

Outcome of Reconstructive Surgery of the Auricular Defects Among Sudanese Population (January 2021 to January 2022)

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ABSTRACT

Background: Auricular deformity is a major problem and topic of interest since ancient history. The methods of repair have similar basis, but modifications through centuries led to improve the outcome and avoid recorded complications. The shape and variation of auricle size made reconstruction of auricle a challenging process, and meticulous planning and delicate surgery must be provided to redecorate the distrusted auricle.

Objective: To assess the outcome of auricular defect reconstruction in Sudanese patients.

Patients and Methods: Cross-Sectional, Multi-centric study (Soba University Hospital, Khartoum North teaching hospital and Association specialized hospital), Khartoum, Sudan. Eighty patients who underwent auricular reconstruction during the period from 2021 to 2022 were included. All patients of auricle defects of different age groups of various aetiologies were included, while those who have congenital deformities and victims of burn have been excluded. Defects have been classified according to the part involved to: upper, middle and lower thirds.

Results: Out of eighty patients 57.5% were females, and 42.5% were males. The etiology of auricular deformity in majority 55% was trauma, 36.3% was keloid, 3.8% was malignancy, and only 2.5% was due to piercing. According to site of deformity, right ear was involved in 46.3% of patients, left ear in 43.8%, and 10% were bilateral. Surgery in 35% of patients were immediate, while in 65% were delayed. Primary repair was used in 40%, followed by intralesional excision in 36.3% and local regional flap in 16.3%. Visual satisfaction was excellent in 22.5%, acceptable in 42.5%, and poor in 5%. Majority of patients didn't develop any complications.

Conclusion: Acquired auricular defects are a major problem, disrupting the aesthetic component of the face of substantial number of population. Also we conclude that the results of our study are consistent with those reported in the literature. In future local and national studies should be performed, and accordingly protocols and guidelines should be instituted, so that this problem can be managed properly.

Key Words: Auricular defects – Ears – Pinna reconstruction.

Disclosure: No conflict of interest.

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Ethical Committee: Patient confidentiality will be maintained and data will be collected after full explanation of purpose of research and obtaining of an informed consent.

INTRODUCTION

Ears are organs characterized by complicity of anatomy, development, functions and even aesthetic aspects. Due to their position on the sides of head, they are considered as part of the face. Auricular deformities similar to other abnormalities affecting the face can be recognized easily even if it is small, and the impaction of ear distortion will definitely affect individuals.

Auricular reconstruction is not a new science but attempting repair of ear deformity was found in history, and the first record was 3000 BC. The base and thoughts created in the past centuries extended through the years to establish the foundation of new methods. In the 19th century ear reconstruction started to be applied and remodeling of auricular structure developed. Sequentially in 20th century evolution of auricular reconstruction reached its maximum and modern techniques were designed to meet the goals of reconstruction [1-3].

Auricular deformities can be produced by trauma, tumors, burn or complication of otoplasty. The aim of auricular reconstruction is to reestablish acceptable shape of the ear and subsequently improve individuals' quality of life [4,5].

Acquired auricular injury can be categorized according to site, size, and tissue involved, the plan should be suited to fit the goals of reconstruction. The reconstructing ladder begins with primary repair and steps up to more complicated methods as free flap.

PATIENTS AND METHODS

This is a cross-sectional hospital based, multi-center study performed to assess the outcome of

auricular reconstruction among Sudanese population in Khartoum, Sudan, during the period from January 2021 to January 2022. All Sudanese patients of acquired auricular deformity who underwent reconstructive surgery during period from January 2021 to January 2022 were included. Patients with congenital abnormalities and burn were excluded. Data were collected by using direct structured newly designed questionnaire interviews and part of information taken from medical records.

Ethical consideration:

Patient confidentiality will be maintained and data will be collected after full explanation of purpose of the research and obtaining an informed consent.

RESULTS

In this study 80 patients have been included.

Among them 2 (2.5%) were within the age group of 5-15 years, 34 (42.5%) within 16-25 years, 27 (33.8%) within 26-35 years, 12 (15%) within 36-45 years, and 5 (6.3%) were >45 years old (Fig. 1).

Gender distribution showed majority were females 46 (57.5%) while 34 (42.5%) were males and female to male ratio was 1.3:1 (Fig. 2).

According to ear deformity results display that the most ear involved is right 37 (46.3%), left 35 (43.8%) and bilateral involvement is the least frequent 8 (10%) (Fig. 3).

