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Reconstructive

Chondrocutaneous Advancement Flap and Postauricular Skin Flap: An Effective Combination for Large Helical Rim Defect Reconstruction

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Background: Defects of the ear helix are a frequent challenge in plastic surgery, with more than 5% of all skin cancers occurring in this region. The Antia-Buch flap is a single-stage reconstruction technique utilizing chondrocutaneous flaps for helix repair. However, for defects exceeding 2 cm, it can lead to auricular distortion. To address this limitation, we propose a modified Antia-Buch technique combining chondrocutaneous advancement with a postauricular skin flap to optimize outcomes.
Methods: A retrospective review was conducted of 15 patients who underwent our modified Antia-Buch flap procedure between 2019 and 2022. This approach incorporated chondrocutaneous advancement for primary defect closure and a postauricular skin flap for improved contouring. Functional and aesthetic outcomes were assessed using a questionnaire developed in collaboration with a clinical psychologist. The questionnaire evaluated surgical satisfaction, cosmetic results, self-image, and social integration postreconstruction.
Results: No complications, including ischemic necrosis or the need for surgical revision, were observed in any case. The technique demonstrated excellent vascularity, with no occurrences of flap failure. Patient-reported outcomes revealed high satisfaction rates, with no evidence of self-image distortion or social barriers. Aesthetic results were rated as superior, with minimal risk of auricular distortion even for larger defects.
Conclusions: The modified Antia-Buch technique is a reliable and effective method for helical rim reconstruction, particularly for defects larger than 2 cm. It offers technical simplicity, low complication rates, patient convenience, and excellent cosmetic outcomes, making it a preferred option for many auricular defect reconstructions.
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INTRODUCTION

Auricular reconstruction presents significant challenges due to the ear's complex anatomy and its critical role in both aesthetics and functionality. The helical rim is the most common site for skin tumors on the ear. Reconstructive techniques aim not only to restore the anatomical structure to resemble the contralateral ear as closely as possible but also to maintain the ear's functionality.[1] Most acquired auricular defects result from trauma or the excision of skin cancers, which accounts for about 6% of head and neck skin malignancies.[2–4] Prolonged sun exposure is a primary cause of skin cancer, particularly affecting the helical rim of the ear, which is highly susceptible to basal cell carcinoma (BCC) and squamous cell carcinoma, the most common types of cutaneous malignancies in this area.[5,6] Several reconstruction options include primary closure, secondary healing, skin flaps, grafts, or auricular prostheses. The choice depends on the defect's size and location, patient preferences, health, and tumor monitoring needs, with combinations sometimes used for optimal results.[7–9] For small defects (<1 cm) located on the helical rim or conchal bowl, primary skin

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sutures or secondary healing may be adequate, providing a straightforward and minimally invasive approach. In cases of moderate defects (1–2.5 cm), wedge excision is commonly used, particularly on the lobule or upper helix, allowing for tissue removal while preserving ear contour. For larger defects (2.5–4 cm), more complex techniques such as the Antia-Buch flap or chondrocutaneous advancement flaps are preferred to restore both skin and cartilage, especially in regions such as the helical rim. For very large defects (>4 cm), composite grafts or skin grafts from other body areas may be necessary, and in some instances, prosthetic reconstruction is required to restore both form and function.[10–12] The Antia-Buch flap, introduced in 1967, is a well-known technique for reconstructing chondrocutaneous ear defects, particularly those involving both skin and cartilage.[13] It involves creating 2 flaps: an anterior skin-cartilage flap and a posterior skin flap.[14,15] Although effective for defects up to 2 cm, it may lead to ear height loss and aesthetic issues for wider defects. A modification of the Antia-Buch technique using postauricular skin flaps addresses these drawbacks, preserving ear height and improving outcomes without scaphal resection. The success of this approach relies on the surgeon's expertise and patient selection. This study aims to evaluate a modified Antia-Buch technique assessing its efficacy through a retrospective review of 15 cases.

Takeaways

Question: How effective is the modified Antia-Buch flap technique in addressing helical rim defects while minimizing complications?

Findings: A retrospective review of 15 patients undergoing our modified Antia-Buch flap technique from 2019 to 2022 demonstrated no complications, necrosis, or psychological impacts. Functional and aesthetic outcomes were assessed via a questionnaire, revealing high patient satisfaction and superior cosmetic results.

