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Versatility of Auricular Cartilage Graft in Oral and Maxillofacial Reconstruction - Our Experience

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KEYWORDS Auricular cartilage graft oral and maxillofacial reconstruction. ABSTRACT This article aims to discuss the simplicity of the technique of harvest, versatility and efficacy of auricular cartilage graft in different scenarios of oral and maxillofacial reconstruction.

INTRODUCTION:

In reconstructive surgery, autogenous tissues are known to show their superior results compared to allogenous materials in most scenarios. Autogenous graft harvesting is associated with problems like increased operative time, donor site complications like infection and Fibrosis. Therefore when the graft is obtained, it is imperative to keep the morbidity and discomfort as well as the extra time and cost to the minimum.Auricular cartilage is a magnificent source of autogenous tissue for reconstruction of a variety of small to medium sized defects while minimizing the donor site morbidity.

This case series describes a part of the spectrum of auricular cartilage graft applications and related review of the literature as well as a note on the technique of harvest.

TECHNIQUE OF HARVEST:

The initial zeal for the use of auricular cartilage grafts was fortified by the ease with which cartilage could be harvested and carved to make a suitable graft. Two approaches have been described for the harvest of auricular cartilage, namely the anterior approach and posterior approach. Though some surgeons aggrandize the harvest of the auricular cartilage from an anterior approach, we advocate the use of the posterior approach as it minimizes visible scars and postoperative contour deformities allowing large amounts of graft to be obtained.

Key steps in the harvest of auricular cartilage include the incision marking on posteromedial surface of the concha (Fig 1.a), at least 2 mm of the superior outer rim of the conchal wall has to be left in place so as not to cause a noticeable change in the conchal concavity of the donor ear. Infiltration of adrenaline-containing local anaesthetic posteriorly in the subperichondral plane produces a vasoconstricted field as well as allows easier development of required plane during dissection (Fig 1.b). Avoid injecting it into the anterior surface, which can result in a hydraulic fracture of the cartilage. After incision is made through the conchal cartilage and subperichondrial dissection is done. The cartilage is slowly freed from all the surfaces. Dissecting the anterior and superior part of the concha needs a special care as the cartilage curvature at this area adheres snugly to the skin so as to avoid inadvertent fracture of the cartilage. The entire conchal cartilage is harvested in similar fashion (Fig 1.c). The harvested cartilage is handled in an atraumatic manner and transferred to a sterile solution for graft preparation and manipulation. This technique allows the harvest of cartilage

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measuring about 4cm to 5cms which can then be shaped according to requirement (Fig 1.d). Wound closure is done in layers and a soframycin based bolster dressing is secured with transcutaneous sutures using 3-0 prolene. Bolster dressing (Fig 1.e) is held in place for 2 weeks not only prevents the formation of seromas but also ensures that the normal auricular contour is maintained.

CASE -I

A 5 year old female presented with unilateral fibrous ankylosis with an Interincisal opening of 5mm, a preauricular incision with Al-kayatBrameley extension was given and gap arthroplasty was performed following which ipsilateral auricular cartilage graft was rolled and interposed in the gap. The graft was stabilized with the surrounding tissues using 3-0 prolene.intra operative mouth opening and the degree of mobility of the mandible was assessed to confirm the graft stability. Wound closure was done in layers. Early and sustained jaw physiotherapy was encouraged; mouth opening was satisfactory on one year follow up. (Fig 2.a-2.d)

CASE -II

A 23 year old female reported with cleft lip nasal deformity (Fig 3.a) on whom secondary cleft rhinoplasty was performed using auricular cartilage to augment the hypoplastic ala on the cleft side, correction of the nasal septum and also as a columellar strut. A transcolumellar incision was given at the junction of the lower one third and upper two third of the columella. The skin was dissected over the tip and the alar cartilages in the submuscular aponeurotic plane. The lower lateral cartilages were freed of all its attachments. The entire cartilaginous skeleton of the lower lateral cartilages was exposed (Fig 3.b). The harvested cartilage was divided into three strips. The harvested auricular cartilage was placed between the medial crura of the alar cartilages to strengthen the ala on the cleft side. (Fig 3.c).

The remaining two strips were sutured to each other to form a columellar strut to achieve columellar projection. Satisfactory outcome was achieved with regard to the columellar height, nasal tip projection and ala base. (Fig 3.d) A 15 year old male presented with bilateral loss of nasal ala secondary to an insect bite (Fig 4.a). The patient underwent ala reconstruction on both the sides using auricular cartilage graft and a bilobed forehead flap (Fig 4.b-4.c), following the nasal subunit principle, alar reconstruction was done using auricular cartilage graft upon which forehead flap was used as skin cover which was depedicilised after 21st day. Post-operative functional and esthetic results were satisfactory. (Fig 4.d)

CASE -IV

A 24 year old male reported with an elliptical hypertrophic scar of 3x3 cms on forehead, he underwent scar excision and the resultant defect was reconstructed using auricular cartilage graft. Excision of the scar tissue was done followed by stabilizing the graft to the recipient bed with 3-0 vicryl. Sub dermal dissection was done in all the directions and the wound was closed primarily in layers. (Fig 5.a-5.b)

DISCUSSION

Auricular cartilage graft has multitudinous advantages in physiological, biochemical and mechanical pretexts[1]. It is promptly available and is much easier to harvest than other sites in the body for reconstruction of small to medium sized defects in the maxillofacial region. It can be obtained quickly, with no donor site morbidity and has proved evidence of superior long term survival. They have the benefit of being readily available in the head and neck. It is resistant to resorption and infection [6] because of the low metabolic rate and the predominantly anaerobic metabolism of cartilage that allows the hypoxic state during the initial period of transplantation to be tolerated. Some surgeons prefer to leave a layer of perichondrium attached to the harvested cartilage to reinforce its strength; while few other authors have advocated that the survival of the autogenous cartilage graft was independent of the presence of attached perichondrium[2].

