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Surgical Treatment of Cauliflower Ear

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ABSTRACT

Cauliflower ear represents an end result of an otohematoma. Surgical correction of this deformity is challenging and somewhat controversial. The author presents six patients with a total of eight cauliflower ears surgically treated at Cairo University Hospitals in the period from February 1st, 2002 till January 31, 2003. Intraoperative findings are consistent with the principle of neocartilage formation that duplicates and is separable from the original. Excision of this neocartilage reveals the underlying auricular cartilage with all its natural convolutions. The aesthetic outcome was satisfactory, with no complications or recurrences. The exact pathophysiology of auricular deformity secondary to otohematoma should be understood in order to improve the aesthetic outcome of corrective surgery. Surgery for cauliflower ear should thus be designed to resect the neocartilage rather than to reshape a deformed cartilage.

INTRODUCTION

Cauliflower ear represents an end result of an otohematoma caused by trauma to the auricle **[1]**. It used to be seen among heavy sportsmen as wrestlers and in some occupations **[1,2,3]**. This deformity is getting rare today with adequate head protection in contact sports as well as in those occupations that subject workers to repeated ear trauma (such as movers).

Trauma to the auricle is usually closed in nature and can range from acute considerable injuries to repeated minor insults. Minor trauma can be so trivial that the patient cannot recognize. It has been reported in patients with eczema and attributed to frequent itching and subsequent trauma to the ear **[4]**.

Patients with cauliflower ear deformity have two concerns: the appearance in the first place and pain or discomfort associated with the deformity. The ultimate goal in surgical treatment is to restore the contours of the normal auricle. Achievement of this goal represents a challenging problem by all means. To date, very few cases of surgical correction have been described and range from shaving, partial resection and resection with graft reconstruction. Understanding the pathophysiology of the deformity starting by a subperichondirial hematoma and ending up in a deformed cauliflower-like appearance is of paramount importance to plan surgical treatment. This study is concerned with the exact mechanism of deformity development. The operative findings of six patients were presented with a postulated analysis of the deformity and guidelines to surgical correction.

MATERIAL AND METHODS

Six patients with cauliflower ear deformities are included in this series. Patients presented to the ENT service at Cairo University Hospitals, during the period from February 1st, 2002 till January 31, 2003. Five patients were children while only one patient was in the adult age. The average age among the pediatric population is 7.1 years. All patients were males. Two children had bilateral deformities, while all other patients had unilateral deformity in their left ear.

All patients were subjected to detailed history taking including, thorough examination of the ear deformity and preoperative photographic documentation. Included in history taking was the reason for consultation, the exact mechanism of the ear trauma and the initial treatment offered after trauma in cases of acute events.

After preoperative consultation with the patients and parents, all patients were scheduled for surgical correction under general anesthesia. Consents were taken for possible need of cartilage grafts from the other ear, or the costal cartilages. The plan of surgery was exposure of the deformed auricular cartilage by degloving the overlying skin through a posteriorly based incision. This was to be followed by reshaping the cartilage with or without grafting. Contouring

dressing was applied in all cases for seven days. No drains were used in any of the procedures. Any specimens obtained were sent for pathological examination. Patients were then followed up for a minimal period of six months (6-18 m).

RESULTS

The mechanism of injury was in the form of repeated minor trauma in all except one patient. This patient was the only adult in the series and was subjected to low velocity blunt trauma (assault), one year prior to presentation. No immediate treatment was offered to him after injury. The auricle remained swollen with color changes for few months and finally ended up by deformity. All children included in this series were subjected to repeated minor trauma rather than an acute event. Parents were reluctant to provide detailed history, however, mentioned that ear pinching was sometimes used in punishing their children in misbehaviors. It was found that the left ear in the three children with unilateral deformities was the affected one and this reflected the possible mechanism of ear traction by their right handed care givers. In all children the deformity was gradual in development and no initial treatment was offered before presentation.

The main reason for consultation for all patients or parents was the appearance of the deformed ear. Only one patient mentioned discomfort on sleeping on his left side having his deformed auricle against the pillow.

