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Sectorial Reconstruction of Auricular Helical and Lobular Defects in a Single Stage: A Clinical Experience and Appraisal of Available Techniques

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ABSTRACT

The ear is a complex three-dimensional structure with well-defined anatomic landmarks and contours. The auricular cartilage is sandwiched between firmly adherent, thin skin with minimal subcutaneous tissue. Reconstruction of auricular defects with like tissue offers the best aesthetic results. Unfortunately, there is a paucity of redundant local ear tissue, owing to the well-defined landmarks of the semi rigid cartilage framework and adherence of the overlying skin. This study included 20 patients of both sexes and of different ages who presented with either total loss of the earlobe or of a segment of the outer helix due to trauma, burn, or malignancy. They presented to the Plastic and Reconstructive Surgery Unit at the Alexandria Main University Hospital in the period from February 2000 through June 2002. The earlobe reconstruction was done in 8 patients suffering from complete ear lobe loss with variable amount of helix and antihelix, using 2 flaps, one from the anterior surface of the helix and antihelix and the other one from the retro auricular skin, it was done in a single stage with good aesthetic results in all cases. Helical rim reconstruction was done in 12 patients suffering from marginal defects of the external ear that affected the upper or the middle thirds of the helix and did not exceed one half of the vertical height of the ear. Reconstruction of these defects was done using the method described by Antia and Buch with some modifications; in 5 cases the defect extended onto the scapha, antihelix and triangular fossa, for these cases a modification of the Antia and Buch flap was done. The results were satisfactory, there was no cupping deformity or alteration in ear projection and it was done in a single stage in all cases.

INTRODUCTION

The anatomy of the external ear presents a unique reconstructive challenge. The difficulty of recreating a complex, three-dimensional, cartilaginous framework with a thin, tightly adherent skin cover has led some surgeons to the belief that reconstruction of partial defects of the ear is ideally performed using "like tissue" whenever possible **[1-5]**.

Treatment of earlobe defects usually includes local flaps. Many techniques require that the rest of the ear is in continuity with retro auricular skin and in this way, different flaps can be elevated from the mastoid region. With these techniques, the earlobe is usually reconstructed in two stages: first, the inferior part of the ear remnant is sutured to the mastoid skin and at a second stage, the flap is elevated. Some of the local flaps also require a skin graft to give posterior earlobe covering **[6]**.

Defects due to trauma, burn and oncologic resection often involve the helical rim, interrupting the marginal contour of the ear **[7]**. Helical defects have been reconstructed with a wide variety of techniques. Primary closure and wedge excision may produce cupping and helical notching deformities unless used to reconstruct very small defects **[8,9]**. Similarly, the use of contra lateral helical rim composite grafts is limited to small defects and is associated with donor-site morbidity. Post auricular advancement flaps **[10]**, tubed flaps **[11]** and banner flaps often require a multistage reconstruction and cartilage grafting **[12]**. Classic helical rim chondrocutaneous advancement flaps, in which the helix is completely freed from the antihelix using a "through-and-through" incision, have a narrow vascular pedicle with a tenuous blood supply **[8]**.

PATIENTS AND METHODS

This study included 20 patients of both sexes and of different ages who presented to the Plastic and Reconstructive Surgery Unit at the Alexandria Main University Hospital in the period from February 2000 through June 2002, with either total loss of the earlobe or of a segment of the outer helix due to trauma, burn, or malignancy.

The operative techniques were divided into 2 categories; the first one for earlobe reconstruction and the second one for reconstruction of marginal ear defect. The follow-up period ranged between 3 to 24 months with an average of 11 months.

I- *Earlobe reconstruction:*

Cases presenting with earlobe reconstruction were not pure earlobe but the loss usually extended to include parts of helix and antihelix. The present technique was not used for acute loss of the earlobe but one month at least should have passed between loss and reconstruction.