In this study, anatomical classification of defects was used in combination with tissue involved. Defects have been categorized into; Upper labeled as A, Middle as B, lower as C, and subtotal as D, then A and B subcategorized into; skin only branded as 1, cartilage as 2, while full thickness (skin and cartilage) branded as 3 (Table 1).

In this study upper and lower parts were equally affected; with 28 (35%) frequency for each, followed by middle part in 22 (27.5%) and subtotal in 2 (2.5%) (Fig. 3).

In general this study showed the most common cause of auricular deformities was trauma 44 (55%), in 29 (36.3) keloid, in 3 (3.8%) malignancy, in 2 (2.5%) piercing, and in 1 (1.3%) benign tumor similar to infection. Among malignancy 2 (2.5%) of cases were basal cell carcinoma (BCC) and 1 (1.25%) were squamous cell carcinoma (Table 2, Fig. 4).

According to anatomical classification the most common cause of upper third defect (A) was trauma in 22 (27.5%) followed by malignancy in 3 (3.75%) and keloid in 3 (3.75%). While in middle third (B) trauma comes first in 16 (20%) then benign tumor in 1 (1.25%), keloid in 1 (1.25%) and piercing in 1 (1.25%). In lower third (C) the prominent cause is keloid in 23 (28.7%) followed by trauma in 4 (5%) and piercing in 1 (1.25%).

Interval for reconstruction was either immediate or delayed. Immediate in 28 (35%) and delayed in 52 (65%) respectively (Fig. 5).

Bulk of cases 32 (40%) underwent primary repair by approximation of edges, in 29 (36.3%) repair attempted by intralesional excision and primary repair, in 13 (16.3%) local regional flap (post auricular flap), in 5 (6.3 %) skin graft was used, and 1 (1.25%) patient was managed with debridement. (Table 3, Fig. 6).

According to stages of reconstruction, 67 (83%) were single surgery, 9 (11.3%) were two stages, 3 (3.75%) were three stages, and 1 (1.25%) were more than three stages (Fig. 7).

Based on modified classification, (A) was managed by single stage procedure in 22 (27.5%) and by two-staged in 5 (6.25%) and three-staged in 1 (1.25%); (B) was repaired by single stage in 17 (21.2%), by two-staged in 3 (3.75%), three-staged in 1 (1.25%) and more than 3 stages in 1 (1.25%), while (C) was treated by single stage in 28 (35%). Formal reconstruction for class (D) needed two-staged procedure in 1 (1.25%) and three-staged in 1 (1.25%).

Total of patients who required cartilage graft to support the skeleton of the auricle was 4 (5%); cartilage were harvested from the auricle in 2 (2.5%), and another 2 (2.5%) were from costal cartilage.

More than half did not develop complications, and other suffered wound infection 11 (13.8%), skin necrosis 5 (6.3%), asymmetry 7 (8.8%), loss of shape 3 (3.8%) and hematoma 1 (1.3%) (Table 4, Fig. 8).

Linking complication to modified classification, infection occurred in 7 (8.75%) of A3, in 2 (2.5%) of B3, 1 (1.25%) of C and in 1 (1.25%) of D. Skin necrosis in 1 (1.25%) of A1, in 1 (1.25%) of B3 and in 3 (3.75%) of C. Asymmetry resulted in 1 (1.25%) of each A1, A3, B1 and B3; and in 3 (3.75%) of C. Loss of shape happened in 1 (1.25%)

of each of B1 and B2 beside in 1 (1.25%) of D. Hematoma just occurred in 1 (1.25%) of D.

Satisfaction was excellent in 18 (22.5%), good in 34 (42.5%), natural in 18 (22.5%), fair in 4 (5%) and poor in 6 (7.5%) (Fig. 9).

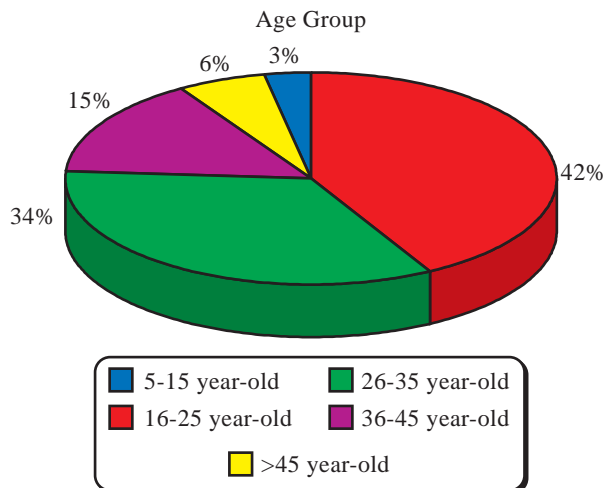


Fig. (1): Patients' distribution according to age groups.

