

CLINICAL TECHNIQUES AND TECHNOLOGIES

Superior temporo-auricular perforator flap for reconstruction of extensive conchal defects

Il lembo perforante temporo-auricolare superiore per la ricostruzione dei difetti estesi della conca

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SUMMARY

Anterior auricular concha reconstruction has always been a challenge for the plastic surgeon. The goal of optimal reconstruction is to achieve a natural aesthetic outcome taking care to avoid meatal stenosis and distortion. We present a new technique for reconstruction of large anterior conchal defects with meatal involvement using a perforator flap harvested from the superior auricular region. All patients undergoing post-oncological reconstruction with superior temporo-auricular perforator flap were retrospectively analysed. A handheld Doppler evaluation was performed prior to surgery. Follow-up at 1, 3, 6 and 12 months was carried out. Nine patients were evaluated. No partial or total vascular complications were observed. No relapse of the tumour and meatal stenosis developed. Eight patients were very satisfied with the aesthetic outcome. Only one patient was not completely satisfied due to the presence of hair at the level of reconstructed site.

The superior temporo-auricular flap is a good alternative to flaps harvested from the retroauricular region and should be considered as a primary choice for reconstruction of extensive defects of the conchal and external meatus area.

KEY WORDS: concha reconstruction, perforator flap, temporal superficial artery, propeller flap

RIASSUNTO

La ricostruzione dei difetti della conca è da sempre stata una sfida per il chirurgo plastico. L'obiettivo di una ricostruzione ottimale è di ottenere un risultato estetico naturale senza creare distorsioni o stenosi del meato esterno.

I pazienti sottoposti a ricostruzione con il lembo perforante temporo-auricolare superiore sono stati analizzati retrospettivamente. Tutti i pazienti hanno eseguito un esame doppler preoperatorivamente. I pazienti hanno seguito un follow-up a 1-3-6 e 12 mesi.

In totale nove pazienti sono stati valutati. Non è stata evidenziata nessuna complicanza vascolare parziale o totale del lembo. Otto pazienti sono risultati molto soddisfatti del risultato estetico. Solo un paziente non è risultato completamente soddisfatto a causa della presenza di capelli a livello del lembo.

Il lembo perforante sopra-auricolare è una buona alternativa ai lembi allestiti dalla regione retroauricolare e dovrebbe essere considerato come prima opzione chirurgica nella ricostruzione dei grandi difetti della conca.

PAROLE CHIAVE: ricostruzione della conca, lembo perforante, arteria temporale superficiale, lembo propeller

Introduction

The auricular conchal cavity is the shallow central structure of the external ear. This anatomical region is extremely important in maintaining the anatomical structure of the external ear and to conduct sound waves to the external auditory canal. Skin cancer localisation at the level of the concha is not uncommon

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and advanced parotid cancer can also affect this region. Surgical access to the anterior auricular concha is quite difficult due to its concavity and partially hidden location. Due to this peculiar anatomical conformation, diagnosis of concha skin tumour is difficult and often delayed. Local topography of the auricular area, with its irregular contours, complicates exploration and treatment. For these reasons, the concha is a high risk area, and follow-up may be more difficult than in other anatomical locations. Complete tumour excision at the first intervention is warranted.

Many reconstructive methods for anterior conchal defects following tumour excision have been described depending on the size and depth of the excision¹. Small defects with intact perichondral layer can heal by secondary intention or reconstructed with split or full-thickness skin grafts (FTSGs). In cases of perichondral layer involvement and for larger defects, it is necessary to use a local flap usually harvested from the post-auricular region. FTFGs can be used only after completely removing the cartilaginous layer weakening the structural firmness of the ear. The revolving-door (RD) flap, described by Masson², is a post-auricular island pedicle type that provides skin from the ipsilateral post-auricular mastoid region and it is one of the most widely used flaps.

For larger defects extending to the external meatus, it is necessary to use the post-auricular flap. Neither the RD nor the post-auricular flap can be used for very large defect that completely involves the concha area and meatus, especially if this is involved circumferentially at 360°.

The aim of this article is to present a novel technique for reconstruction of auricular conchal and meatus defects using a local perforator flap from the superior auricular region.

Description of surgical technique and medical management

A retrospective study analysing all patients undergoing conchal immediate or delayed reconstruction after tumour resection with superior temporo-auricularis perforator (STAP) flap from January 2017 to June 2021 at the European Institute of Oncology (IEO), Milan, Italy was performed.

