OVERVIEW ON THE DIFFERENT APPROACHES FOR POST-TRAUMATIC AURICULAR DEFECTS RECONSTRUCTION

An Essay

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Introduction

The Reconstruction of the outer ear can be considered one of the most complex techniques in the field of reconstructive surgery since it requires a certain skilled & specialized surgeon. Perhaps this is the reason why the surgical techniques used, in the past, have undergone, over the last few decades, important improvements with results that are increasingly satisfactory ***(Brunelli et al., 2004)*.**

Many causes are responsible for secondary deformities of the outer ear, such as: car accidents, sport- or work-related accidents, assaults, bites from animals or humans, benign or malignant tumors, burns and the effects of surgical interventions of the ear (plastic surgery on the ear or attempts at correction of primary malformations of the ear ***(Brunelli et al., 2004)*.**

The anatomical complexity of the ear makes its reconstruction particularly complicated with post-operative results that are often disappointing**.** These considerations have allowed us to stress some fundamental elements in the reconstruction of the ear. So, we aim to ensure a sufficient quantity of local skin in order to cover the cartilaginous graft and, therefore, reduce the risk of exposing the cartilage and

subsequent infection, to guarantee an optimal end result ***(Brunelli et al., 2004)*.**

Auricular reattachment or reconstruction after traumatic ear loss remains a challenge for the plastic reconstructive surgeon. Because of the diverse accident mechanisms, no standard algorithms exist and several modalities have been proposed in the literature ***(Theodora et al., 2010)*.**

Most auricular deformities are acquired, partial defects for which there is a good solution. The more superior on the ear the defect is located, the more choices there are for reconstruction. Reconstruction of the lobule is the most difficult and is aesthetically the most important ***(Thorne, 2007)*.**

Acquired losses of the helical rim vary from small defects to major portions of the helix. The former, which usually result from tumor excisions or minor traumatic injuries, are best closed by advancing the helix in both directions ***(Thorne, 2007; Alexsandar et al., 2006).***

If the helical rim alone is missing, as may occur in burn injuries, a thin tube of retroauricular skin can be applied to the residual scapha with acceptable results. This is one example where cartilage may not be necessary. The disadvantage of this

technique is that it requires three stages to introduce the tube into place ***(Thorne, 2007).***

There are several Techniques available for upper-third defects in increasing order of size and complexity. These techniques include Local skin flaps, Helical advancement, Contralateral conchal cartilage graft covered with a retroauricular flap, Chondrocutaneous composite flap, Rib cartilage graft covered with retroauricular skin or temporoparietal flap/skin graft ***(Thorne, 2007).***

There are other Techniques available for middle-third defects. These are Primary closure with excision of accessory triangles, helical advancement, Conchal cartilage graft and retroauricular flap, Rib cartilage graft and retroauricular flap and/or temporoparietal ***(Thorne, 2007).***

Various techniques have been described to reconstruct earlobe defects using soft-tissue flaps. These techniques are not as effective as those that employ cartilaginous support. Like the alar rim, the normal earlobe does not contain cartilage. A reconstructed earlobe, however, maintains its shape better if cartilage is included, analogous to the nonanatomic alar rim grafts to the nose. The author prefers to use thin, flat cartilage

obtained from the nasal septum .The cartilage is placed beneath the cheek & retroauricular skin in the first stage. In the second stage, an incision is made around the cartilage graft and the flap is advanced beneath the earlobe as in a facelift ***(Thorne, 2007).***

Gillie is credited with the first use of rib cartilage for construction of an auricular framework in 1920. The importance of his contribution was temporarily neglected by several reports using allogeneic cartilage. The allogeneic cartilage, whether from a living donor such as the patient's parent or preserved cadaver cartilage, always underwent gradual resorption. The modern era of auricular reconstruction began with Tanzer who reintroduced the technique of autogenous costal cartilage grafts as a method of auricular reconstruction ***(Thorne et al., 2001).***