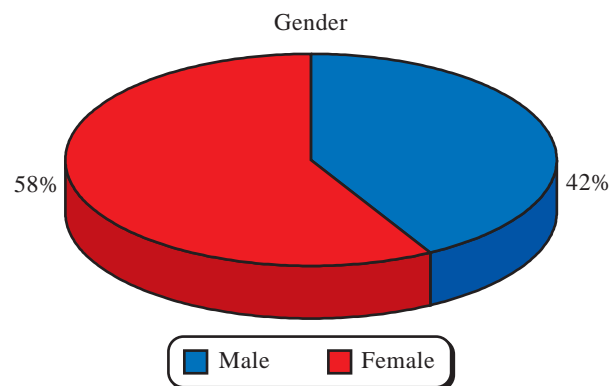


Fig. (2): Patients' distribution according to gender.

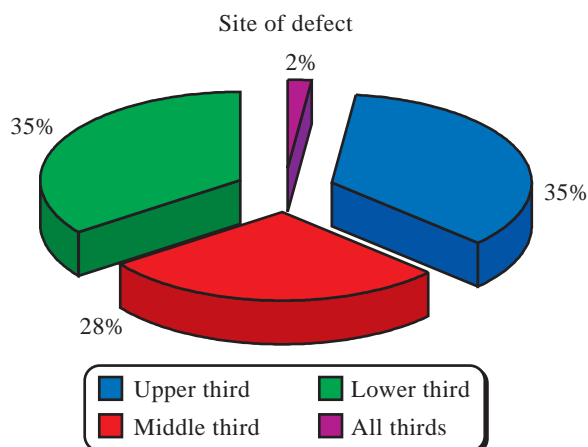


Fig. (3): Patients' distributions according to site of defect.

Table (1): Modified classification of auricular defects.

Upper third (A)	A1 cutaneous defect A2 cartilaginous involvement A3 Full thickness (cartilage and skin) involvement
Middle third (B)	B1 cutaneous defect B2 Cartilaginous involvement B3 full thickness involvement
Lower third (C)	Skin and subcutaneous tissue
Subtotal (all parts) (D)	Full thickness

Table (2): Aetiology of auricular deformity.

Aetiology	Frequency	Percent
Trauma	44	55.0
Malignancy	3	3.8
Benign tumor	1	1.3
Keloid	29	36.3
Infection	1	1.3
Piercing	2	2.5
Total	80	100.0

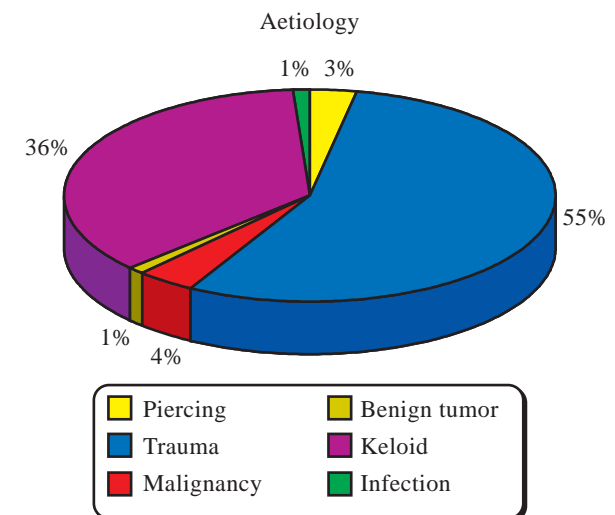


Fig. (4): Aetiology of acquired auricular defects.

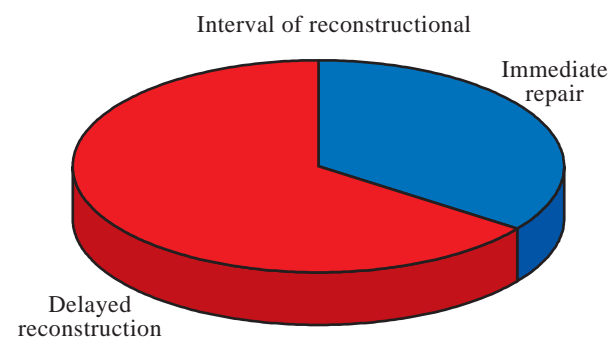


Fig. (5): Surgical interference according to interval of reconstruction.

