

# Anteriorly Pedicled Retroauricular Flap for Repair of Auricular Defects

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**Abstract** The reconstruction of the auricle is aesthetically very demanding. Various techniques have been used depending on the defect size, the defect location, and tissue involved. For better wound control and result predictability, we developed an anteriorly pedicled retroauricular flap. We used this modified double-full-thickness skin graft in three patients. This anteriorly pedicled flap provides a visible wound surface which makes wound dressing easy. The aesthetic outcome is good and predictable. No major complications were encountered during surgery or the healing phase. All patients were satisfied with the outcome. The described method offers a good option for reconstructing larger auricular defects with local tissue.

**Keywords** Anteriorly pedicled retroauricular flap · Auricular full-thickness defect

Defects of the auricle frequently occur within the context of congenital deformities, trauma, and, in particular, the surgical excision of benign and malignant tumors [1]. As exposed parts of the head, the ears play an important role in the overall aesthetic image. They largely help to determine the outer contour of the face. An anatomically correct

reconstruction of the external ear contributes significantly to the psychological well being of the patient [2].

The anatomical characteristics, the three-dimensionality, and the delicate quality of the ear frame make reconstruction of the auricle particularly challenging [3]. The reconstruction techniques are diverse and their application depends on the type, shape, location, extent, and kind of tissue involved. Many single-stage and multistage treatment methods are available for restoring the helical ear [1, 4–8]. Defects can be covered by a simple reduction procedure or with local flaps with or without cartilage grafts [9–13]. With flap-based reconstructive procedures, retroauricular skin is frequently used, preferably for its known advantages [1, 2, 5, 7, 11]. The posterior pedicled retroauricular flap is one of these retroauricular skin-using techniques. However, this method does not allow adequate control of the wound surface directed inward, which also hampers dressing changes.

## Method

Eight patients with ear defects were treated in our clinic between 2008 and 2010 in cooperation with the Department of Dermatology, University Hospital RWTH-Aachen. All defects included both skin and cartilage deficits. Three patients had a defect of less than 0.5 cm in diameter, and five patients had a defect of more than 1 cm in diameter. In three cases, primary closure was performed in which the resulting ear size was not significant different than the contralateral unaffected ear. In five patients, primary closure could not be performed because it would have resulted in a visible size difference compared to the unaffected ear. We used the posterior pedicled retroauricular flap in two of these cases.

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For the remaining three patients we developed the so-called “anteriorly pedicled retroauricular flap.” The operating procedure is as follows: Corresponding to the existing defect, a defined area of the retroauricular skin is marked and an incision is made in the dorsal part (Figs. 1, 2, 3).



**Fig. 1** Fan-shaped defect in the upper third of the left ear helix measuring  $3.2 \times 2.4$  cm following the excision of a malignant melanoma



**Fig. 2** Marked area of the flap to be lifted



**Fig. 3** Anterior pedicled skin flap after preparation for the first stage of reconstruction

The dorsally located tip of the flap is adapted to the posteriorly located tip of the defect (Fig. 4). Thus, the skin side faces the head. The defect of the flap donor site should be closed without tension after mobilization of the local tissue (Fig. 5). After covering the wound surface with a polyurethane foam sponge, a compression-free dressing is applied. After 3 weeks, incision and adjustment of the anterior part of the flap take place in order to cover the front-side defect (Fig. 6). To shape the ear frame, a corresponding piece of cartilage is removed from the concha of the contralateral ear and fixed with sutures (Fig. 7), followed by exact adaptation of the soft tissue margins (Fig. 8). After moving the edges of the wound, the donor-site defect should again be closed primarily.

## Result

In all three cases in which this new technique was used, there was no need for the patient to return to our clinic for



**Fig. 4** Flap after transposition into the defect area



**Fig. 5** Tip of the flap adapted to the medial section of the defect (rotated from dorsal to anterior position)



**Fig. 6** Transection of the flap pedicle and transposition of the anterior part of the flap in the second step of reconstruction



**Fig. 7** Cartilage graft from the contralateral concha for constructing a hard tissue frame



**Fig. 8** Flap folded down and fixed anteriorly

postoperative follow-up. The wound dressing and healing control could be done by a local physician.

The wounds were already healed 3 weeks after the final flap transposition (Fig. 9). The scar of the donor site is in



**Fig. 9** Treatment outcome 3 months postoperatively

the hair-covered area and is barely visible after fading. The shape and outline of the ear correspond to those of the contralateral side. The thickness and color of the transplanted skin fit well into the overall picture. If desired, further adjustment and thinning of the flap can be conducted in the course of treatment as well as epilation [5, 14].

