

Surgical Reconstruction for Partial Auricular Defects

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ABSTRACT

Introduction: Ear reconstruction is a challenging form of surgery. Acquired defects of the ear may be secondary to trauma, burn, or infection. Different ear reconstruction procedures require good understanding of the 3D architecture of the ear, analysis of the defect, reconstruction of harmonious missed parts of the framework, and wise dealing with the skin envelope.

The aims of this work are to formulate a strategic approach for management of partial auricular defects, presenting our experience in this demanding form of reconstruction, and to review the literature.

Patients and Methods: Thirty one patients with auricular defects of different causes were included in this study. The study was conducted in Plastic Surgery Department, Assiut University Hospital during the period from October 2013 to January 2015. Defects were classified into upper, middle, and lower third defects. Different surgical procedures and fasciocutaneous flaps were used according to the site and composition of each defect. Cartilaginous frameworks were fashioned and used in 13 cases in the composite defects. Results were evaluated through clinical assessment, patients' satisfaction, and the percentage of complications.

Results: The average age of the patients was 23 years. The ear defects were in the upper third in 12 patients, in the middle third in 8 patients, and in the lower third in 11 patients.

By clinical assessment, our results were considered to be excellent in 11 cases, good in 18 cases, and fair in 2 cases. Complications were in the form of partial skin necrosis in 2 cases, infection in 3 cases, and hypertrophic scarring in 4 cases.

Conclusion: Both framework reconstruction and soft tissue coverage are mandatory for auricular reconstruction. Autogenous rib cartilage or conchal cartilage could be used for framework reconstruction and choosing the optimal flap for further skin coverage is crucial to get the optimal results and to avoid complications. Chondrocutaneous advancement flaps, post auricular flaps, and double crossed skin flaps are very valuable options in reconstruction of upper, middle, and lower thirds auricular defects respectively.

INTRODUCTION

The external ear is a critical component of the overall aesthetic balance and contour of the face.

It is characterized by a unique three dimensional topographic shape, so, slight alterations in the size, shape, location, or position of the ear are easily recognized, especially when compared with the opposite "normal" ear [1].

Accurate reconstruction of acquired auricular defects is one of the most challenging procedures in plastic surgery due to the unique shape of the auricle, the convexities and concavities of the cartilage, complex tissue structure, and auricle's tenuous blood supply [2].

Acquired segmental defects of the ear may be due to trauma, burn, previous surgery, or infection, and the goal of reconstruction of the auricle is gaining normal appearance, position, and symmetry with respect to the contralateral normal one [3].

Every effort should be made to produce an ear that the surgeon can present without apology and that the patient can expose without embarrassment. [4].

Different ear reconstruction procedures require good understanding of the 3-dimensional architecture of the ear and learning the step-by-step construction of a harmonious framework and how to deal with the skin envelope [3].

PATIENTS AND METHODS

Thirty one patients were included in this study with auricular defects of different causes. All patients were treated in Plastic Surgery Department, Assiut University Hospital during the period from October 2013 to January 2015. Of these patients, 19 were males and 12 were females. The average age of the patients at the time of the initial surgery was 23 years (range from 9 to 53 years).

Patients presented for secondary auricular reconstruction were excluded from this study.

All patients were subjected to full history, general examination, and local examination of the deformed auricle to assess anatomical site, size, composition of the defect, and the condition of the peri-auricular skin. Doppler assessment for the regional blood vessels was performed when needed.

By drawing two horizontal lines from point A (at the junction between the lower crus of the anti-helix with the root of the helix), and point B (at the lower edge of the tragus), the defects were classified into upper (13 cases), middle (7 cases), and lower third auricular defects (11 cases) (Fig. 1).

The choice of the used techniques was based on anatomical site, size, composition of the defect, and the condition of the surrounding tissues.

The study included thirteen cases of composite defects. For these composite defects, we used autogenous rib cartilage for structural support in eight defects that consisted of 25% or more of the helical rim, and five conchal cartilage grafts from the opposite normal ear were used in smaller defects.

Repositioning and anatomical repair were done in three cases presented by avulsion and severe laceration. Full thickness skin grafts were used in three auricular defects with intact perichondrium. Other fasciocutaenous and chondrocutaenous flaps were used for further skin coverage as shown in (Table 1).