Table (3): Methods of reconstruction distribution.

Method of reconstruction	Frequency	Percent
Primary repair	32	40.0
Skin graft	5	6.3
Intralesional excision and primary repair	29	36.3
Local regional flap	13	16.3
Debridement	1	1.3
Total	80	100.0

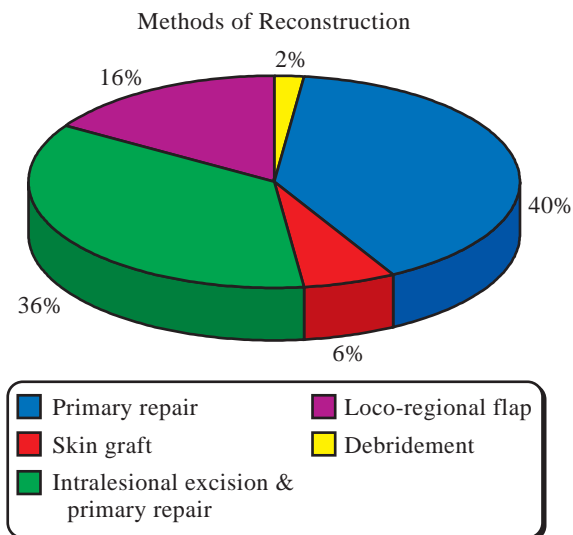


Fig. (6): Methods of reconstruction distribution.

Table (4): Frequency and percentage of complications.

Complication	Frequency	Percent
Hematoma	1	1.3
Wound Infection	11	13.8
Loss Of Shape	3	3.8
Asymmetry	7	8.8
Skin Necrosis	5	6.3
Total	27	33.8

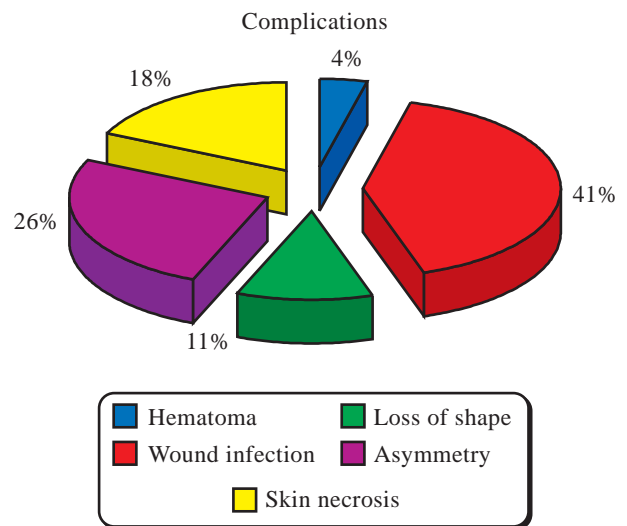


Fig. (8): Post-operative complications.

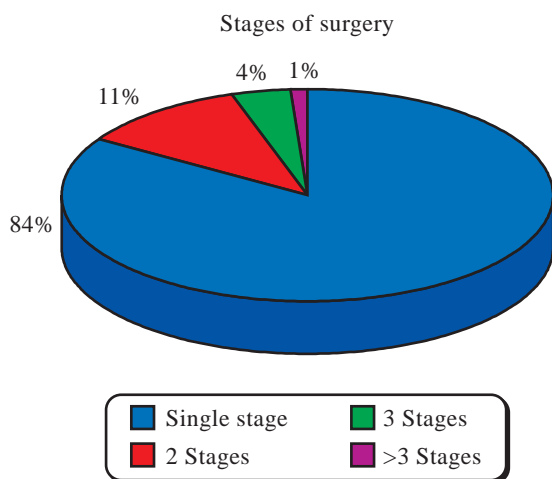


Fig. (7): Stages of surgery.

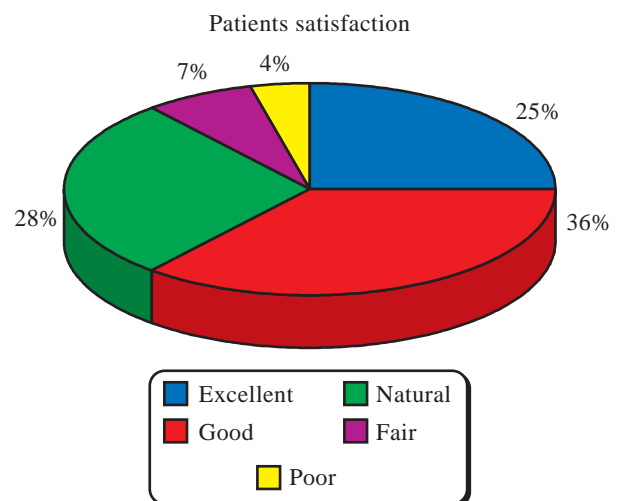


Fig. (9): Classification of patient's satisfactions.