One of the most common complications of TMJ ankylosis is re-ankylosis due to improper postoperative physiotherapy. The main aim of interpositional arthroplasty is to prevent recurrence and encourage early and sustained jaw physiotherapy. To facilitate this early movement and creation of functioning psuedoarthrosis, the fixation of the auricular cartilage graft as an interposing material has

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been carried out in our case. The first report of using auricular cartilage as a disc replacement is attributed to Perko[10]. Lei[3] described the use of auricular cartilage graft in the treatment of TMJ ankylosis as an interposing material as the contour of the cartilage exactly fits the condylar process and achieved good results with no relapse which was further supported by Krishnan[1].Obwegeser and Farmand have used stacked, thin sheets of lyophilized cartilage as an interposing material to prevent re-ankylosis and also to serve as a support to the ramal stump.[11]

Few authors believe that the method of fixation of the graft has a role in the stability of the cartilage; It was found that fixation of the graft to the surrounding soft tissue had shown to be associated with thinning and perforation when compared to that fixed to the bone.[8] In our case, fixation to soft tissue with sutures provided satisfactory stability to the graft.

A minimal gap arthroplasty, lined by an autogenous auricular cartilage graft has provided a pre-existing joint enviroment which has allowed for better adaptation replacing the articular disc, prevention of reankylosis as well as allowing post-operative mobilization and functioning of Temporomandibular joint in our case on long term follow up.

Tucker[6] et al stated that the most common disadvantage of auricular graft was the formation of fibrous adhesions to the bony stumps. Adding more, C. Chossegros[7] et al have found that cartilage interposition did not provide good results as the cartilage can easily ossify itself. Howeverthe type of cartilage used for the study was not mentioned. Contrarily Takashi[8] et al in their study stated that the fibrous layers that were found between the grafted cartilage and the temporal bone run parallel to the temporal surface and the temporal surfaces were smooth and did not interfere with joint movements which were obvious in our case.

Conchal cartilage is an extremely useful source of graft for use in cleft rhinoplasty. It can be conveniently shaped into onlay alar graft as it recreates the natural curvature of the ala while providing the support. The columellar strut contoured from the cartilage gives strength to the medial crura so that adequate tip projection can be attained. The advantage of this cartilage graft is that the inherent springiness can be reduced and softened by multiple cross hatching incisions and lamination of several layers of cartilage serves to augment significant nasal depressions. In addition it has an advantage of being positioned precisely created accurately in soft tissue pockets.[10]However few authors in their study observed that the ossification of the cartilage was a challenging aspect and had generated hard irregularities which needed a second surgery. They found out that the response of perichondrium to trauma was not only new cartilage formation but also ossification especially when incomplete incisions were made on the perichondrium. [15]In our case the long term results were satisfactory with adequate nasal projection and improved alar architecture.

One of the many challenging aspects of the nasal ala defect reconstruction is neither it can be closed primarily nor can be allowed for healing by secondary intention. Moreover the nasal ala creates natural creases with the cheek, nasal sidewall, and nasal tip that need to be maintained. It is important to reconstruct these defects in layers as each layer is important to integrate coherently with the nose, prevent scar contracture, and maintain nasal patency. Nasal ala reconstruction using auricular cartilage and forehead flap has the advantage of three layered reconstruction. The auricular cartilage is preferred for ala reconstruction as natural curvature of the conchal cartilage is well suited for recreating the convexity of the ala.

The advantage of auricular cartilage is that it can be approached from an anterior or posterior skin incision and can be shaped and trimmed to match the native alar curvature and thinned down to 1 mm while maintaining its convexity [13]. The skin covering over the ala can be best achieved by forehead flap as it has a good color match, similar degree of sun exposure and matching sebaceous character to the alar skin.[14]

The rationale for the use of auricular cartilage to repair the defect after the scar excision on the forehead and malar augmentation is that thickness of the cartilage and its convex shape. These qualities facilitate a precise fit as an onlay into the defect. Also, the most parts of the face have a convex architecture, hence the contour of the graft will fit without much manipulation and the long-term survival of fresh cartilage autografts increases the attractiveness of auricular cartilage use in maxillofacial reconstruction which has been demonstrated experimentally. Clinical investigations also confirmed that fresh cartilage autografts maintain adequate structure and volume even after years of transplantation.[4]

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CONCLUSION

Auricular cartilage grafts can serve as a safe, effective, and versatile alternative for the reconstruction of small to medium sized defects. This graft ensures excellent reconstruction results and guarantees low morbidity in the donor areas. There is also an increased patient compliance as the posterior approach for graft harvest would well conceal the scar.

Conflict of interest – None

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Figure legends



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Fig 2.a- Fig 2.d:Interpositional arthroplasty using Auricular cartilage graft



Fig 3.a- Fig 3.d: Auricular graft as an onlay graft for cleft lip nasal deformity





Fig 3.c



Fig 3.b



Fig 3.d

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Fig 4.a - Fig 4.d:Ala reconstruction using auricular cartilage graft and forehead flap







Fig 4.c



Fig 5.a - Fig 5.b: Auricular cartilage graft as an onlay graft for depressed scar revision



Fig 5.a

Fig 5.b