All patients undergoing this type of reconstruction were preoperatively analysed by a handheld Doppler to mark the superior perforator of the superficial temporal artery, which is the principal pedicle of the temporo-auricular flap.

First, the tumour was excised with removal of the affected conchal cartilage. Definitive histological examination was always performed. Intraoperative examination of the skin limits was always done.

After removal of the tumour, the perforator of the superior

temporo-auricular perforator (STAP) flap was intraoperatively checked again with a handheld doppler. A flap was designed around an eccentric perforator as in propeller flaps in the superior and retro-auricular area. Surgery was performed under magnification with 3.5X surgical loops. Perforator vessels were examined through an exploratory incision made along the margin of the flap outline. A skin island was incised and dissection performed in a subfascial plane. Care was taken to preserve the fat tissue surrounding the perforator to the temporalis vessels. Dissection was performed until the superficial temporalis artery was reached; when a longer pedicle was needed, the terminal branches of temporalis vessels were closed and the dissection performed further along temporalis vessels to gain movement and reduce the risk of kinking. To decide the 180° rotation direction of the flap, a gentle rotation of the flap was performed counter-clockwise and clockwise to evaluate flap perfusion before the definitive in-setting. Next, the flap was passed through a subcutaneous tunnel under preauricular skin.

All patients with meatus demolition superior to 180° maintained a removable stent for one month.

Follow-up was carried out at 1, 3, 6 and 12 months. A Visual Analogue Scale from 0 (worst result) and 10 (better result) to evaluate cosmetic outcomes was administered to patients at 12 months.

A total of 9 conchal reconstructions with temporo-auricular flap were performed; 8 patients had immediate reconstruction (Tab. I). One patient received reconstruction one year after tumour excision due to a complete meatal stenosis and ear acquired deformation (Fig. 1).

There was 1 woman and 8 men. Mean age was 62 years (range from 58 to 70). All patients required reconstruction after tumour removal for oncological purposes. The mean dimension of the excision was 1.8 cm x 2 cm (range 1.5 x 2 to 2 x 2 cm).

The diagnoses were: one case of adenoidocystic cancer (ACC) of the parotid gland affecting concha and external meatus; four cases of squamocellular carcinoma (SSC) of the concha involving cartilage and partially the external meatus; three cases of invasive basocellular carcinoma (BCC) of the skin and cartilage. The patient who underwent delayed post-oncological reconstruction was negative for a neoplastic lesion and histopathologic exam of the scar revealed a chronic inflammatory lesion.

In all cases the affected conchal cartilage was removed.

In the cases of ACC of the parotid gland, ear demolition was conducted together with nerve sparing total parotidectomy and a 360° meatal reconstruction was performed using the superior temporo-auricular perforator flap (Fig. 2). In 3 cases (2 SCC and 1 BCC), a 200° meatal reconstruc-

Table I. Characteristic of the case series.

Patient	Gender	Age	Lesion diameter (cm)	Histological type	Meatal involvement (grade)
1	M	58	1.5 X 1.8	BCC	no
2	M	59	1.8 X 2	Scar	180°
3	M	61	1.8 X 2	SCC	200°
4	M	64	1.6 X 1.8	SCC	no
5	F	62	1.8 X 2	BCC	no
6	M	59	1.7 X 2	SCC	no
7	M	70	2 X 2	BCC	200°
8	M	63	2 X 2	ACC parotid	360°
9	M	62	2 X 2	SCC	200°

Note: M: male; F: female; BCC: basocellular carcinoma; SCC: squamocellular carcinoma; ACC: adenoidocystic carcinoma.

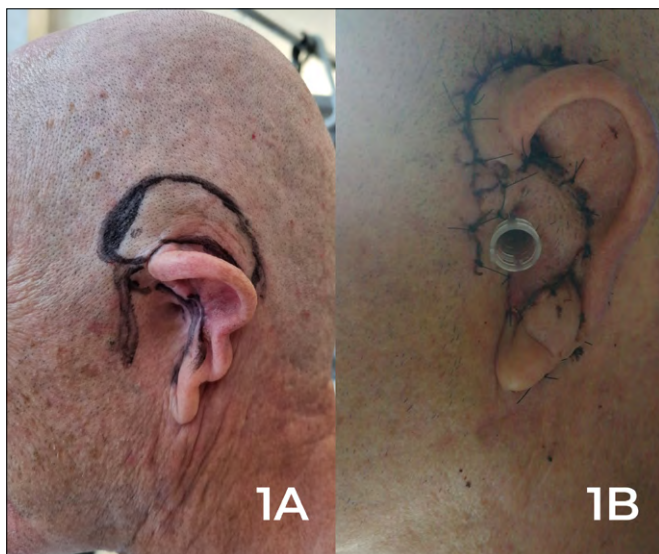


Figure 1. Delayed reconstruction in a patient with acquired ear deformity and meatal stenosis. (A) preoperative appearance and flap marking; (B) reconstruction with STAP flap with a 180° meatal reconstruction.