Fig. (10): Patient with massive keloid underwent intralesional excision.



Fig. (11): Patient with traumatic ear amputation underwent multi-stages reconstruction.

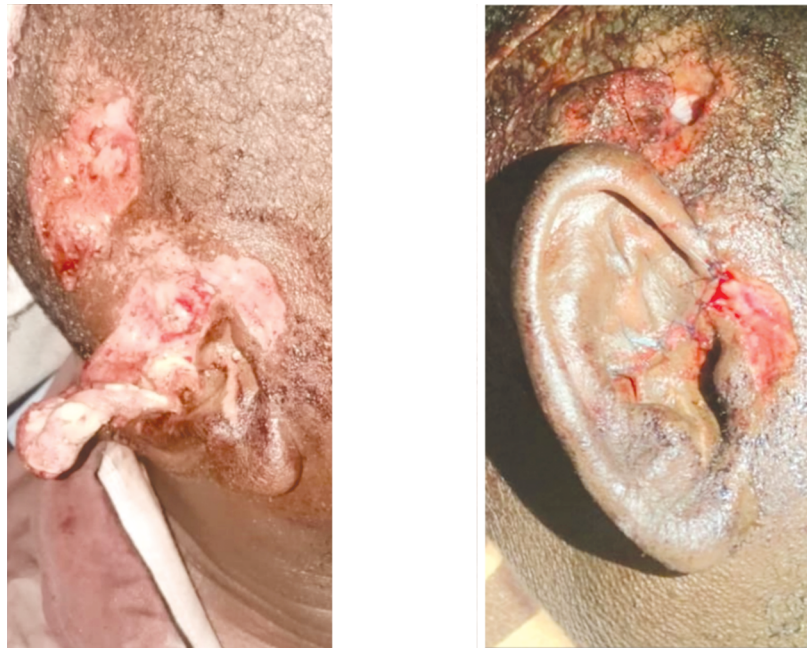


Fig. (12): Patient of traumatic subtotal auricular tear underwent primary repair.



Fig. (13): Patient with partial helical loss underwent post-auricular (tube) flap.

DISCUSSION

Auricular deformity is a major problem affecting the life of a lot of population. Those people will use head covers to hide these deformities and may even prefer to isolate themselves. The most of aetiology of deformities are not preventable. Reconstruction of auricle is complex as its structure and small defect if it is not accurately managed will cause another deformity. For this reason it

was chosen to study the outcome of the suffering population and assess the causes, and extension of deformity to provide maximal proper treatment.

In this study majority of patients 34 (42.5%) within age group of 16-25 years and 27 (33.8%) within age group 26-35 years, and this group is considered active population. Similar to Dr Shameem Ahamed, who described a total of 45 cases with ear defects, with bulk of cases within

20-50 years [6]. In comparison to Ravikumar Gopalakrishnan, who studied 24 cases of acquired partial auricular defect and most of the cases were 31-40 years, this study showed slight shift of age group to younger population [7].

Female predominance in our study may be due to include keloid as one cause of deformities, but similar to many studies conducted to evaluate acquired auricular deformity. Karthik Shamanna et al., described management of auricular keloid, 22 patients were females and 8 were males [8].

Trauma is the main cause of disfigurement and male are more affected in our study, as many authors detailed in various study. In a study conducted in Nigeria, W.L. Adeyemo et al., reported their experience with prosthetic reconstruction of ear defects, that most causes of external ear deformity were due to trauma mainly road traffic accidents [9]. Regarding malignancy, in this study basal cell carcinoma (BCC) more than squamous cell carcinoma (SCC), and same report published by Erdoğan Özgür et al., eighteen (43.9%) tumors were basal cell carcinoma (BCC) and 17 (41.5%) tumors were cutaneous squamous cell carcinoma (CSCC) [10]. Universally ear keloid is more prominent in female and in dark skin population more than others, and because of piercing. Our study proved that keloid prominent in female with multiple piercing.