Total auricular reconstruction of the acquired deformity differs from congenital Microtia. There is always less skin available. In Microtia, removal of the cartilaginous remnant provides some supple, unscarred skin to supplement the retroauricular skin. In the acquired situation, there may be no residual ear skin and the presence of scarring from the traumatic or surgical removal of the ear restricts the skin pocket. In many cases, a temporoparietal flap with skin graft is required in

addition to the native skin. The flap provides an unlimited amount of vascularized tissue, but the combination of the flap and the skin graft never has the definition or color match of the native skin. In addition, the presence of an external auditory meatus limits the access incisions, the extent of the skin pocket and the risk of infection. The canal is colonized with bacteria, frequently Pseudomonas species, which adds additional problems not encountered in Microtia cases ***(Thorne, 2007).***

Tissue expansion has been used in selected ear reconstruction cases, but the associated risk of expander complications, such as exposure, are significantly higher in this region than in other areas, and expansion is generally not recommended. This is particularly the case in the treatment of significant facial scarring around the vestige or in the remaining ear segment following trauma. The most readily available tissue for reconstruction in these cases is the temporoparietal fascial flap (TPFF) or occasionally its extension into the postauricular area. This flap usually is based on the superficial temporal artery but is best raised on both superficial temporal and postauricular vessels for total auricular reconstruction. In cases of severe tissue loss and deep scarring, use of the contralateral TPFF by microvascular transfer may be necessary. In most

cases of fascial coverage of the framework the fascia is covered with a split-thickness skin graft. The most preferable site is split thickness skin graft from the scalp. This donor site is totally hidden as the hair regrows, and the color match of the graft is excellent ***(Bruce et al., 2009)*.**

Auricular reconstruction has been shown to have a significant psychosocial benefit in the majority of patients treated, despite donor-site morbidity and a range of technical results. This was established by Horlock et al in a retrospective review. The sample group included patients with congenital or acquired auricular deformities that had either autogenous or Osseointegrated reconstruction. There was significant psychosocial morbidity causing reduced self-confidence associated with auricular deformity. Teasing was prominent and the main motivation for surgery in children, while dissatisfaction with appearance was the main motivation for surgery in adults. Surgical intervention resulted in improved self-confidence, thus enhancing social life and leisure activity ***(Horlock et al., 2005)*.**

The evolution of microsurgery introduced new challenging reconstructive methods also in the field of ear replantation that offer optimum results in a single procedure.

However, auricle revascularization techniques require special microsurgical skills, which can be expected only in certain specialized centers ***(Toole et al., 2008; Schonauer et al., 2004)*.**

Aim of the work

The aim of this work is to study different modalities of the current approaches available for reconstruction of the auricle after traumatic defects and to present an algorithm for each technique in relative to patient's requirements, facility and surgeons' skills.

Anatomy of the auricle

The auricle is on the side of the head and assists in capturing sound. It consists of cartilage covered with skin and arranged in a pattern of various elevations and depressions **(Richard et al., 2007).**

The external ear poses a unique reconstructive challenge due to its intricate surface topography and conspicuous location. Successful auricular repair depends on meticulous restoration of several anatomic parameters that critically contribute to the aesthetic balance of the ear **(Horlock et al., 2005)**

The large outside rim of the auricle is the helix. It ends inferiorly at the fleshy lobule which is the only part of the auricle that isn't supported by cartilage. The hollow center of the auricle is the concha of auricle where the external acoustic meatus leaves from the depths of this area. The tragus is an elevation anterior to the opening of the external acoustic meatus & in front of the concha. The antitragus is another elevation lies opposite the tragus and above the fleshy lobule. The antihelix is a smaller curved rim parallel and anterior to the helix **(Richard et al., 2007).**