In all three cases no major complications were encountered during surgery or the healing phase. There were no postoperative complications such as wound infection, hematoma, or significant pain. The flap survival rate was 100%. All patients were very satisfied with the aesthetic outcome.

## Discussion

Malignancy and trauma can cause defects of the external ear. Although mostly aesthetic, the consequences of these defects can be mental stress and a decrease of self-confidence. To avoid these problems, adequate reconstruction of the ear is necessary. Subtotal defects can be replaced by local or free flaps. Among flap-based techniques, retroauricular flaps are used most often. However, the often used posteriorly pedicled retroauricular flap is not the best choice with respect to wound control and dressing as the wound area cannot be seen easily.

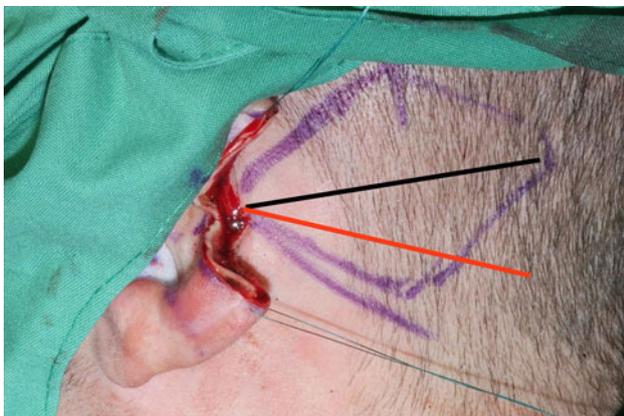
Because of this we developed the anteriorly pedicled retroauricular flap to close full-thickness auricle defects. This technique is appropriate for reconstructing large auricular defects that cannot be closed primarily without causing aesthetically unfavorable deformities. In contrast to the techniques previously mentioned in literature, the postauricular flap is pedicled anteriorly in the first stage of the operation, and it is then displaced in an anterior direction and separated from the base in a second stage.

As a result of this technique, the position, shape, and size of the external ear are affected as little as possible, which is necessary for a cosmetically appealing outcome. However, there are some visible color and surface differences, as with all retroauricular flaps [11]. Apart from this, the retroauricular skin of the head is much thicker than the skin of the ear, which is why the three-dimensional tissue structure is changed. Nevertheless, this problem can be easily solved by thinning of the flap [5].

As with other plastic surgery techniques involving postauricular flaps, the secondary defects are in the not directly visible area which can be concealed by hair. However, by mobilization of the local tissue, the donor-site defects can be closed primarily in most cases [7].

A notable advantage of the retroauricular anterior pedicled flap is that after the first step of the operation, the base of the flap has a width-to-length ratio of not less than 1:3, thus ensuring a good blood supply to the graft. Moreover, excellent control of the wound surface is possible during the healing phase. In the second step of the operation, the final vertical expansion can be designed and adjusted as required.

The well-known problem of hair growth in the area of the transplanted tissue can be avoided by the method presented here if the transplanted tissue that is in the visible area is lifted directly from the area behind the ear [5]. Weerda and Munker [7] solved this problem with the development of the transposition rotary flap. However, this flap has the disadvantage in that the base of the flap cannot be determined freely and there is no possibility of directly controlling the raw wounded skin. Finally, in order to avoid unfavorable hairiness of the graft, a possibly large part of the hair-free skin should be included in the flap design. Thus, it might be necessary to align the longitudinal axis of the flap in a more caudal direction (Fig. 10). Otherwise,



**Fig. 10** With caudal rotation of the longitudinal axis of the flap, the hairless flap area becomes larger

any remaining hair can be eliminated by the use of appropriate epilation techniques, e.g., laser [5, 14].

Reductive surgery can still be performed in many cases. This one-stage reconstruction is recommended for defects following wedge or rear excision, with a diameter of up to 1 cm, and also in cases of patient multimorbidity [11, 15].

## Conclusion

The retroauricular anterior-pedicled flap offers a good alternative for reconstructing medium to large full-thickness defects of the auricle. In contrast to posterior pedicled flaps, the wound surface can be easily controlled and dressing can be performed by a local physician. Although some differences in color and thickness will be unavoidable, an aesthetically satisfying result can be obtained. Similar to the previously described methods, reconstruction of the ear scaffold is possible by means of a supporting costal cartilage framework or cartilage from the contralateral ear [1, 5, 7]. In case of unpleasant hairiness, one can make use of the known methods of epilation.

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