tion was performed (Fig. 3). Two patients with SCC and two with BCC did not require meatal reconstruction. The patient who performed delayed reconstruction required a 180° meatal reconstruction (Fig. 1). Eight patients were discharged from hospital the day after intervention; the patient who required parotidectomy was discharged after 72 hours. All patients were administered antibiotics for 6 days post-operatively. No complication such as venous congestion, partial/total ischaemic bleeding, haematoma, or infection were observed.

A total of 4 patients maintained a removable stent for one month.

Two patients received radiotherapy after surgery. Due to the thickness of the flap, cartilage reconstruction was not needed in any case. No patient had meatus stenosis at 12 months. No local cancer recurrence was detected during follow-up.

Cosmetic results were judged very satisfactory (10) by 8 patients; one patient judged it as sufficient (5). This patient

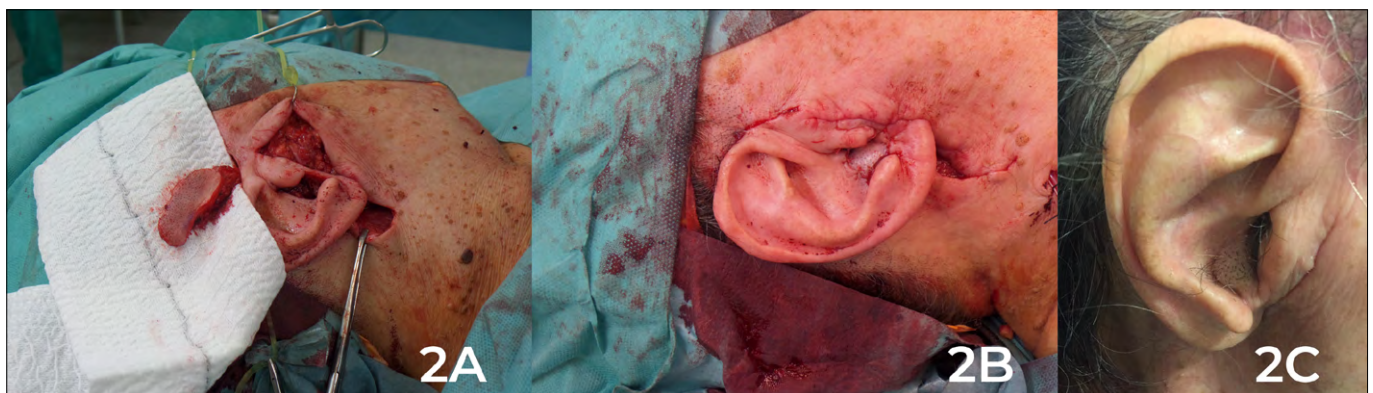


Figure 2. Ear demolition in patient with adenoidocystic tumour of the parotid gland and reconstruction with STAP flap. (A) intraoperative image after ear demolition and STAP flap; (B) in-setting of the flap with a 360° meatal reconstruction; (C) post-operative appearance after 12 months follow-up.