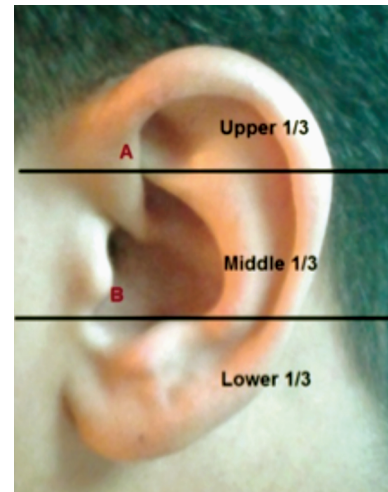


Fig. (1): Auricular defects are classified into upper, middle, and lower third auricular defects according to two horizontal lines extending from points "A", and "B".

Table (1): Techniques used for skin coverage.

Flap	Number of cases	Location of the defects	Percentage
Anatomical repair	3	Upper, middle, and lower third	9.7
Full thickness skin graft	3	Middle third	9.7
Posteriorly based postauricular flap	7	Middle third	22.6
Superiorly based postauricular flap	2	Upper, and middle third	6.4
Chondrocutaenous advancement flap	5	Upper, and middle third	16.1
Superiorly based transposition flap	3	Upper third	9.7
Double crossed skin flap	5	Lower third and lobule	16.1
Gavillo transposition flap	3	Lower third and lobule	9.7

RESULTS

Thirty one acquired auricular defects were reconstructed using different techniques.

Of these defects, 16 cases (51.6%) were due to trauma, mostly due to motor car accidents and human bites. 10 cases (32.3%) were due to burn injuries, and 5 cases (16.1%) were due to previous infection.

Complications were not serious and occurred mostly in the post-burn deformed cases as shown in Table (2).

Table (2): Types of complications.

Type of complications	Number of cases	Percentage
Superficial skin necrosis	2	6.4
Infection	3	9.7
Hematoma	2	6.4
Hypertrophic scarring	4	12.9
Minimal pleural tear	1	3.2

Evaluation of the results had been done for every case after 3 months from the last procedure, and our evaluation depended on clinical assessment, complications, and patients' satisfaction.

Clinical assessment for the degree of symmetry, projection, color match, shape and size of the reconstructed ear was done and was considered to be the most important factor in outcome. The details of the reconstructed ear were also assessed as secondary factors.

By clinical assessment, the results were considered to be excellent in 11 cases, good in 18 cases, and fair in 2 cases.

Twenty three patients were completely satisfied, and eight patients were satisfied.

Clinical cases:

Case 1:

A 20 years old male patient with post-traumatic auricular defect in the upper third of the auricle. Reconstruction was done by local tissue rearrangement with chondrocutaneous advancement flap (Fig. 2).

Case 2:

A 28 years old male patients with post-traumatic middle third auricular defect. Reconstruction was done by chondrocutaneous advancement flap (Fig. 3).

Case 3:

A 30 years old male patient with post-traumatic loss of the helix in the middle and lower third of the auricle. Reconstruction was done by autogenous rib cartilage for structural support and superiorly based postauricular flap for skin envelope (Fig. 4).

Case 4:

A 15 years old male patient with post-traumatic loss of the helix in the middle third of the auricle. Soft tissue reconstruction was done using posteriorly based postauricular flap in the first stage and flap separation one month later (Fig. 5).

Case 5:

A 35 years old male with post-traumatic loss of the lower third of the auricle and the ear lobule. reconstruction of the framework was done by conchal cartilage from the opposite ear and skin coverage was done using the double crossed-skin flap (Fig. 6).

Case 6:

A 18 years old male with post-traumatic avulsed and severely lacerated auricle. Reconstruction was done by repositioning of the avulsed auricle and anatomical repair of the cartilage and skin envelope (Fig. 7).

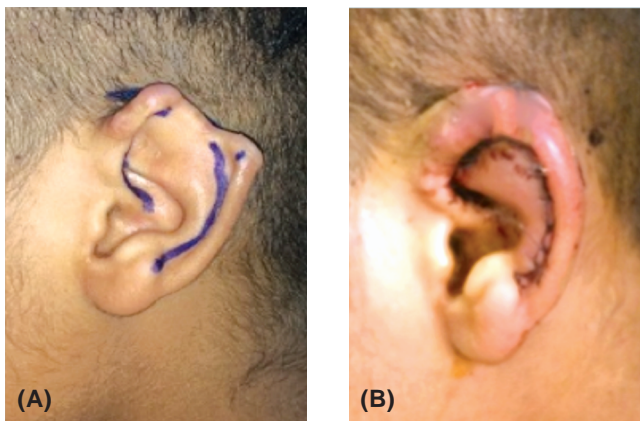


Fig. (2): Chondrocutaneous advancement flap for reconstruction of a post-traumatic upper third auricular defect in a 28 years old male patient. (A) Preoperative view. (B) Postoperative view.



