

External auditory meatus and/or conchal bowl reconstruction with postauricular island flap in patients with Basal Cell Carcinoma or Squamous Cell Carcinoma

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ABSTRACT:

Aims. Presenting our clinical experience with the postauricular island flap (pif) and estimation of the results following partial external auditory canal (eac) and/or auricular conchal bowl reconstructions with pif in patients after carcinoma resections. **Methods.** We have analyzed postoperative results of 19 patients after auricular conchal bowl (11), or auricular conchal bowl and eac (8) reconstructions with pif, following malignant tumor resections, between 2000-2015. The patients were reexamined and evaluated in respect of early and long-term results after surgical treatment considering both the plastic surgeon's and the patient's opinion.

Results. The cancers were completely excised in all patients, and there were no recurrences within at least 2 years of follow-up. The observed complications after reconstructions comprised venous congestion in five cases (26.3%), pinning of the operated ear in four patients (21%), prominent earlobe in three (15.8%), and eac constriction in three cases (15.8%). The postoperative result was very good in all cases (both in the opinion of the plastic surgeon and the patients), except for patients with pinning of the operated ear, with a prominent earlobe (moderately satisfied).

Conclusions. 1. Combined operations involving postauricular island flap reconstructions after partial (external auditory meatus and/or auricular conchal bowl) resections allowed for complete removal of malignant tumors with no evidence of recurrence, and for the preservation of a proper conchal shape in the reconstructed ear. 2. A retroauricular approach in cases with cancer involvement of the external auditory meatus allowed for proper visualization and estimation of lesions extent, as well as adequate surgical access.

KEYWORDS:

conchal bowl, external auditory canal reconstruction

INTRODUCTION

Deformities of the external ear in the vast majority of cases result from resections of skin cancers (BCC – Basal Cell Carcinoma, SCC – Squamous Cell Carcinoma), and very rarely from burns [21, 1, 18]. The frequency of malignant lesions amounts up to 5.5% of all skin cancers involving the auricle (2/3) and the external auditory canal (eac) (1/3) [11]. SCC as well as BCC of this localization are more aggressive in nature compared with cutaneous cancers in other sites, especially if they spread to the auditory canal. The ratio of BCC to SCC on

the ear is 2:1, whereas BCCs constitute merely ¼ of all malignancies of the eac [6].

Among various of local flaps for conchal bowl restoration, postauricular island „revolving door” flap, known also as the flip-flop flap (pif), is the method of choice for reconstructive surgery of the auricular bowl [5, 24]. Transposition of the postauricular flap with a deepithelialized pedicle through the conchal cartilage was first described by Owens in 1959, while the retroauricular island flap was introduced by Masson in 1972 [19]. Indications for use of the original technique, and its

modifications (Talmi, Rodendo, Jackson) were later extended for larger auricular defects [22, 15, 8].

Due to rich vascular supply of this area (auricular branch of the posterior auricular artery and superficial temporal artery), risk of the flap's necrosis is minimal [22, 15, 8, 10, 14].

Pif, which comprises the posterior auricular muscle, local fascia, and sometimes the sternocleidomastoid muscle, is most often transferred in a single-stage operation [10, 13].

Surgical management should be properly planned to minimize the risk of complications including auricular-conchal and eac disfigurements. In spite of many literature reviews discussing postoperative outcomes with the use of pif reconstructions in this localization, this technique is still not widely practiced [23, 2]. The achievement of proper margins in external ear cancer resections along with preservation of a proper postoperative conchal shape and eac requires surgical expertise, as there is very little excessive tissue in this localization. Mohs micrographic surgery (MMS) is the advocated method for the removal of such tumors [6, 3]. Some authors reported modifications of surgical approaches to improve visualization and access to these lesions [11].

