Print ISSN: 2321-6379
Online ISSN: 2321-595X

Original Article

Two Stage Superiorly Based or Inferiorly Based Retroauricular Flaps in Partial Ear Defects

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Abstract

Background: Partial ear defects present a unique challenge in reconstructive surgery due to their complex anatomical characteristics and aesthetic importance. Various surgical techniques have been developed to restore the helical rim contour and provide optimal outcomes. One such technique involves the utilization of retro-auricular flaps either superiorly or inferiorly based, which offer several advantages, including a reliable blood supply, inconspicuous donor site, and versatility in flap design. This study provides a comprehensive review of retro-auricular flaps in partial ear defects, outlining their indications, surgical techniques, and outcomes.

Key words: Inferiorly based, Partial ear defect, Retro-auricular flaps, Superiorly based

INTRODUCTION

Partial ear defects can arise from various causes and pose challenges in reconstructive surgery due to their intricate anatomy and aesthetic significance. The absence of certain parts of the auricular region is a significant esthetic problem. Cartilage reconstruction procedures are performed on over one million patients in the developed world each year.[1] Several approaches have been proposed to restore the helical rim contour and achieve favorable functional and cosmetic outcomes. Reconstructive plastic surgery techniques, including primary repair, local flaps, regional flaps, and skin grafts, can be used to manage the defect. Extensive injuries often require multistage procedures for optimal repair.[2]

Two-stage superiorly and inferiorly based retro-auricular flaps have become popular due to their availability and ability to address various defects along the helical rim, scapha, and antihelix. The donor site for these flaps includes the superior ear, posterior ear, and mastoid area.[3]

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www.ijss-sn.com

Month of Submission : 06-2023
Month of Peer Review : 06-2023
Month of Acceptance : 07-2023
Month of Publishing : 08-2023

The advantages of this flap include the availability of similar tissue, robust vascularity, and no need for cartilage, resulting in inconspicuous scarring.[4,5] However, the main disadvantage lies in the two-stage procedure and the inclusion of hair-bearing skin in the flap.[6,7]

These flaps are particularly useful in cases with limited tissue laxity or compromised blood supply. They can be used for both acute and delayed reconstructions, allowing flexibility in timing surgical intervention.[4]

MATERIALS AND METHODS

This study enrolled 21 patients (9 females and 12 males) with partial ear defects treated between March 2022 and February 2023 at our institution. Informed consent was obtained before surgery, and patients were categorized based on age, gender, etiology, location of the flap, and area of the defect. Wounds caused by human bites and traumatic injuries were considered dirty wounds with a high risk of infection, so wound rinsing and cleaning were mandatory. Devitalized wound edges were carefully excised. Prophylactic measures, including anti-tetanus vaccination in acute settings and antibiotic administration 1 h before surgery, were implemented. Postoperative follow-up was conducted at 4 and 8 weeks.

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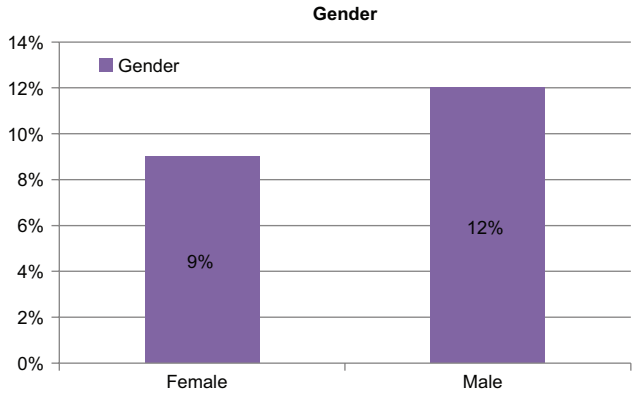
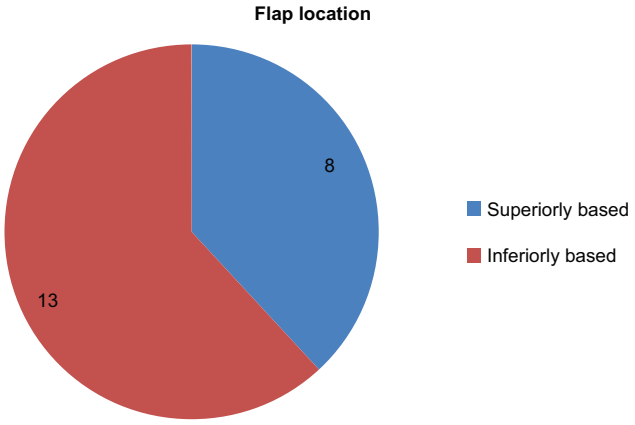