Fig. (3): Chondrocutaneous advancement flap for reconstruction of a post-traumatic middle third auricular defect in a 26 years old male. (A) Preoperative view. (B) Flap marking. (C) Postoperative view.

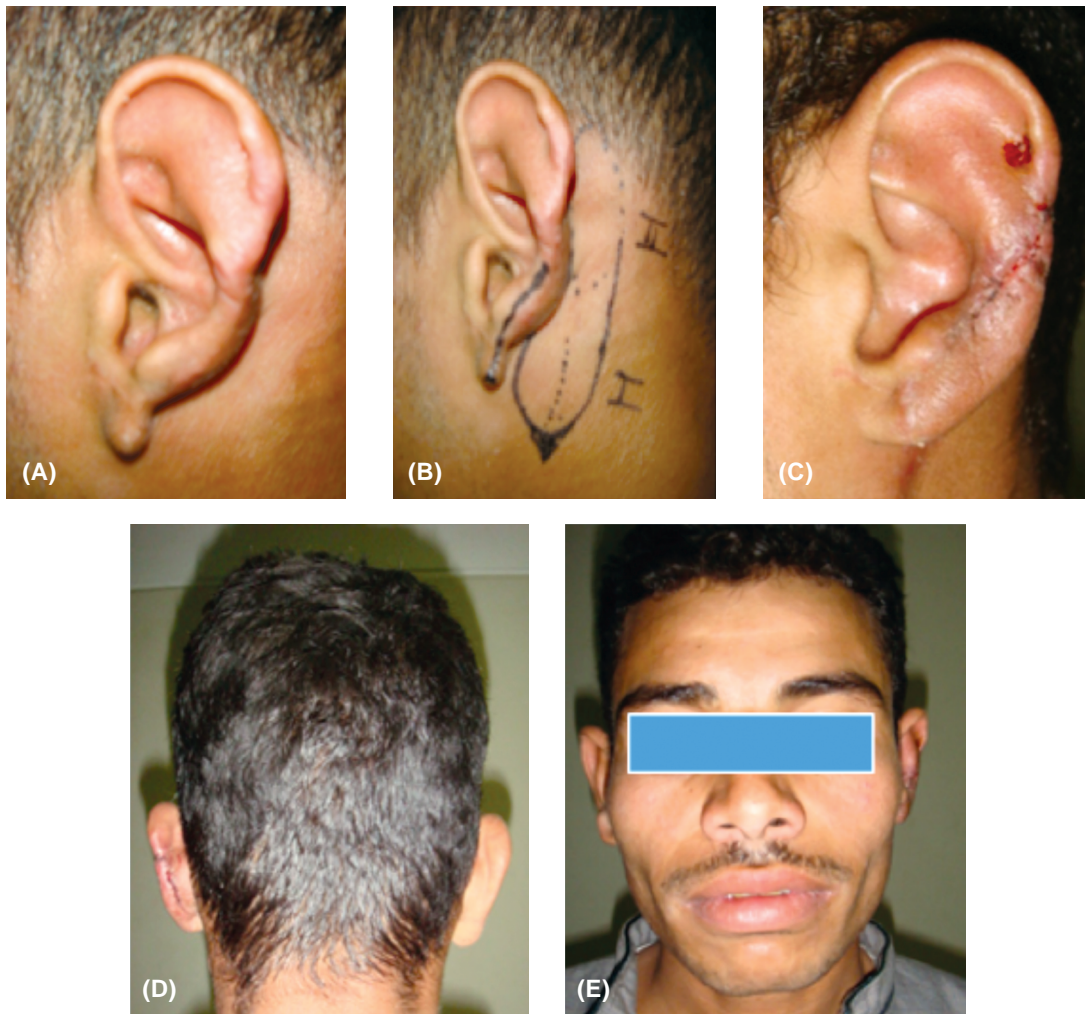


Fig. (4): Autogenous rib cartilage and superiorly based postauricular flap for reconstruction of the helix of a post-traumatic deformed ear in a 20 years old male patient. (A) Preoperative view. (B) Flap marking. (C) Postoperative view. (D) Posterior view. (E) Anterior view.