The purpose of this study was to present our experience with pif and postoperative results in patients after eac and/or conchal bowl reconstructions following cancers resections. Methods

We analyzed 19 patients (13 – males, 6 - females), aged between 48-83 years, with a mean age of 71 years, who underwent partial ear reconstructions with pif following excision of eac and/or conchal bowl malignant tumors between 2000-2015. Seven patients were operated after a biopsy performed in other institutions, which revealed BCC infiltrative type – 3, BCC nodular type – 2, or SCC G-2 – 2. The tumor size ranged from 1 to 3 cm, the defect size after surgical excision from 1.5x2.0 to 4x5cm. All resected tissue material was subjected to histopathologic evaluation. The excision margin inside eac was a special concern. The clinical classification of malignancies advancement in the analyzed group is shown in Table I.

Other comorbidities included diabetes mellitus in four, cardiovascular diseases in seven, and nicotine in eight cases.

All patients, except for these with eac involvement, surgically treated under general endotracheal anesthesia, were operated under local anesthesia (Lidokaine with 1: 100000 Epinephrine). Taking into consideration the local severity of the cancer and suspected cartilage involvement, resection in all cases included the whole thickness of the ear concha. Margins of the tumors in

all patients were estimated and excised with microscopic control (microscope Zeiss Vario) under 6-10x magnification during operation. Mohs micrographic surgery was not performed. Closure of the defect was achieved by a pif of a size adjusted to the defect.

To obtain adequate estimation of the lesions, and surgical access to the auditory canal, the operation began with a retroauricular approach in six of eight cases with cancer extension up to 5 mm into opening of the eac. From postauricular incision, the auricular navicular region was removed, then external auricular meatus skin to the level of annulus tympanicus was separated. The next step was removal of skin and lesions with the margin of healthy tissue (3-4 mm). In two patients with auricular canal involvement, an anterior-conchal approach allowed to reach and excise the cancer. In remaining cases with isolated conchal cancers, excision of the lesions with an anterior conchal approach was performed. Next, in all individuals, the flap was outlined behind the defect, involving the postauricular skin, as well as the subcutaneous, and the muscle layers. Then, it was incised around the periphery and attached to its base, whereas the margins of the flap were undercut and mobilized. With the ear pushed back, the flap was pulled through the defect (Fig. 1). In order to reconstruct eac in cases after resection of cancer infiltration, the anterior margin of pif was extended to the posterior surface of the auricle. In this area, the flap consisted of skin and subcutaneous tissue only. Additional pif elongation in to the eac was inserted and sutured to the margin of healthy skin inside the canal. This allowed to cover the wall of the eac in 1/2 to 2/3 with healthy skin, which accelerated healing and reduced the risk of this canal atresia (Fig. 1). In three cases with involvement of the eac, when the flap coverage of the defect was not complete, it was left to heal by secondary intention. An antibiotic (aerosol – Neomycinum) was applied to the postoperative wound. The sutures were removed after 7-10 days. All patients were followed up in an Outpatient Clinic a month following surgery, then after 3, 6 and 12 months, and once a year in consecutive years (Fig. 2). We analyzed the early and long-term results of surgery. The postoperative results were subjectively graded by a plastic surgeon on the basis of physical examination (scale of satisfaction), as well as by the patients (scale of satisfaction).

RESULTS

A histopathologic evaluation of postsurgical specimens revealed BCC in 12 cases (7 - infiltrative type, 5 - nodular type) or SCC (G2) in 7 cases. According to the histopathologic evaluation (pTNM), a change of the BCC clinical stage was noted in two out of five cases, as a result of cartilage infiltration. Neither lymph node metastases nor distant metastases were present. The histopathologic evaluation of margins showed that excision was