The most interesting finding was the intraoperative observation of the deformity. In all patients, the deformed auricular cartilage was found to be duplicated, with an outer layer attached firmly to the perichondrium and overlying skin and an inner layer that is completely separable. This inner layer is thicker and retained the normal convolutions of a normal auricle. The two layers of cartilages were separated by fibrous tissue, which was dissected without difficulty. These layers had contact with each other at the rim of the deformity. The outer layer was excised in all cases. This was achieved by a mixture of sharp and blunt dissection at the level of the intervening fibrous tissue layer. Then, the areas of contact were sharply cut using the knife.

On examining the resected cartilage, it was seen to have two surfaces: the outer surface, which was corrugated and deformed and an inner surface that exactly duplicated the original cartilage. After resecting the outer layer of cartilage, the inner layer was obviously representing the original cartilage, with all its convolutions. This original cartilage was found to be moderately thickened in all cases, with small areas of calcifications. Minimal shaving was needed to decrease the thickness of the cartilage. No defects were encountered and hence no grafting was needed.

All pieces of resected cartilage were sent routinely for pathological examination. Microscopic examination revealed cartilage matrix, few areas of chondrocytes intermingling with areas of fibrous tissue.

The postoperative outcome was reasonable in all cases. Focal areas of thickening of the original cartilage were encountered in three patients, however, did not warrant revision surgery. There was no skin loss secondary to complete degloving of the upper part of the auricle. The skin attained a dusky color towards the end of the procedure and regained its pinkish color gradually thereafter. With a follow up period ranging from six to eighteen months, no recurrences were encountered.

DISCUSSION

Known to occur among heavy contact sports and piano movers, cauliflower ears represent an end deformity caused by subperichondrial otohematoma **[1]**. Auricle traction is used by some parents or schoolteachers for punishing children. Children constitute the majority of patients presented in this series. No accurate history could be obtained from the parents, however, it is believed that the main mechanism of their deformity is ear traction. Children with unilateral lesions (3/5) were found to have their deformity in the left ear (Fig. 1). This may be explained by right-handed parent or teacher traction.

In order to improve the outcome of surgery, the exact pathophysiology of the whole process needs to be understood. Otohematoma implies collection of blood in the auricle in a subperiosteal plane. How can this collection end up by a deformed auricle? A deformity that is severe enough to be described as" cauliflower-like". Simple explanations for the auricular deformity include hematoma organization **[5]** or chondritis with structural collapse **[6]**. A fact mentioned by most authors is the constant finding in cauliflower ears of two leaves of cartilage. This can be explained either by a split in the cartilage **[2]**, or the deposition of neofibrocartilage **[3]**.

Fig. (1): A patient with left unilateral cauliflower ear.

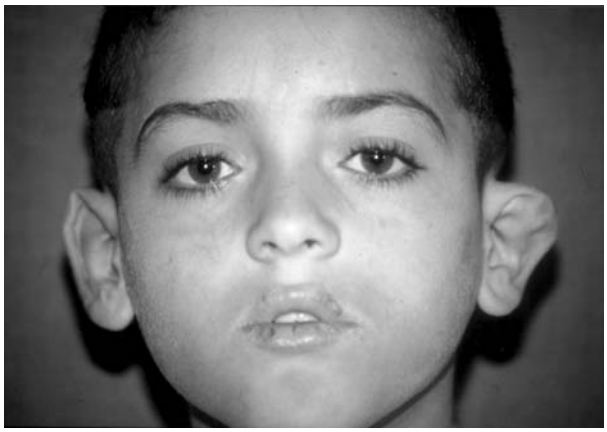

Fig. (1-A): Preoperative front view.

Fig. (1-B): Postoperative front view.

Fig. (1-C): Preoperative close up on the deformity.

Fig. (1-D): Postoperative close up view.

Fig. (2): Intraoperative findings:

A- The appearance of the deformed cartilage after degloving the overlying skin to provide wide exposure. Note the plane of cleavage between the deformed outer cartilage and the original inner cartilage.

B- The appearance of the original cartilage after resection of the deformed neocartilage. Note the smooth surface retaining its natural convolutions.

C- The resected neocartilage on a drawn model of the ear.