Operative technique:

A flap (Y) was designed from the anterior surface of the helix and antihelix based on the inferior part of the remaining ear and equal to the lost lobule (Fig. 1 Upper, Left). This flap was transposed inferiorly to become the posterior surface of the earlobe. For the anterior surface covering of the earlobe a retro auricular flap (X) (Fig. 1 Upper, Right) was elevated based on a medial pedicle. This flap was extended upwards along the retro auricular and mastoid region and it would cover the anterior surface of the earlobe and the defect created by elevation of the anterior flap. A little inferior extension (Z) (Fig. 1 Upper, Right) was added to this retro auricular flap. This extension would turn up behind the main flap to cover the inferior part of the new earlobe to give a reasonable normal roundness of the inferior part of the earlobe (Fig. 1 Lower, Left and Lower, Right).

II- *Marginal helical reconstruction:*

In case of the defect involves the upper or middle thirds of the helix and does not exceed one half of the vertical height of the ear, the classical Antia and Buch technique is used.

However, if the defect involves the scapha, antihelix and triangular fossa a modification of the above technique is used:

The skin and cartilage were incised along the helical crease from the root of the helix and in line with the base of the defect extending into the lobule. The posterior skin was widely mobilized off the posterior surface of the conchal cartilage and post auricular sulcus. A V-Y advancement of the helical root was done to facilitate closure (Fig. 2). The helical rim flaps were advanced together, without tension, attaining meticulous cartilage apposition and skin eversion using vertical mattress sutures. Conservative excision of redundant posteromedial auricular skin was performed, with care taken to maintain a wide vascular pedicle. A bulky protective dressing was then applied. In cases where the defect extended beyond the helical limit, we removed a crescent-shaped scaphal skin and cartilage (including portions of the triangular fossa and antihelix), extending from the site of the defect to the helical root sulcus. A Burrow's triangle of the anterolateral skin was then excised from the ear lobe (Fig. 3).

RESULTS

This study included 20 patients divided into 2 groups; the first comprised 8 patients suffering from total loss of the ear lobe. Their ages ranged between 24 and 52 with an average of 34 years. In five of them the loss was due to trauma and in the remaining 3 cases the loss resulted from tumor removal. Two cases in this group presented with complete loss of more than the lower half of the ear (Figs. 4,5), they wanted to be able to put on earrings. In those 2 particular patients we extended the use of the two flaps technique for ear lobe reconstruction to cover more than the lower half of the ear. The second group comprised 12 cases; 8 had full-thickness defects of the upper one-third of the auricle and the remaining 4 patients had full thickness defect of the middle third of the auricle. The ages of the patients in the second group ranged between 5 and 49 with an average of 29 years.

The results of the first group suffering from earlobe loss were satisfactory, the two patients who suffered the loss of more than the lower half of their ears were very satisfied, though the aesthetic result was not excellent, but they were happy because they could wear earrings. This technique is an easy one, the defect can be repaired in a single stage and with no skin grafting.

In the second group suffering from helical defect, the aesthetic results were good (Figs. 6,7), there was no cupping deformity or alteration in ear projection. It was found that there was minimal reduction of the vertical height of the reconstructed ears, which was unnoticed. The overall contour of the ear was more rounded than before resection and reconstruction, the reconstructed helix was more consistent with the architecture of the normal ear than when the repair has been accomplished by some of the other methods proposed and finally it is a single stage reconstruction.