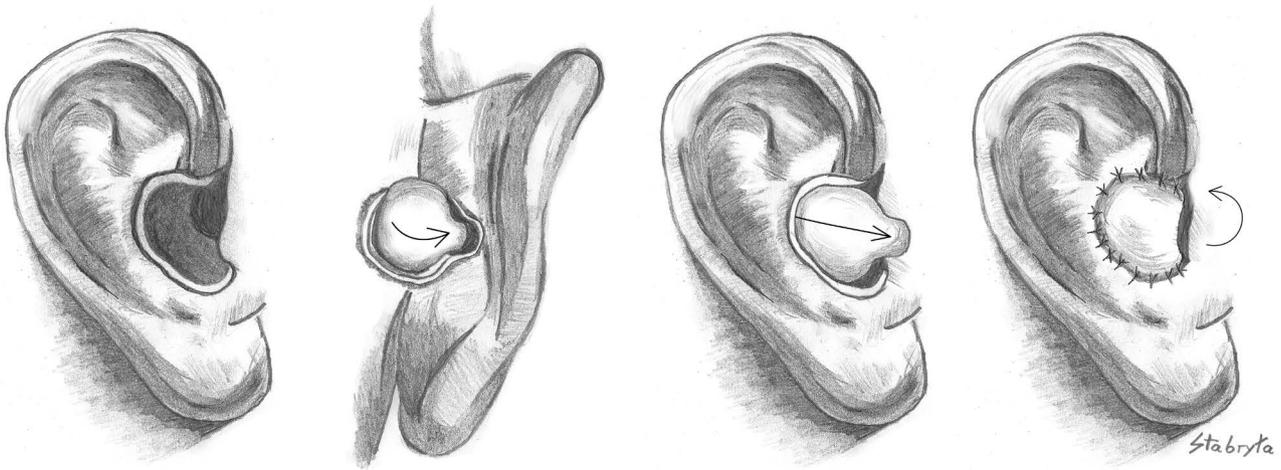


Fig. 1. Scheme of auricular conchal bowl and external auditory canal reconstruction following cancer resection with postauricular island flap.



Fig. 2. Patient with squamous cell cancer located on the auricular conchal bowl and auricular external canal aged 53, before (A) and after reconstruction with postauricular island flap (B).

complete in nine cases; the width of margin was not evaluated. The minimal excision margin ranged from 2 to 4 mm (an average of 3.1 mm) in remaining 10 specimens. None of the patients had a recurrence of cancer at control examinations. Postoperative outcomes in the examined patients are shown in Table II. Venous congestion resolved in 5 postoperative days. Pinning of the operated ear towards the scalp in cases of prominent ears had a tendency to improve within a few months, and addi-

nal corrections were not required (in the doctors' as well as the patients' opinion). Normal contour of the reconstructed auricular concha was preserved in all cases apart from individuals with a postoperative prominent earlobe, who did not want to undergo any further revisions. Initial eac constriction was confirmed in three individuals with cancer spread to the auditory canal (varying from 20 to 40 % of the preoperative lumen of the eac). In these cases, the eac was widened and in order to avoid

Tab. I. Clinical classification of malignancies advancement in the analyzed group (n = 19).

TYPE OF SKIN CANCER	CLINICAL STAGE					
	Feature T		Feature N		Feature M	
	T1	T2	T3	T4	No	MO
BCC (n=12)	7	4	0	1	0	0
SCC (n=7)	4	2	0	1	0	0
Total	11	6	0	2	0	0

its renewed atresia, delayed full thickness skin grafts (from the contralateral retroauricular area) were used. In long-term follow-up, we did not confirm any functional abnormalities, and there was no need of further surgery in eac. Long-term postoperative estimation, performed two years after reconstruction by the plastic surgeon and the patients, is shown in Table III. The evaluation was based on adopted standards.