However, based on literature review in addition to the surgical observations in the presented patients, an explanation of the response of the auricular cartilage to injury can be postulated. The cornerstone in the effect of trauma on the auricular cartilage is disruption of the perichondium-cartilage relationship. Cauliflower ear accordingly, is the resultant of three vectors: the response of the perichondrium, the response of the cartilage and finally the fate of the entrapped blood.

The cartilage becomes deprived of some of its lateral perichondrial blood supply. Retaining the perichondrium on its medial surface, the auricular cartilage suffers minimally from this disruption. This can be seen as areas of thickening and sometimes calcification. Calcification mostly represents the population of chondrocytes located furthermost from the feeding perichondrium that do not survive the distance. Overall, the original auricular cartilage mostly retains its smooth convoluted surface, apart from minimal localized thickening.

The perichondrium, that possesses an internal chondrogenic layers of cells, start to build up new cartilage. This is similar to the normal "appositional growth" at the cartilage surface that is known to occur in mature cartilage **[7]**. This process of neocartilage formation results in another sheet of cartilage with two surfaces: an outer surface attached to the perichondrium and the overlying skin and an inner surface that duplicates the convolutions of the original cartilage. These findings are supported by experimental animal studies that proved the formation of fibroneocartilage by the raised perichondrium **[8,9]**.

The entrapped blood is resorbed over a relatively longer period of time, based on the poverty of the circulation of the adjacent cartilage. Persistence for long period of time interferes with the fusion of both the original and the new cartilage sheets. Finally, this plane of cleavage persists and is filled by fibrous tissue. As the entrapped blood slowly becomes resorbed, the perichondrium, stretched over the newly formed cartilage then starts to retract, with subsequent buckling of the underlying cartilage. Accordingly, the new cartilage has an outer irregular (cauliflower-like) surface and an inner smooth surface duplicating the original cartilage. The edges of the hematoma represent the contact rim between both the new and the original cartilages.

Reviewing the literature, similar findings were reported in cases of auricular pseudocysts. Auricular hematoma and pseudocyst may represent opposing ends of a continuum of damage and repair of traumatic insults **[10]**. Whereas hematoma represents a significant acute trauma, the pseudocyst could be the outcome of chronic lower grade trauma. However, the sequence of events is almost the same, starting with disruption of the cartilage-perichondrial relationship and followed by deposition of new cartilage. The difference in pseudocyst is the persistence of the entrapped blood in a way to form an olive oil-like fluid separating both the original and new cartilages **[11]**. This maintains the perichondrium stretched and produces the smooth fullness in cases of pseudocysts, rather than the corrugated deformity found in cauliflower ears.

Bearing in mind this sequence of events, surgical treatment of cauliflower ear can be revisited. If the deformity is approached as a deformed cartilage, the solution will be shaving this deformed cartilage, which in case of elastic cartilage will be extremely demanding. This principle, however, with its subsequent treatment modality is still used by some authors **[12]**. However, instead of looking at the problem as a deformed cartilage, it should be considered as having a completely separable cartilaginous sheet on top of the original minimally affected cartilage.

Attempts to resect the new cartilage returns back to 1985, when Giffin recommended its resection in acute conditions **[3]**. The same should be applied to long-standing deformities. Vogelin et al. **[2]** recommend removal of either the anterior or posterior leaf, while reshaping the leaf preserved. Lim et al. **[11]** recommend excision of the anterior segment leaving behind the posterior segment. It seems more convincing to resect the so-called anterior leaf, that is actually the neocartilage deposited by the perichondrium and has a smooth medial surface and a buckled lateral surface. Regarding the posterior leaf, or the original cartilage, little should be done only to shave areas of thickenings. The helical rim is by far the commonest site that shows some degree of thickening. Shaving this thickened rim can be done to improve the aesthetic outcome. Schonauer **[13]** recommended using a part of the thin neocartilage to reconstruct the helical rim. With the concept of resecting the newly formed cartilage, the deformity should be mostly corrected by revealing the underlying original auricular cartilage. The remaining problem will be the thickened edges of the original cartilage at the points of contact with the new cartilage (Fig. 2).

In conclusion, the concept of neocartilage formation is important in planning for surgical correction of cauliflower deformity. Resection rather than reshaping should be the cornerstone of repair.

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