concluded these complications were mainly related to the poor health status of the patient, comorbidities, radiation and smoking history. All of them were treated conservatively.

The advantages described above make this type of flap suitable for reconstructing different types of cutaneous and mucosal defects. Kokot, *et al.* [7] described the use of this flap for the cervicofacial region, skull base, oral cavity and pharyngolaryngeal region. However, they found some limitations in its use for complex three-dimensional defects, mainly at the base of the tongue and on the palate [7]. Emerick, *et al.* [4] also described multiple uses with low morbidity rates, and some technical considerations were addressed in terms of improving the length, thickness and appearance of the pedicle. The subperiosteal dissection of the half and medial third of the clavicle, as well as the blunt dissection of the pedicle's surrounding fat tissue could be useful for gaining a rotation arc. However many authors have suggested that the skeletonization of the pedicle is not strictly necessary. In our patient, this blunt dissection was performed with extreme caution to gain an arc of rotation. When a neck dissection of levels IV or V is needed, it is important to respect the cervical transverse vessels [5-7]. Likewise, the surgeon should be aware that both the mandible and the sternocleidomastoid muscle could act as potential vascular compressors, so passing the flap over them is recommended to avoid compressing the pedicle [7]. In our experience, we recommend passing the flap over the acromioclavicular joint, and if the flap is used for covering a skin defect, a skin bridge could be left to avoid compression. In these cases, a second surgery might be needed to

improve the cosmetic results. Another technical tip described for gaining length (3-4 cm) is the expansion of the flap with silicone sheeting at least 10 days prior to surgery [6]. Some authors have suggested that this flap is better suited for reconstructing cutaneous defects rather than mucosal ones, as infection and fistulas are more frequently described [8]. Our experience with pharyngeal reconstruction is good, with a low morbidity rate, but we recommend using this flap mainly for partial defects. However, in cases where the defect belongs to the pharyngolaryngeal space or to the floor of the mouth, the de-epithelialization of the proximal part of the flap should be done, as tunnelization below the platysmal flap is required. The most important aspect of this step is to achieve a tension-free pedicle [8].

The drawbacks of this type of flap are that it should be no longer than 22 cm, as it might suffer from distal flap necrosis. This makes this flap unsuitable for covering very complex defects in the oral cavity and pharynx. We recommend not extending the design of the skin paddle beyond the deltoid insertion to avoid this complication. Another characteristic of this flap is that it has a limited angle of rotation even when adequate mobilization is attained. The necrosis of the skin paddle is rare, and the rate of complications is similar to those of other rotational flaps [6,7,9].

Conclusion

This flap continues to be an excellent option when a local flap fits the defect better or when patients are not suitable for free tissue transplants. Most authors advocate its use for almost all defects in the cervical and skull base area considering that it is well vascularized, pliable and thin; it has a low rate of complications; less intraoperative time is required; donor-site morbidity is low; and the functional and aesthetic results are relatively good. We consider this type of flap to be suitable mainly for reconstructing lateral and retroauricular defects as shown in this case. However, we discourage its use in the oral cavity due to its rigidity; we prefer free flaps in this area instead.

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