Meaning: The modified Antia-Buch flap technique offers a safe and effective solution for reconstructing helical rim defects, emphasizing minimal risk of complications and excellent cosmetic outcomes.

MATERIALS AND METHODS

The authors provide a description of a retrospective study conducted at the IRCCS-Centro di Riferimento Oncologico della Basilicata, Rionero in Vulture (PZ), Italy. The study focused on ear reconstruction after cancer excision using the modified Antia-Buch technique in patients who underwent surgery between February 2019 and November 2022. The inclusion criteria involved auricle reconstruction after cancer excision and a minimum follow-up time of 1 year. Exclusion criteria included smaller defects treated with primary closure, larger defects requiring major ear reconstruction, multiple-stage procedures, patients who missed follow-ups, and those lacking documentation. The study was conducted following the ethical standards of the Declaration of Helsinki, and patients provided informed consent, including a photograph release section. Fifteen patients participated in the study, with each undergoing the modified Antia-Buch technique for ear reconstruction after cancer excision. The patients' ages ranged from 54 to 89 years, with an average age of 76 years. BCC was the leading reason for ear reconstruction in the study. Defect sizes ranged from 3.0 to 4.5 cm, primarily located along the helical rim, and the mean area defect was 3.4 cm^2. The study ensured that the technical details, risks, and benefits of the procedure were thoroughly discussed with the patients during medical interviews, and they were required to provide informed consent before the surgery, which included reporting possible surgical and cosmetic risks. The procedure is performed under local anesthesia, where the posterior aspect of the ear pinna is infiltrated with a solution containing xylocaine 1% and epinephrine 1:100,000.[16,17] This helps in numbing the area and minimizing bleeding during the surgery. Epinephrine is indeed not used on the anterior aspect of the ear pinna to avoid the risk of skin necrosis. The initial steps are consistent with tumor resection, where the lesion is marked, and margins are determined accordingly (Fig. 1). The excisional defect is then converted to a rectangular shape, and immediate reconstruction follows (Fig. 2).

The procedure begins as a classic Antia-Buch technique, with an anterior incision made along the helical sulcus to create anterior and posterior flaps. The anterior flap, containing both skin and cartilage, is advanced to cover the chondrocutaneous defect. Although effective for smaller defects, defects more than 3 cm may require a crescent chondrocutaneous scapha resection, risking auricular

Fig. 1. Clinical lesion and margin delimitation. A, Design of the chondrocutaneous advancement flap. B, A BCC, observed from a cephalic perspective, located on the upper left ear. C, Design of the retroauricular skin flap.

deformities like height reduction. For larger defects, to avoid scapha resection and prevent ear cupping, a postauricular skin flap is elevated and advanced into the space between the 2 chondrocutaneous flaps. This flap is then sutured into place, effectively closing the defect (Fig. 3).

Fig. 2. A full-thickness ear defect involving the superior pole of the ear.

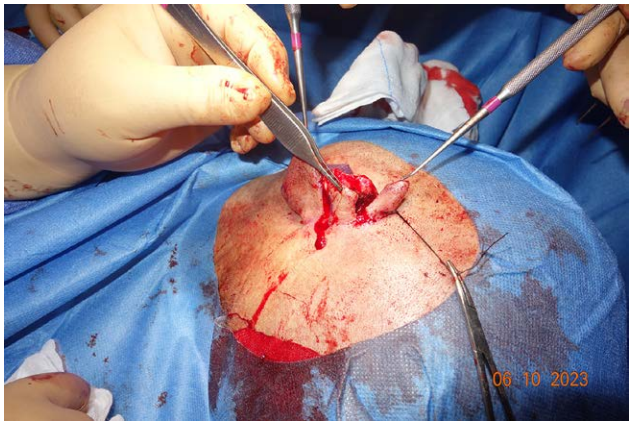

Fig. 3. The lesion was surgically removed, and a retroauricular skin flap was raised.