Surgical Technique

All patients underwent reconstructive surgery for ear defects using either general anesthesia or local anesthesia following thorough preoperative planning. The scar margin of the helical rim defect was exposed, and with the help of proper marking and a predetermined pattern, a flap was raised either superiorly or inferiorly based on the desired outcome. The flap was raised above the fascia to ensure a rich blood supply and adjusted to an appropriate length based on the mobility required.

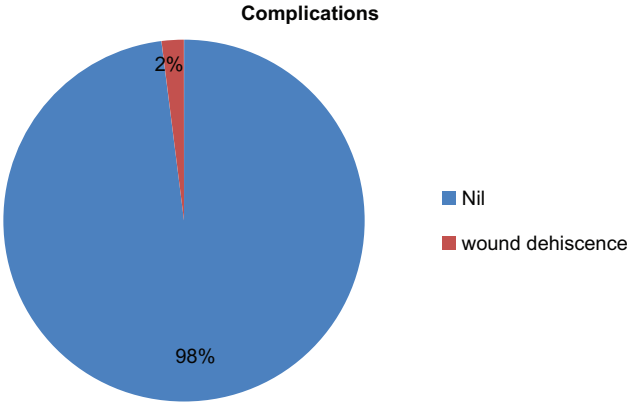
Subsequently, the anterior margin of the flap was approximated to the anterior edge and the posterior margin to the posterior edge of the denuded helical defect using multiple interrupted sutures (5–0 ethilon). The second stage of the procedure was performed 3 weeks after the initial surgery. During this stage, the flap was detached with caution, ensuring complete coverage of the entire defect, and then repositioned using fine non-absorbable sutures. In this technique, cartilage was not utilized, and the majority of the defects involved the upper helical rim. The post-auricular region was chosen as the ideal donor site due to its proximity and color match with the helical rim.

The donor site defect of the flap was primarily closed when the defect was small, whereas a skin graft was used to cover larger defects. A non-adhesive firm dressing was applied, and sutures were removed on the 7th post-operative day. Detailed patient information, including demographic characteristics and the techniques employed, is found in Table 1. In addition, the illustrations [Figures 1-3] provided depict the surgical procedure.

RESULTS

The study reported positive outcomes from the two-stage retroauricular flap reconstruction technique used to address partial ear defects. Among the 21 cases of partial ear defects, 8 superiorly based and 13 inferiorly based retroauricular flaps were designed, resulting in excellent survival rates and achieving a good texture and color match. Aesthetic outcomes were considered satisfactory in 19 patients, with only 2 patients experiencing wound dehiscence during follow-up, which healed through secondary intention.

The survival of the flaps can be attributed to their robust vascular supply, which enables reliable restoration of the anatomical contour and a natural appearance. As a result, there is an improvement in symmetry and aesthetics, leading to high patient satisfaction rates. However, in cases where superiorly based flaps were used and the hair-bearing area cranial to the auricle was incorporated into the flap, the presence of hair over the ear was deemed unsatisfactory, particularly for female patients. This issue was later addressed by employing laser epilation as the preferred method to minimize hair growth on the flap while maintaining its aesthetic qualities.