DISCUSSION

Malignant tumors of the auricular concha, particularly if recurrent or long-lasting, may involve eac, the distal cartilaginous ear canal and the middle ear. Higher-risk subtypes of BCC (infiltrative, metaplastic etc) tend to recur after surgery [1, 12, 4, 9]. In turn, SCC which is observed over the pinna three times more frequent than in other locations, is related to a greater recurrence rate, metastatic potential and morbidity [1, 20]. The above-mentioned consequences result from a peculiar to auricular neoplasms pattern of growth – a horizontal growth phase, which causes these lesions to be prone to inadequate excision [16]. Sometimes, apart from surgery, their treatment requires additional therapies. The management of BCC or SCC can be improved by evaluation of the phenotypic subtype before excision of the cancer, frozen section, or MMS [9]. All malignancies in our study were removed with histopathologically free margins and full thickness ear concha under microscopic control during a single procedure, and recurrences were not detected within subsequent follow-up visits, including resections of invasive forms. Other authors do not excise the whole thickness of the ear concha, as we did and very often perform MMS, as a technique which ensures tumor removal and tissue conservation. According to some data, the SCC local recurrence rate after MMS (5.6%) is smaller in comparison with surgical excision (18.7%) [17]. However, in other reports, patients with several recurrences following ear cancer excision that needed further surgery primary underwent the Mohs technique. This also proves how difficult it is to eradicate external ear cancers [21, 12, 20]. MMS allows for complete margin control

Tab. II. Results of reconstruction with postauricular island flap in the examined group.

Postoperative complications and results of external auditory meatus and /or auricular conchal bowl reconstructions	M	K	Total
Venous congestion	3	2	5
Abnormal wound healing	0	0	0
Infection	0	0	0
Infection	0	0	0
Secondary flap shrinkage	0	0	0
Depression in the contour of the flap	0	0	0
Non-aesthetic appearance of the donor site, concha	0	0	0
Pinning of the operated ear	3	1	4
Prominent earlobe of the operated ear	3	1	3
Auditory canal constriction	3	1	3

M – group of men, K – group of women

during removal of a skin cancer, but – as indicated by other authors - the majority of conchal bowl tumors is cured only with their aggressive removal [3]. Similarly to other authors, we state that in cases of concha cancer spreading to the eac, special aggressive multidisciplinary treatment (including dermatological, laryngological and surgical) is required [6, 3, 7].

We confirmed the effectiveness of the retroauricular approach to the eac. The technique facilitated adequate access and possibility of a proper estimation of lesion extensiveness for laryngologists, and complete tumor removal in this restricted space in individuals from our group. Another method advocated by other authors allowing clear visualization of lesions localized in this area may be partial auriculotomy. However, despite a rich circumferential arcade from posterior auricular and superficial temporal arteries, there is still concern as to the viability of the ear supplied only from the inferior pedicle during surgery with this technique [11].

A variety of reconstructive techniques (including flaps and skin grafts) following resections of the external ear cancers has been described [19]. Although pif allows for the reconstruction of auricular ear conchal defects of up to 6.6 cm in size, the size of resected tissues along with tumors in our individuals was less extensive than those reported [13]. We did not confirm flap necrosis, but its venous congestion, also observed as a transient postoperative complication in other series [19]. The use of pif has many advantages (such as flap color, texture, thickness match, hidden scars), which constitutes its superiority over skin grafting,

Tab. III. Postoperative evaluation by plastic surgeon and patient / Postoperative satisfaction survey.

Postoperative evaluation by:	Patient		Plastic surgeon	
	M (n=13)	F (n=6)	M (n=13)	F (n=6)
completely satisfied – real contour / shape of the reconstructed auricular concha	8	3	8	3
very satisfied - almost real contour / shape of the reconstructed auricular concha	–	–	–	–
moderately satisfied - imperfections of the reconstructed auricular concha, or pinning of the operated ear or prominent earlobe of the operated ear are apparent	3*	1*	3*	1*
slightly satisfied - unreal contour / shape of the reconstructed auricular concha, and pinning of the operated ear or prominent earlobe are apparent	2#	2#	2#	2#
not satisfied - additional surgical revision is needed, unreal conchal shape, pinning of the operated ear prominent earlobe are apparent	–	–	–	–

M – male, F – female

* patients with postoperatively confirmed pinning of the operated ear

prominent earlobe of the operated ear

as reported by other authors [4]. While skin graft application is easier and therefore more often used, the disadvantages of this procedure involve retraction, poor color match, depressed contour, donor site morbidity, and difference in pigmentation which might negatively impact postoperative results of conchal bowl reconstruction [18]. Besides, eac constriction is also more frequently reported after skin grafting, than following the use of flap reconstruction [4]. Moreover, skin grafting is not a solid support as flaps, which provide better appearance of the ear after surgery and allow to avoid ear contour imperfections, distinctively in large conchal defects after cartilage excision [18]. There are few reports on the use of a flap in combination with cartilage graft, providing improved auricular shape after extensive conchal resections [13]. However, these complex procedures may be related to longer operative time and increased risk of donor site morbidity. The size of defects in our patients de-

termined that cartilage grafting was not required for obtaining a satisfactory conchal shape after reconstruction.