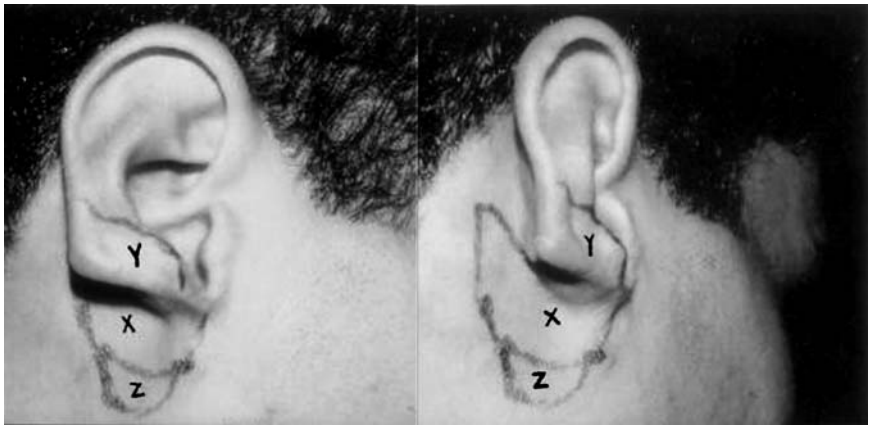

Fig. (1): (Upper, Left) Pre-operative view showing marking of the Y flap which is designed on the anterior surface of the helix and antihelix based on the inferior part of the remaining ear and equal to the lost lobule. (Upper, Right) retro auricular flap X which will cover the anterior surface of the earlobe and the defect created by elevation of the anterior flap. (Z) flap is a little inferior extension of X destined to complete the newly formed earlobe. (Lower, Left) early post-operative view showing a nice looking lobule anterior view. (Lower, Right) Post-operative posterior view showing direct closure of the donor site.

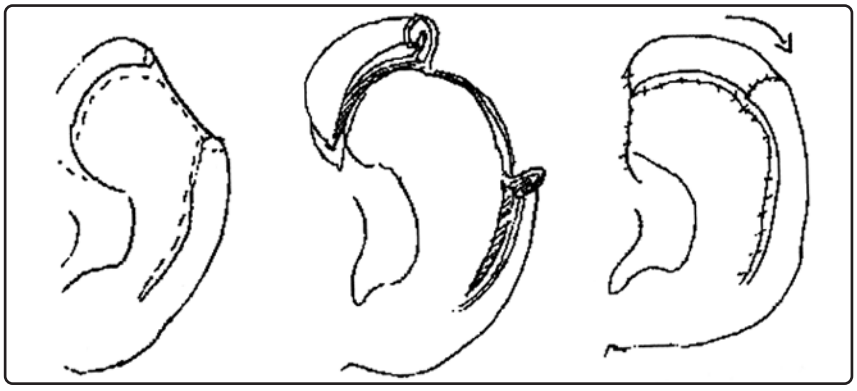

Fig. (2): The chondrocutaneous advancement flap as described by Antia and Buch transposes the adjacent helical margin based on a wide postauricular skin pedicle.

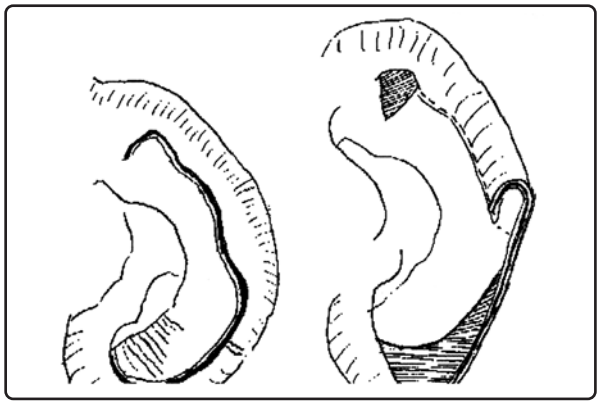

Fig. (3): (Left) Incisions are made along the helical sulcus, through the anterior auricular skin and cartilage extending from the root of the helix into the lobe. A crescent-shaped area of anterior scaphal skin and cartilage and a Burow's triangle of anterolateral earlobe skin are excised. (Right) The helical rim flaps are advanced and inset under no tension.