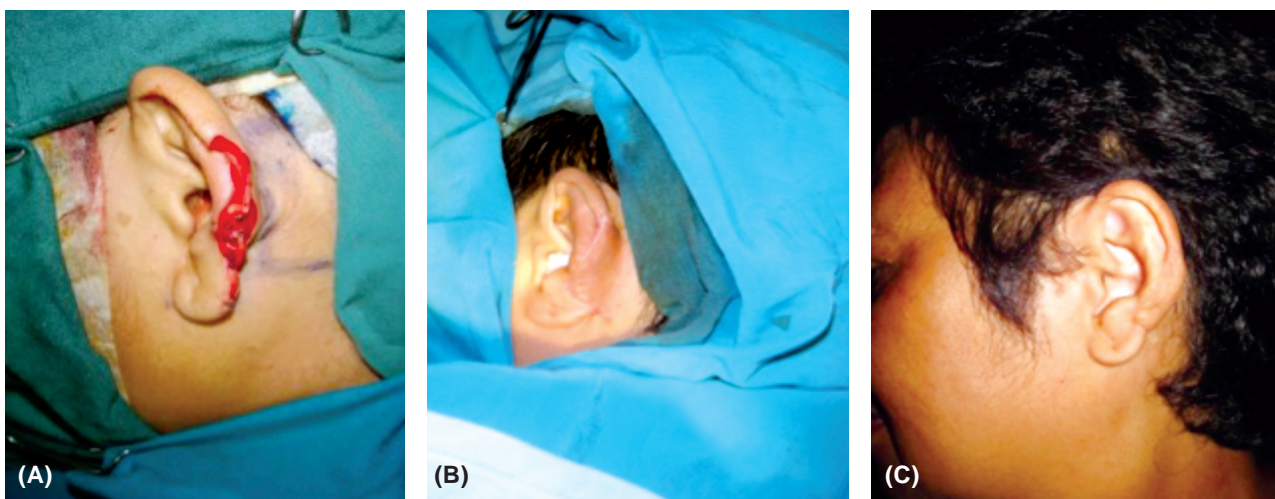


Fig. (5): Posteriorly based postauricular flap for reconstruction of the helix of a post-traumatic deformed ear in a 16 years old male patient. (A) Preoperative view. (B) Flap before separation. (C) Postoperative view after the second stage.

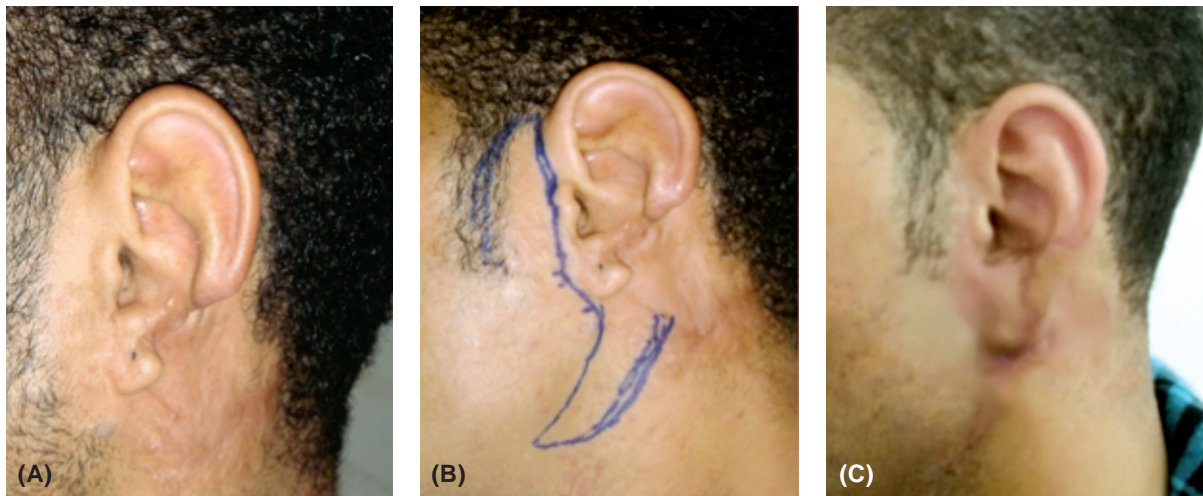


Fig. (6): Double-crossed skin flap for reconstruction of the lower third defect and lobule of a post-traumatic deformed ear in a 35 years old male patient. (A) Preoperative view. (B) Flap marking. (C) Postoperative view.