We used and recommend a radical but not burdensome operation, with a relatively low early complication rate in spite of the patient's senile age and ratio of other systemic diseases – cardiovascular (38.5%), diabetes mellitus (23%), and nicotine (46.15%).

Similar to the results of other studies, postoperative auricle pinning had a tendency to improve and additional surgical revisions were not required in our patients with prominent ears. Postoperative pinning is more visible in persons with prominent ears, and the degree of its severity, as well as limitation of flap mobility, decide upon asymmetry in the reciprocal position of the auricles [5, 13]. The occurrence of a prominent ear lobe after pif reconstructions was not reviewed by other authors, but observed in a few cases in our study after reconstructions with pif of a greater size. Stenosis of the eac, following cancer resections of this localization, has been reported in cases of extensive cartilage removal. In our individuals with postoperative auditory canal constrictions, we used delayed skin grafting and there was no functional impairment nor the need of another surgical correction, which corresponded with the observations of other authors [3].

Postoperative results are reflected in the plastic surgeon's, as well as the patient's estimations - moderate satisfaction in cases with pinning of the operated ear, or prominent earlobe, and complete satisfaction in the remaining cases. These opinions are also related to maintaining a normal contour of the reconstructed auricular concha in spite of sufficiently extensive cancer resections, with no signs of recurrence in long-term follow-up.

Our observations referring to the patient's and doctor's postoperative estimations after reconstructions with the use of the pif correspond with apperceptions presented by other authors [4].

CONCLUSIONS

1. Combined operations involving the postauricular island flap reconstructions after partial (external auditory meatus and/or auricular conchal bowl) resections allowed for complete removal of malignant tumors with no evidence of recurrence, and also preservation of proper conchal shape in the reconstructed ear.
2. A retroauricular approach in cases with cancer involvement of the external auditory meatus allowed for proper visualization and estimation of the lesions' extent, as well as adequate surgical access.