Importantly, no cartilage support harvested from the contralateral ear is necessary, as the support is provided by the scapha itself (Fig. 4). Overall, patients reported high satisfaction with both aesthetic and functional outcomes. Patients were followed up either in person or via telephone and asked to complete a postoperative survey. The survey, developed with a clinical psychologist, aimed to assess satisfaction, cosmetic results, and overall experience with the modified Antia-Buch technique (Table 1). The questionnaire included several scales evaluating different aspects of their outcomes after ear reconstruction.[18,19]

RESULTS

Between February 2019 and November 2022, a total of 18 patients underwent auricle reconstruction. Three patients were excluded from the study due to unrelated deaths during the follow-up period. Of the remaining 15 patients included in the study, 9 were men and 6 were women, with an average age of 76 years (range 64–89 y). The primary indication for ear reconstruction was BCC, which accounted for 43.5% of cases, followed by squamous cell carcinoma (34.8%) and precancerous lesions (21.7%). The excision margins for the primary lesions were standardized at 0.5 mm or more. Defect sizes ranged from 3.0 to 4.5 cm, primarily located along the helical rim, with a mean defect area of 3.4 cm^2 (Table 2). All patients underwent reconstruction using our modified Antia-Buch technique.

Postoperative Complications

The study achieved a 100% success rate in complete tumor excision across all cases. Notably, there were no postoperative complications, such as infection, hematoma, bleeding, wound dehiscence, ear cupping, or cauliflower ear deformity. Additionally, no patients required surgical revision, further underscoring the reliability and favorable outcomes of the modified Antia-Buch technique for ear reconstruction.

Postreconstructive Evaluation

All 15 patients completed the evaluative questionnaire 1 year postoperatively, reporting positive outcomes

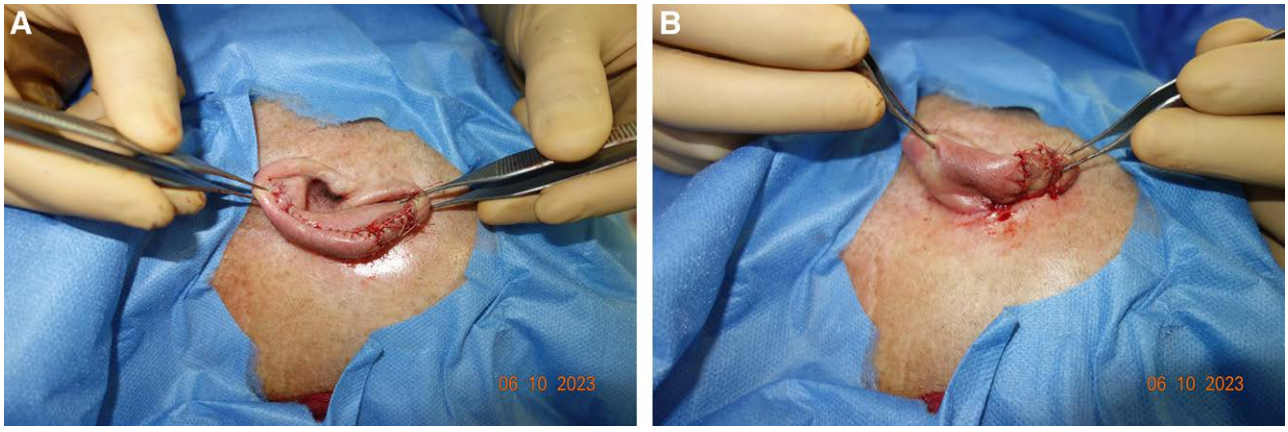

Fig. 4. Immediate postoperative period. A, The surgical results are seen immediately after reconstruction (anterior aspect). B, Posterior aspect.

Table 1. Postreconstructive Evaluation Questionnaire

Do you find the aesthetic result satisfactory?
Do you notice a difference in the size of your ear since your surgery?
Do people comment on the size of your ears?
Do people notice that you have had surgery on your ear?
Do you find it difficult to wear glasses and/or hearing aids?
Overall, do you like the appearance of your ear?

Table 2. Patient Demographics

Characteristics	n (%)
Mean age (range), y	76 (64–89)
Sex	
Female	6
Male	9
Cause for ear reconstruction	
BCC	20–43.5
Squamous cell carcinoma	16–34.8
Precancerous lesions	10–21.7
Mean area defect	3.4 cm^2
Location defect	Helical rim

Table 3. Patient Satisfaction

Evaluation Outcome	No. Participants (Total, N = 15)
Highly satisfied	12
Moderately satisfied	3
Not satisfied	0

(Table 3). The aesthetic results were rated as satisfactory or very satisfactory by all participants, with no reports of self-image distortion or social limitations due to the reconstruction. The modified Antia-Buch technique, combining a helical chondrocutaneous advancement flap with a retroauricular skin advancement flap, demonstrated excellent long-term results. The additional tissue mobility provided by the retroauricular flap allowed for effective contour and height preservation, with no significant long-term indentation or deformities observed (Figs. 5, 6). This modified approach proved to be particularly advantageous in the reconstruction of larger helical defects, offering improved aesthetics and function.