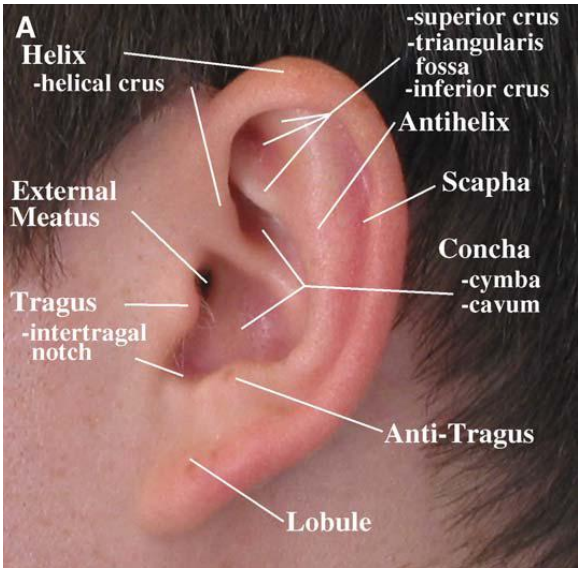
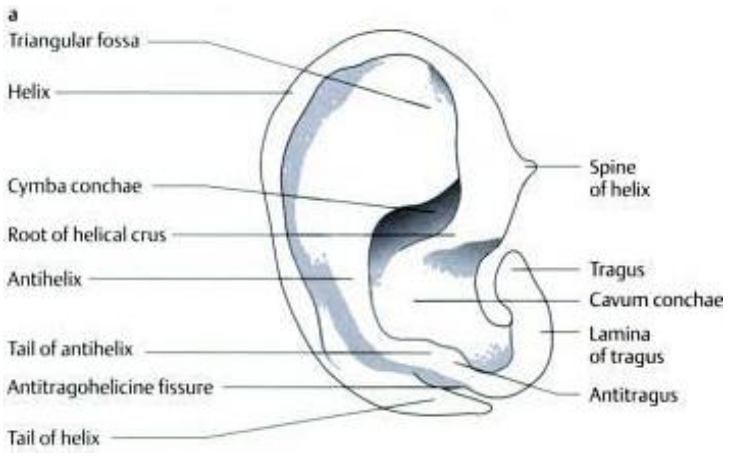


Figure 1: Normal auricular anatomy **(Sclafani et al., 2006).**



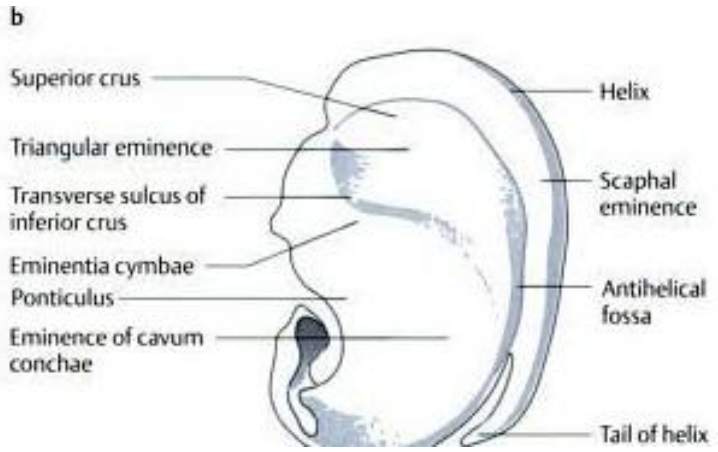


Figure 2: Anterior view (a) & Posterior view of the elastic auricular cartilage **(Weerda, 2007).**

The anterior and posterior auricular aspects have two different patterns of skin. The anterior surface is densely adherent to the underlying perichondrium and the posterior area is freely movable. Therefore, the posterior surface has been the main focus of flap design. Its contents include skin, loose connective tissue (fascia), perichondrium and cartilage **(Park et al., 2002).**

Regarding the blood supply, the superficial temporal and Posterior auricular arteries are the major blood supply of the auricle and its vicinities. They both derive from the external carotid artery and its network of vessels nourish even the most narrow of the pedicles in an avulsed ear segment which increases the success rate of replantation procedures **(Pham et al.,2003 ; Park et al.,2001; Park et al .,2002).**