Outcome of Two stage Retroauricular Flaps

Outcome	No. of patients (%)
Uneventful healing	19 (90.4)
Wound dehiscence	2 (9.6)
Total	21 (100)

AESTHETIC OUTCOME	Male[9]	Female[12]	TOTAL[21]
1. Hair bearing flaps	3[42.8%]	4[57.1%]	7[100%]
2.Notcing	2[50%]	2[50%]	4[100%]
3.Bulky flap	4[57.1%]	3[42.8%]	7[100%]
4.Scarring of donor region	1[33.3%]	2[66.6%]	3[100%]
5.Satisfaction rate	7[43.8%]	9[56.2%]	16[100%]

Table 1: Details of the patients and techniques used

S. No.	Age	Gender	Etiology	Site	Flap location	Donar site closure	Complication	Area treated
1	23	Female	Trauma	Middle 1/3rd	Superiorly based	Primary closure	Nil	Helix
2	44	Female	Trauma	Upper	Superiorly based	Primary closure	Nil	Helix
3	17	Male	Trauma	Upper+middle	Inferiorly based	Skin graft	Nil	Helix+superior crus of anti helix
4	32	Female	Trauma	Middle	Inferiorly based	Primary closure	Nil	Helix
5	25	Male	Trauma	Middle	Inferiorly based	Skin graft	Nil	Helix+scapha
6	41	Female	Trauma	Upper	Superiorly based	Primary closure	Nil	Helix
7	22	Male	Trauma	Upper	Inferiorly based	Primary closure	Nil	Helix
8	42	Male	Human Bite	Upper	Superiorly based	Primary closure	Nil	Helix
9	26	Female	Trauma	Middle	Superiorly based	Primary closure	Wound Dehiscence	Helix
10	45	Female	Trauma	Middle	Inferiorly based	Primary closure	Nil	Helix
11	53	Male	Trauma	Upper+Middle	Inferiorly based	Skin graft	Nil	Helix+superior crus of anti helix
12	19	Male	Trauma	Upper	Inferiorly based	Primary closure	Nil	Helix
13	35	Male	Human bite	Middle	Inferiorly based	Primary closure	Nil	Helix
14	16	Male	Trauma	Middle	Superiorly based	Primary closure	Nil	Helix+scapha
15	29	Male	Trauma	Middle	Superiorly based	Primary Closure	Nil	Helix
16	44	Female	Trauma	Upper	Inferiorly based	Skin graft	Nil	Helix
17	26	Male	Trauma	Upper	Superiorly based	Primary closure	Nil	Helix
18	39	Female	Trauma	Upper+middle	Inferiorly based	skin Graft	Wound Dehiscence	Helix
19	20	Male	Trauma	Upper+middle	Inferiorly based	Skin graft	Nil	Helix+superior crus of anti helix
20	37	Male	Trauma	Middle	Inferiorly based	Primary closure	Nil	Helix
21	51	Female	Human bite	Upper	Inferiorly based	Skin graft	Nil	Helix

Figure 1: (a) Intraoperative image showing exposed cartilage of the left ear following trauma. (b) Post-operative image of well-settled flap

DISCUSSION

Auricular reconstruction is a complex procedure due to the intricate structure of the ear. Distortions in the ear architecture can have a significant impact on facial aesthetics. There are various reconstructive options available, and the choice should be individualized based on each case and the surgeon's preference.[8] In addition to flap reconstruction, there are alternative methods such as spontaneous healing, skin grafts, and wedge excisions, which can be used to reduce auricular height. Flap reconstruction is primarily effective for one-third auricular defects. In cases where there is a wide defect (>2.5 cm) that cannot be repaired through resection and primary closure (<1.5 cm), flap techniques involving multi-stage reconstruction operations are chosen.[9]