DISCUSSION

The Antia-Buch chondrocutaneous advancement flap remains a cornerstone technique in the reconstruction of helical rim defects, particularly for small- to medium-sized lesions.[20,21] However, limitations associated with this method have prompted the development of various modifications to enhance both aesthetic and functional outcomes. One major concern is defect size; the traditional Antia-Buch flap becomes less effective for larger defects, often necessitating more complex approaches, such as composite flaps.[22,23] Additionally, cosmetic challenges, such as ear notching or cupping, have driven the adoption of caudally based flaps, which improve aesthetics without affecting the cranial flap.[24–26]

Another drawback highlighted in the literature concerns the reduction of ear height, a complication that can result in visible deformities and compromised aesthetic outcomes, especially for defects larger than 2 cm.[27,28] The classic Antia-Buch technique, while effective for moderate-sized defects, has been critiqued for this specific issue. Noel et al[29] emphasized that, although the technique allows for the closure of helical defects up to 2 cm, it often results in a frequent loss of ear height due to the resection of a portion of the scapha to provide sufficient mobility of the chondrocutaneous flap.[30,31] This reduction in the ear's height and projection can lead to a noticeable deformity, affecting the overall contour of the ear. Similarly, Abdelkader et al[32] reaffirmed these concerns, demonstrating that the loss of ear height becomes more pronounced with larger defects, leading to a decrease in auricular size and patient dissatisfaction with the aesthetic outcome.[33,34]

To overcome the limitations associated with the classic Antia-Buch technique, our study proposes a modified approach incorporating a postauricular skin incision and retroauricular advancement flaps, which avoids scaphal resection. The postauricular incision provides increased tissue mobility, whereas the retroauricular advancement flaps utilize skin from the retroauricular region to better cover the helical rim defect. By preserving the scapha, the natural contour of the ear is maintained, whereas the increased mobility of the flaps enhances the reshaping and positioning of the ear during reconstruction, ultimately leading to improved cosmetic and functional outcomes.[35,36] The advantage of our technique compared with the previous one is the increased speed and simplicity of execution. It is also useful in preventing notching and contour irregularities, which are particularly visible in the helical rim area.

Our experience with this modified Antia-Buch flap demonstrates its efficacy in addressing helical rim defects up to 4.5 cm. The outcomes suggest that this approach offers more reliable cosmetic and functional results for larger defects compared with the traditional method.

CONCLUSIONS

The Antia-Buch chondrocutaneous advancement flap remains a reliable technique for addressing small-to-medium helical rim defects, but its limitations, particularly concerning larger defects and potential ear height reduction, cannot be overlooked. The necessity for scaphal resection in some cases can compromise the overall aesthetic outcome, leading to issues such as ear notching, cupping, and loss of projection. However, modifications to the traditional approach, such as the use of transposition and caudally based flaps, have demonstrated significant improvements in preserving ear height and enhancing cosmetic results.

The choice of reconstruction technique must always be personalized, taking into account the specific characteristics of the defect and the patient's anatomy. In this context, we believe that our modified approach can serve as a valuable tool for reconstructive surgeons. Its ability

Fig. 5. Follow-up at 1 year.

Fig. 6. Follow-up at 1 year (posterolateral aspect).

to preserve the natural contour of the ear while providing greater tissue mobility makes it particularly effective in achieving both aesthetic and functional outcomes.

In conclusion, our modified approach to the Antia-Buch technique not only prevents auricular height reduction but also offers a higher degree of patient satisfaction in cases with larger defects, confirming the efficacy of our technique for defects up to 4.5 cm. For these reasons, it should be incorporated into the surgical armamentarium of those managing auricular defects.

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DISCLOSURES

The authors have no financial interest to declare in relation to the content of this article. The present article is enclosed in research line number 1 of the current research project of the IRCCS-Centro di Riferimento Oncologico della Basilicata, Rionero in Vulture, Italy.

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