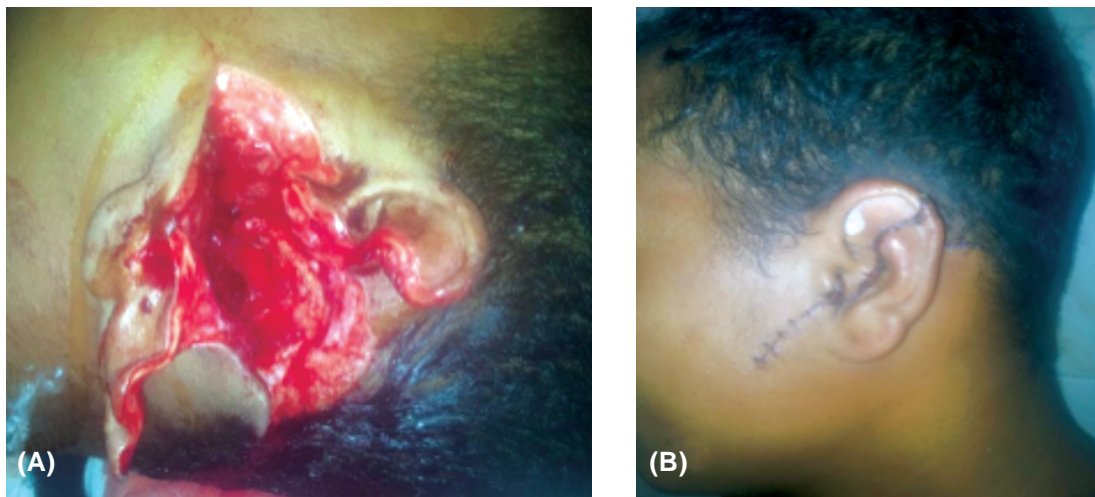


Fig. (7): Repositioning and anatomical repair of an avulsed and severely lacerated auricle in a 16 years old male patient. (A) Preoperative view. (B) Early postoperative view.

DISCUSSION

Trauma due to motor car accidents followed by human bites is the most common cause of acquired ear deformities [5]. Burns are the second most common cause and most of the complications usually occur during reconstructing the post-burn deformed ears due to the densely scarred surrounding tissue and the tenuous blood supply [6].

Auricular lacerations, partially avulsed or segmentally avulsed auricles should be repaired and reattached in a layered fashions, all the components of the cartilaginous framework should be reattached, and every effort should be done to restore the normal topographic details of the auricle [5].

The retroauricular skin is considered a flap bank for ear reconstruction. It is an ideal donor

site because it is richly vascularised, it is hidden behind the ear, and it is very similar to the skin of the ear and the face [7].

Nine postauricular flaps were done in our study mostly for helix reconstruction and the results were excellent to good. This mean that the postauricular flap is a very important flap for partial ear reconstruction, and we agree with many authors that the flap gives its optimal results only in cases of soft tissue defect, but, if there is a significant framework defect, a cartilage graft should be used for structural support [8,9].

The 8th rib cartilage is easy to harvest with low risk of pleural tear and it could be easily fabricated to reconstruct the missed part of the cartilaginous frame of the auricle.

Conchal cartilage shouldn't be overlooked as a very valuable cartilage graft for framework reconstruction in the small composite defects of the auricle. It is very easy to harvest without any donor site morbidity.

Helical rim defects and wedge-shaped defects of the upper and middle thirds up to 2.5cm can be reconstructed by modified chondrocutaneous advancement flaps. The benefits of these flaps include excellent morphological reconstruction with preservation of the normal anatomical landmarks, hidden scars, technical simplicity, lack of donor site morbidity, and low risk of flap necrosis. Furthermore, it is a single staged operation with easy learning curve. It is found that the resulting auricular reduction is not important as it is not seen in the lateral profile [10].

For ear lobe and lower third auricular reconstruction, we agree with many authors [11,12], that the double-crossed skin flap, taken from preauricular skin, is a very important flap. It is simple and could be performed under local anesthesia. It allows an immediate, one stage reconstruction of the entire earlobe. No skin grafts are used and the size and thickness of the flaps may be trimmed to the exact size of the defect.

Conclusion:

Framework reconstruction and wise dealing with the skin envelope are mandatory for partial ear reconstruction [1].

Autogenous rib cartilage is needed for structural support in composite defects involving more than 25% of the helix, and conchal cartilage should be used in smaller defects [13].

Choice of the proper technique for skin envelope reconstruction, depends on site, size, composition of the defect, and choosing the optimal flap for skin coverage is crucial to get optimal results and to avoid complications.

Post auricular flaps (superiorly or inferiorly based), chondrocutaneous advancement flaps, and

double crossed skin flaps are our recommended tools in reconstruction of upper, middle, and lower thirds auricular defects respectively.

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