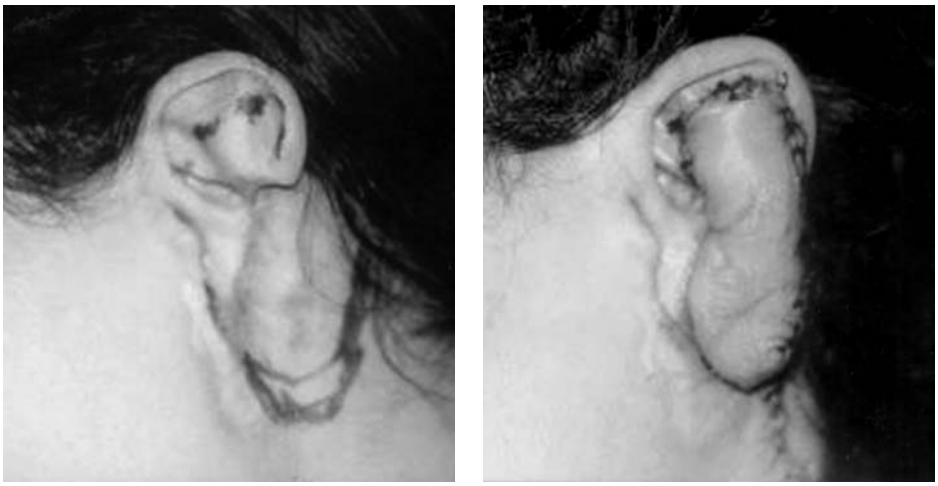

Fig. (4): (Left) pre-operative view showing traumatic loss of more than the lower half of the left ear. (Right) Early post-operative view showing the extent of the flap that covers most of the ear.

Fig. (5-A)

Fig. (5-B)

Fig. (5-C)

Fig. (5-D)

Fig. (5): (Upper, Left) Pre-operative view showing loss of the lower half of the left ear after tumour excision, it also shows the markings of the Y posterior flap. (Upper, Right) Showing the retro auricular anterior flap and it also shows the Z flap extension. (Lower, Left) Late post-operative view showing complete healing. (Lower, Right) posterior post-operative view showing direct closure of the donor site.

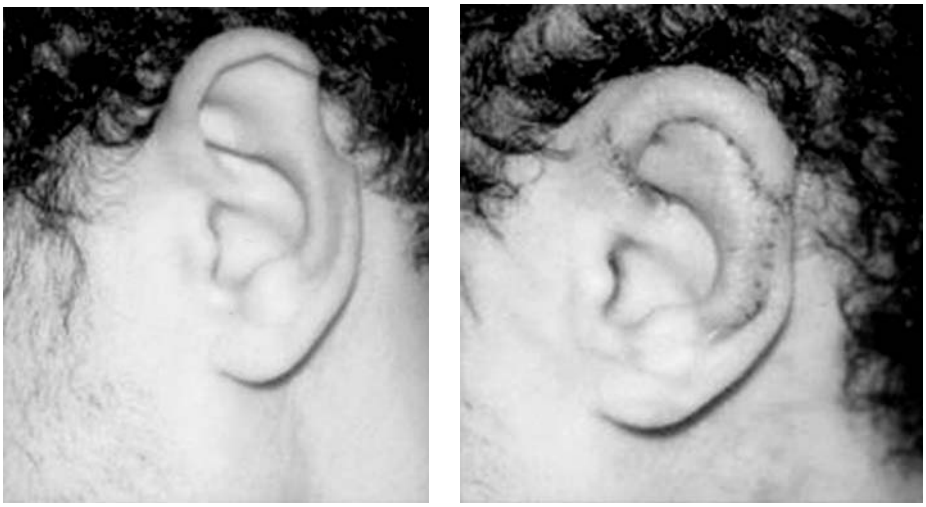

Fig. (6): (Left) Pre-operative view showing traumatic loss of middle third of the left helix. (Right) Early post-operative view showing near normal looking ear.