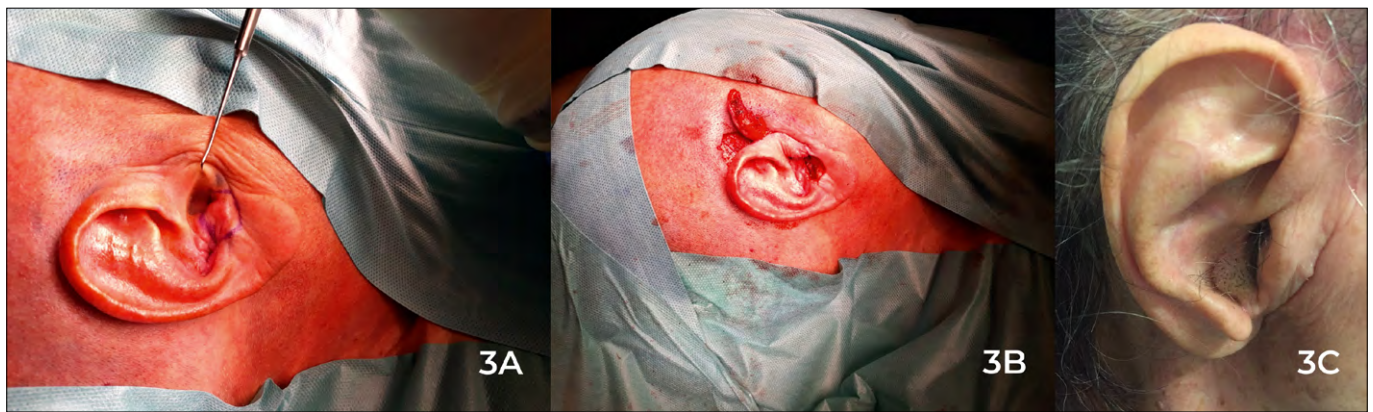


Figure 3. Ear demolition and reconstruction with STAP flap in a patient with basocellular carcinoma; (A) preoperative image of BCC with meatal involvement; (B) intraoperative harvesting of STAP flap with 200° meatal reconstruction; (C) post-operative appearance at 3 month follow-up.

presented hair very close to the ear, so that hairy skin was included in the conchal reconstruction requiring definitive hair removal with laser.

Discussion

Reconstruction of ear defects has always been a challenge to the plastic surgeon given the complex three-dimensional conformation of this anatomic area.

Good reconstruction should aim to correct the deformity with minimum morbidity and to achieve the utmost natural aesthetic outcome; thus, care should be taken to avoid meatal stenosis, distortion of the concha, or significant aesthetic change as much as possible. Reconstruction of defects of the auricular concha is difficult because the skin in this region is closely adhered to the underlying cartilage. Skin grafting is still widely used by many surgeons for repair of defects in this region. However, skin grafts can lead to development of complications such as delayed wound healing, pigmentation, and centripetal contraction, with meatal stenosis in cases of involvement of this area. Furthermore, for defects that are not supported by nearby cartilage, wound contraction and irregularities of contour will lead to a less than optimal aesthetic outcome. For these reasons, local flaps become the leading reconstructive option. Houseman et al.³ demonstrated that the blood supply of the external ear consists of two angiosome territories, the superficial temporal and the posterior auricular artery, which supply the anterior and posterior surfaces of the ear, respectively.

The posterior auricular artery ascends behind the ear in the auriculo-cephalic sulcus and branches into 3 to 5 sizable vessels providing blood supply to the lower, middle, and upper posterior auricle.

The superficial temporal artery emerges from within the

parotid gland in the preauricular region and runs superficially underneath the skin and superficial temporal fascia. It gives off between one and three branches to supply the root of the helix and the upper two-thirds of the helical rim. These branches from the superficial temporal artery also provide blood to the hairless supra-auricular and retro-auricular area which can be included when designing the temporo-auricular flap.

The majority of flaps described in the literature have used the postauricular skin area due to its rich vascularisation, skin laxity and skin colour, ease of surgical access and reduced donor site morbidity. The post-auricular flap technique has been thoroughly described for reconstruction of various ear defects, including those of the anterior surface. Preauricular flaps for anterior ear reconstruction have also been described⁴. Field described a 2-stage approach using a preauricular flap inferiorly (IBPA) and superiorly (SBPA) based for anterior ear reconstruction. A two-stage IBPA for closure of a defect, which extended from the inner rim of the superior helix to the inferior crus of the antihelix, was described by Suchin et al.⁵ Wang et al.⁶ described a tunneled preauricular island flap for an earlobe defect. Pereira et al.⁷ described a tunneled preauricular superiorly based flap in a single stage operation for closure of an auricular defect in the scapha. Sorkin et al.⁸ presented a case series of 11 patients with anterior ear defect reconstructed with an IBPA. Braga et al.⁹ presented a case report of a single-stage tunneled, IBPA flap procedure for reconstruction of antitragus and concha. Recently, Binhimd et al. described a superficial temporal artery capillary perforator-based island flap for conchal bowl and external auditory canal with good results and without need for surgical revision¹⁰.