The upper and lower parts of ear were equally involved in this study, this can be explained by exposed location of upper part make it more accessible to trauma, while the lower part more frequent due to occurrence of keloid, in controversy to Michail N. Kolodzynski et al., who stated that the upper third of the auricles were mostly injured part (41%), followed by the entire auricle (19%) and did not mention other causes of auricular defect apart from trauma, while in this study all causes were included except burn [5].

Analysis illustrated the most favorable site of trauma is the upper third in 22 patients and full thickness more than partial thickness in 20 (25%) patients and 2 (2.5%) patients, respectively. This supports the results of Michail N Kolodzynski et al, who reported 105 patients with acquired defects the majority of them caused by trauma; bite (22%), and traffic accidents (17%) [5].

Immediate repair of auricle has the advantage of reducing the frequent of surgery, complications and cost, beside early return to daily activities. The part of ear, tissue was involved and size of defect influence and control process of manage-

ment. For these deformities with extensive disfiguring, classic staging procedures must be followed to reach better result [11,12]. This study demonstrates that the bulk of patients 52 (56%) have been treated in elective procedure, and 28 (35%) of all cases has been managed immediately, this can be explained by late presentation and complexity of defects which are not amenable to be repaired in emergency department.

Selection of method for repair is regulated by status of defect and para-auricular tissue, aetiology and surgeons preference. Deformity with preserved auricular subunits can be closed primary with respect of auricular curvature, however lost unit need to be replaced by local flap. Vascularity of post auricular tissue enhances flap viability and makes it the best donor site if not scared [6,13]. In this study 32 (40%) patients underwent primary repair, 13 (16.3%) local regional flap and 29 (36.3%) intralesional excision for keloid. Iman Labib Salem, conducted study of 20 patients with helical and lobule defects which were acquired by various causes, lobular defects were managed by two local flaps, while helical defects were treated by advancement chondrocutaneous flap and both in single a stage surgery [14].

Costal cartilage is used to create a new skeleton, and it is preferred over conchal because it is stronger and can suspend the ear, besides being more available. In this study 2 (2.5%) patients needed costal cartilage and another 2 (2.5%) required contralateral auricular cartilage to augment the auricle. P. A. Harris mentioned usage of costal cartilage in management of 27 of 28 patients with subtotal ear defects. Hesham Aly Helal et al., in Egypt, mentioned 14 patients with subtotal loss of the upper one- third of the auricle treated with autologous contralateral conchal cartilage graft and superficial temporoparietal fascial flap [15,16].

Single stage procedure became more trending; most of authors encouraged using this method, but complicated defects usually required multiple staged surgeries to reach desirable results and avoid complications. In this study most of cases 67 (83%) were treated by single-staged procedure and multiple stages were used for advanced cases with complicated defects (A3, B3 and D) and account 13 (16.25%). Timothy M et al., supports using staged-procedures and stated in a study of 26 patients with helical defect following excision of cutaneous cancer, that staged-reconstruction ensure better cosmetic result, while Datao Li et al., described using single-stage in 31 of 51 patient of partial defects and two-stage in 20 patients [17,18].

This study recorded some complications in less than half of patients; 11 (13.8%) suffered wound infection, 5 (6.3%) marginal skin necrosis and 7 (8.8%) asymmetry, these similar to other studies. Ravikumar Gopalakrishnan et al., also reported complications in 9 of 24 patients of acquired defect; hematoma in (8.3%), flap necrosis in (4.16%) and infection in (12.5%) [8].

Although presence of complication will affect degree of satisfaction, the majority of patients reported satisfaction as excellent in 18 (22.5%), good in 34 (42.5%), and poor in 6 (7.5%), similar to Datao Li et al., who reported 55 of 60 patients of partial auricular defect were satisfied by the end results [18]. Deformed auricle in most cases retained its ability to hold glasses and sustained in erect position, unless deformity softened the skeleton, this is why most of patients are satisfied with the functional aspect of auricular reconstruction. Color matching, symmetry and fine decoration of curves must be ensured for full aesthetic satisfaction for both patients and surgeons. But the condition of the auricle and other factors affect the results and lead to color mismatch, and some degree of irregularity which may bother the patient and decrease the level of satisfaction.

Conclusion:

- The etiology of auricular deformity in majority was trauma, followed by Keloid, malignancy, and piercing.
- According to site of defect, Lower and upper thirds commonest site then middle, and entire ear.
- Common type of reconstruction method used was primary intention, followed by intralesional excision of keloid and local regional flap.
- Functional and aesthetic outcome was satisfactory in the majority of patients.
- Complications rate reported was not high and commonly presented as infection, skin necrosis, asymmetry and loss of shape.

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