In 1946, Brown and Cannon introduced the postauricular or auriculomastoid area as a donor site for free skin and composite grafts. Subsequently, postauricular flaps were used in staged partial and total reconstruction of the ear. These flaps are random pattern flaps with a robust vascular supply based on branches of the posterior auricular, superficial temporal, and occipital arteries. The use of a wide-based pedicle maximizes the availability of blood supply from the rich vascular retroauricular skin, thereby increasing the success rate of the reconstruction procedure. However, the main disadvantage of this flap is the need for a two-stage procedure.[10] The superior ear, posterior ear, and mastoid area provide a good match in terms of skin color and texture, resulting in excellent aesthetic results.[11]

In most cases, loss of cartilage can be tolerated for ear defects, and if the defect involves the loss of a portion of the helical defect, the flap can be folded onto itself to provide adequate thickness and support without requiring a cartilage graft.[12] Both superiorly based and inferiorly based two-stage retroauricular flaps are considered effective methods for repairing partial ear defects, offering high aesthetic and functional results with the restoration of ear architecture.[1]

However, the study suggests that inferiorly based retro-auricular flaps are superior to superiorly based retro-auricular flaps in terms of transferring tissue devoid of hairs.[13]

Before proceeding with reconstruction, it is important to identify and address patient-specific factors. The

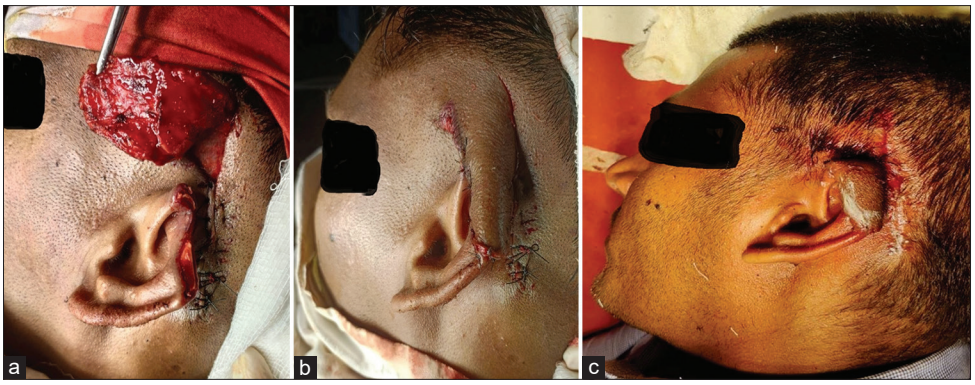


Figure 2: (a) Intraoperative image showing superiorly based retroauricular flap (b) Immediate post-operative image (c) Immediate post-operative image after division and insetting in a second-stage procedure

Figure 3: (a) Pre-operative image of left auricle defect post-human bite (b) Post-operative image after a well-settled flap

surgeon should discuss the patient's expectations and any comorbidities that may affect the feasibility of lengthy or multi-staged operations. Conservative treatment may be the best option for some patients, especially the elderly or critically ill, either due to necessity or patient preference. Secondary intention healing of full-thickness auricular defects has been evaluated, and it was found that all wounds healed within 10 weeks.[14] Exposed cartilage was not found to be a contraindication for secondary intention healing. Agrawal *et al.* have advocated primary reconstruction in all human bite, provided the wound is not infected clinically.[15]

CONCLUSION

The two-stage retroauricular flap is a versatile option for reconstruction of partial ear defects and is considered a viable solution in the management of auricular defects as a "flap bank" for ear reconstruction. While the use of two-stage retroauricular flaps shows promising outcomes in partial ear defect reconstruction, there are limitations to consider. Achieving flap thickness and contour match, particularly in patients with thin helical rims, can be challenging.

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How to cite this article: Narang B, Thakurani S, Gupta P. Two Stage Superiorly Based or Inferiorly Based Retroauricular Flaps in Partial Ear Defects. Int J Sci Stud 2023;11(5):34-37.

Source of Support: Nil, **Conflicts of Interest:** None declared.