According to our knowledge, one-stage perforator flaps from the superior region based on perforator of the superficial temporal artery have not been described for conchal

and meatal reconstruction. This is the first case series describing the use of a superior temporo-auricular perforator flap from the superior auricular region to reconstruct extensive defects from the concha and meatus in a single stage operation.

The advantages of this perforator/propeller flap, despite a pedicled cutaneous/subcutaneous/island flap, are: the possibility to gain major mobilisation of the flap for coverage of larger and more distant defects; mobilisation can be improved by increasing the pedicle dissection when necessary. Our outcomes and results demonstrate that the STAP flap is an effective and safe flap for one stage reconstruction of an extensive conchal defect with meatal involvement. We did not observe difficulties during dissection or vascular postoperative complications: the harvesting procedure is simple, and the flap has a rich blood supply with a high survival rate. No flap bulkiness or contraction was seen during follow-up. No meatal stenosis developed. The natural shape of the auricle was preserved so that our patients were satisfied about the aesthetic outcomes.

The use of the superior auricular and retro-auricular area permits harvesting a larger flap, based on a single perforator, that can be closed primarily. The donor site scar is completely hidden in the super-auricular sulcus with the exception of a small tract in the pre-auricular area.

We acknowledge that the sample of patients described herein is small and follow-up is short. Longer time and larger numbers of patients will validate the outcome of this technique. Nonetheless, we consider that this flap is a good alternative to flaps harvested from the retro-auricular and preauricular region and should be considered as a primary choice for reconstruction of extensive defects of the conchal and external meatus area.

Conflict of interest statement

The authors declare no conflict of interest.

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Author contributions

VN conceived and performed the analysis; PP collected data; MA and EP contributed to data analysis; PP, FDM and DR wrote the paper.

Ethical consideration

No Ethical Committee approval was required for this study. The research was conducted ethically, with all study procedures being performed in accordance with the requirements of the World Medical Association's Declaration of Helsinki.

Written informed consent was obtained from each participant/patient for study participation and data publication.

References

- Zhu J, Zhao H, Wu K, et al. Reconstruction of auricular conchal defects with local flaps. *Medicine* 2016;95:e5282. <https://doi.org/10.1097/MD.0000000000005282>
- Masson JK. A simple island flap for reconstruction of concha-helix defects *Br J Plast Surg* 1972;25:399-403. [https://doi.org/10.1016/s0007-1226\(72\)80083-3](https://doi.org/10.1016/s0007-1226(72)80083-3)
- Houseman ND, Taylor GI, Pan WR. The angiosomes of the head and neck: anatomic study and clinical applications, *Plast Reconstr Surg* 2000;105:2287-2313. <https://doi.org/10.1097/00006534-200006000-00001>
- Toia F, Garbo G, Tripoli M, et al. A systematic review on external ear melanoma. *J Plast Reconstr Aesthetic Surg* 2015;68:883-894.
- Suchin KR, Greenbaum SS. Preauricular tubed pedicle flap repair of a superior antihelical defect. *Dermatol Surg* 2004;30(2 Pt 1):239-241. <https://doi.org/10.1111/j.1524-4725.2004.30065.x>
- Wang SQ, Goldberg LH, Kimyai-Asadi A. Tunnelled island pedicle flap for an earlobe defect. *Dermatol Surg* 2007;33:835-837. <https://doi.org/10.1111/j.1524-4725.2007.33178.x>
- Pereira N, Brinca A, Vieira R, et al. Tunnelized preauricular transposition flap for reconstruction of auricular defect. *J Dermatolog Treat* 2014;25:441-443. <https://doi.org/10.3109/09546634.2012.713457>
- Sorkin A, Heller L, Landau G, et al. Inferiorly based preauricular flap for anterior ear reconstruction. *Ann Plast Surg* 2020;84:394-396. <https://doi.org/10.1097/SAP.0000000000002124>
- Braga AR, Pereira LC, Grave M, et al. Tunnelised inferiorly based preauricular flap repair of antitragus and concha after basal cell carcinoma excision: case report. *J Plast Reconstr Aesthet Surg*. 201;64:e73-75. <https://doi.org/10.1016/j.bjps.2010.09.005>
- Binhim U, Alkaabi SA, Alsabri GA, et al. Superficial temporal artery capillary perforator-based island flap for conchal bowl and external auditory canal reconstruction. *Ann Chir Plast Esthet* 2022;67:42-48. <https://doi.org/10.1016/j.anplas.2021.11.005>