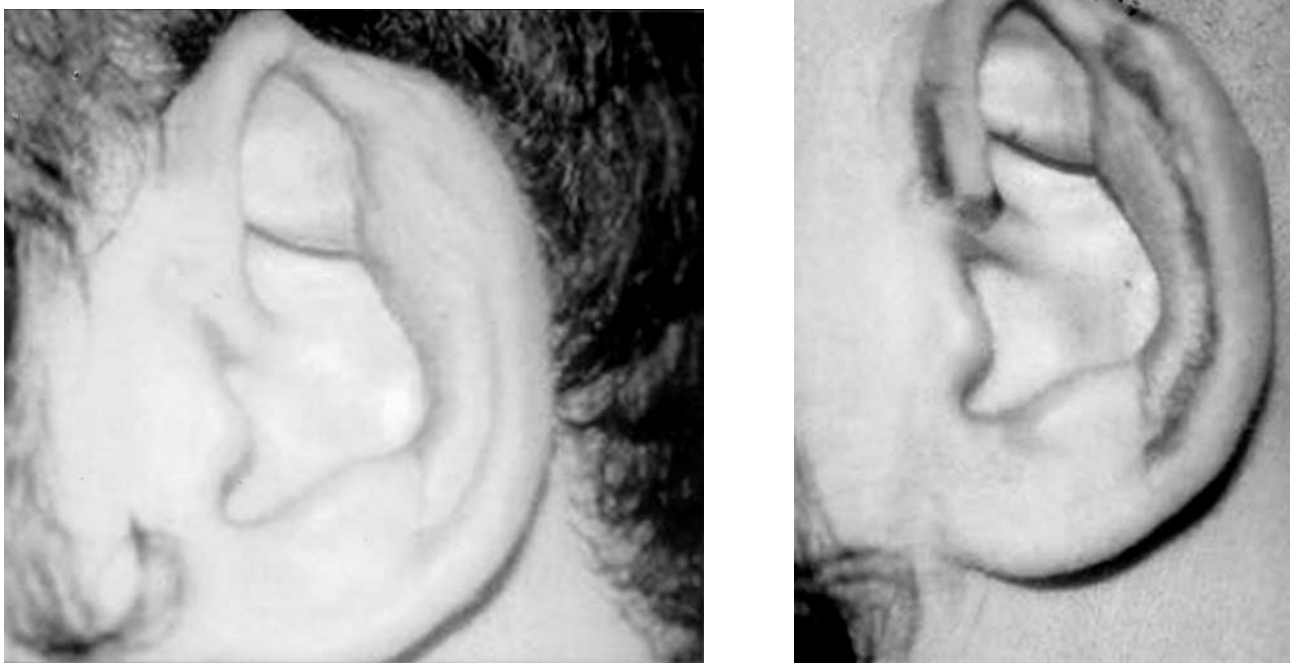

Fig. (7): (Upper, Left) Pre-operative view showing post-burn loss of the upper third of the left helix. (Upper, Right) Pre-operative marking. (Lower) Post-operative view showing a near normal looking ear.

DISCUSSION

Cosmetic aspects are the main problem for patients with congenital or acquired defects of the external ear. Extensive defects that cannot be solved by mere suturing require plastic surgery, which is very difficult to perform due to the anatomy of the ear and to the fact that the ears are situated in a very exposed position.

The earlobe is a portion of the ear which is difficult to reconstruct, basically because of its thickness and its fat content. The use of skin grafts for the posterior surface of the lobe makes the lobe thinner and gives it a poor appearance. We think that the two flaps technique is another one to be borne in mind for earlobe reconstruction, especially when the edge of the defect is hanging free and in cases where the loss includes more tissue than the lobe.

It is difficult, if not impossible, to duplicate the helix, due to the delicate and intricate architecture of the chondrocutaneous sandwich of the external ear. A composite auricular graft from the opposite ear has been advocated as the most appropriate tissue for reconstruction. This is at best a hazardous procedure and should only be attempted for minor losses.

The technique of chondrocutaneous flap advancement as described by Antia and Buch **[13]** is an ingenious and highly rewarding method of helical rim reconstruction. The cosmetic result is usually excellent, with minimal changes in ear shape and size. The surgical scars are well camouflaged, being hidden in the natural shadows and indentations of the ear.

The operative technique, as suggested here for extended antihelix and scaphal defects, permits a transfer of tissue of the same quality and of a larger quantity in a relatively safe way. The reconstructed ear clearly has a more rounded appearance and moreover, anatomic landmarks of the reconstructed ear are preserved. This technique is an excellent alternative to periauricular skin flaps with or without cartilage grafting for large marginal defects extending beyond the helical rim.

Alternative techniques may be more complicated and less satisfactory **[12,14]**. A post auricular flap and cartilage graft may require more than one stage and the helical contour is usually bulky or blunted. A cervical or mastoid pencil tube flap requires three stages and can leave significant donor site scars. An auricular composite graft from the contra lateral ear may not take reliably and results in bilateral ear scars.

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