REFERENCES

1. Ahmad I., Das Gupta A.R.: Epidemiology of basal cell carcinoma and squamous cell carcinoma of the pinna. *J. Laryngol. Otol.*, 2001;115: 85-6.
2. Chen C., Chen Z.J.: Reconstruction of the concha of the ear using a postauricular island flap. *Plast. Reconstr. Surg.*, 1990; 86: 569-72.
3. Clark D.P., Hanke C.W.: Neoplasms of the Conchal Bowl: Treatment with Mohs Micrographic Surgery. *J. Dermatol. Surg. Oncol.*, 1988;14: 1223-8.
4. Dessy L.A., Figus A., Fioramonti P., Mazzocchi M., Scuderi N.: Reconstruction of anterior auricular conchal defect after malignancy excision: revolving-door flap versus full-thickness skin graft. *J. Plast. Reconstr. Aesthet. Surg.*, 2010; 63: 746-52.
5. Fader D.J., Johnson T.M.: Ear reconstruction utilizing the subcutaneous island pedicle graft (flip-flop) flap. *Dermatol. Surg.*, 1999; 25: 94-6.
6. Glied M., Berg D., Witterick I.: Basal cell carcinoma of the conchal bowl: interdisciplinary approach to treatment. *J. Otolaryngol.*, 1998; 27: 322-6.
7. Hanke C.W., Temoffew R.K., Miyamoto R.T., Lingeman R.E.: Chemosurgical report: Basal cell carcinoma involving the external auditory canal: Treatment with Mohs micrographic surgery. *J. Dermatol. Surg. Oncol.*, 1985; 11: 1189-94.
8. Jackson T., Milligan L., Agrawal K.: The versatile revolving door flap in the reconstruction of ear defects. *Eur. J. Plast. Surg.*, 1994; 17: 131-3.
9. Jarell A.D., Mully T.W.: Basal cell carcinoma on the ear is more likely to be of an aggressive phenotype in both men and women. *J. Am. Acad. Dermatol.*, 2012; 66: 780-4.
10. Krespi Y.P., Ries W.R., Shugar J.M., Sisson G.A.: Auricular reconstruction with postauricular myocutaneous flap. *Otolaryngol. Head Neck Surg.*, 1983; 91: 193-6.
11. Massey R.A., Eliezri Y.D.: Partial auriculotomy for exposure of tumors of the external auditory meatus and conchal bowl. *Arch. Dermatol.*, 1998; 134: 13-15.
12. Mulvaney P.M., Higgins H.W. II, Dufresne R.G., Cruz A.P., Lee K.C.: Basal cell carcinomas of the ear are more aggressive than on other head and neck locations. *J. Am. Acad. Dermatol.*, 2014; 70: 924-6.
13. Nemir S., Hunter-Ellul L., Codrea V., Wagner R.: Reconstruction of a large anterior ear defect after Mohs micrographic surgery with a cartilage graft and postauricular revolving door flap. *Case Rep. Dermatol. Med.*, 2015; article ID 484819.
14. Papadopoulos O.N., Karypidis D.K., Chrisostomidis C.I., Konofaos P.P., Frangoulis M.B.: One-stage reconstruction of the antihelix and concha using postauricular island flap. *Clin. Exp. Dermatol.*, 2008; 33: 647-50.
15. Redondo P., Lloret P., Sierra A., Gil P.: Aggressive tumors of the concha: treatment with postauricular island pedicle flap. *J. Cutan. Med. Surg.*, 2003; 7: 339-43.
16. Robbins P., Nix M.: Analysis of persistent disease on the ear following Mohs' surgery. *Head Neck Surg.*, 1984; 6: 998-1006.
17. Rowe D.E., Carroll R.J., Day C.L.: Prognostic factors for local recurrence, metastasis, and survival rates in squamous cell carcinoma of the skin, ear, and lip. *J. Am. Acad. Dermatol.*, 1992; 26: 976-90.
18. Ruiz M, Garcia O, Hernán I, Sancho J, Serracanta J., Barret J.P.: Revolving-door flap: an alternative for the coverage of acute burn defects of the auricle. *Burns*, 2011; 37: e.41-3.
19. Schonauer F, Vuppapalapati G, Marlino S., Santorelli A., Canta L., Molea G.: Versatility of the posterior auricular flap in partial ear reconstruction. *Plast. Reconstr. Surg.*, 2010; 126: 1213-21.
20. Silapunt S., Peterson S.R., Goldberg L.H.: Squamous cell carcinoma of the auricle and Mohs micrographic surgery. *Dermatol. Surg.*, 2005; 31: 1423-7.
21. Talmi Y.P., Horowitz Z., Bedrin L., Kronenberg J.: Auricular reconstruction with a postauricular myocutaneous island flap: flip-flop flap. *Plast. Reconstr. Surg.*, 1996; 98: 1191-9.
22. Talmi Y.P., Horowitz Z., Bedrin L., Kronenberg J.: Technique of auricular reconstruction with a postauricular island flap: flip-flop flap. *Operative Techniques In Otolaryngology. Head and Neck Surg.*, 2000; 11: 313-17.
23. Talmi Y.P., Liokumovitch P., Wolf M., Horowitz Z., Kopolovitch J., Kronenberg J.: Anatomy of the postauricular island „revolving door” flap („flip-flop” flap). *Ann. Plast. Surg.*, 1997; 39: 603-7.
24. Tanzer R.C.: Postauricular flap based on a dermal pedicle for ear reconstruction (Discussion). *Plast. Reconstr. Surg.*, 1981; 68: 165-70.