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Research Paper

Partial Reconstruction of the Upper Third of the Ear After Infectious Perichondritis Secondary to Otomodelling: Case Report in a Pediatric Patient

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Abstract
Infectious perichondritis is a serious complication associated with cosmetic ear procedures and can result in partial destruction of the cartilage, with functional and aesthetic deformity. We report the case of a 13-year-old pediatric patient who underwent a previous ear reshaping procedure that progressed to perichondritis and cartilage absorption, especially in the upper third of the ear. After six months of tissue stabilization, reconstruction was performed using contralateral autologous conchal cartilage, molded and fixed with PDS sutures. The procedure, performed under local anesthesia, resulted in satisfactory anatomical recovery in a first surgery. The case demonstrates the safety and efficacy of partial cartilage reconstruction in young patients, contributes to the literature on late complications of ear reshaping, and highlights the importance of ear reshaping or closed otoplasty (ear harmonization) procedures being performed by experienced professionals who are specialists in oral and maxillofacial surgery and facial cosmetic surgery.

Keywords: Ear reconstruction; Otomodeling; Auricular perichondritis; Conchal graft; Closed otoplasty.

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I. INTRODUCTION

Protruding ears are the most common congenital anomaly related to the outer ear, affecting about 5% of the population. The specialties of orofacial harmonization, oral and maxillofacial surgery and traumatology, as well as facial aesthetic interventions, perform a complete evaluation of the face, recognizing that facial harmony involves much more than superficial skin care. Correcting protruding ears to achieve ideal anatomy, both aesthetically and functionally, contributes significantly to the beautification of the face and helps resolve psychological issues, promoting greater self-esteem and self-confidence.[1]

The main anatomical characteristics of prominent ears are protrusion of the upper half of the helix with a wide concho-scalp angle resulting from the antihelix failing to fold properly, together with a wide concho-mastoid angle, deep auricular concha, or absence of the helix fold.[1,2,3]

Otomodeling or harmonization of protruding ears and ear reconstruction techniques have become minimally invasive cosmetic options for correcting anomalies in the helix and antihelix. However, improper handling of cartilage, as well as the application of inappropriate materials or methods, can increase the likelihood of infectious chondritis. This condition impairs perichondral vascularization, which can lead to cartilage absorption and cause significant deformities.[1]

Perichondritis of the outer ear refers to inflammation of the perichondrial layer surrounding the ear cartilage. This condition usually presents a higher degree of infection than cellulitis of the outer ear, with which it can be confused, although both cases share similar risk factors. Penetrating injuries to the ear, such as piercings that go through the cartilage, are the main causes of this condition. Most ear piercings are performed by individuals without proper medical training, and infections can arise if sterile practices are not maintained. Abscesses form from infections that have been left untreated, leading to detachment of the perichondrium, which compromises the blood supply to the underlying cartilage. This situation can result in cartilage death and changes in the appearance of the outer ear. Inflammation can occur due to the accumulation of blood in the area between the perichondrium and the cartilage, as well as in the cartilage itself. Perichondritis caused by bacteria can also progress to a serious soft tissue infection or affect the system if not properly treated.[4,5]

Studies indicate that injuries to the perichondrium significantly reduce the ability of ear cartilage to regenerate, especially in children, whose tissue is still undergoing structural development. Partial reconstruction using the patient's own conchal cartilage shows effective results in restoring the shape of the ear in cases of acquired defects.[6,7]

This paper describes a case of partial reconstruction of the upper third of the ear after infectious perichondritis secondary to previous ear reshaping (closed otoplasty), highlighting the technique, clinical evolution, and scientific rationale.

II. CASE REPORT

Male patient, GSP, 13 years old, previously underwent ear reshaping in another state of Brazil, by another professional and using another technique. The young patient came to the clinic with advanced acute infectious perichondritis, presenting exacerbated edema of the auricle, associated with purulent secretion and the onset of fistula formation, characterizing signs of active infection and inflammatory expansion of the perichondrial and cartilaginous tissues. Figure 1.

Figure 1. Initial photo showing advanced stage of acute infectious perichondritis. Source: the author.

Initial assessment and clinical management:
1. Immediate request for antibiogram to identify the etiological agent and establish targeted antibiotic therapy.
2. Initiation of empirical therapy with: • Levofloxacin 750 mg – once daily for 7 days • Dexamethasone 4 mg – every 12 hours for 3 days, for anti-inflammatory and edema reduction purposes • Toragesic 10 mg – every 8 hours as needed for pain relief.
3. Probe and remove the sutures to eliminate possible sources of contamination and reduce inflammatory stimuli. Local Protocol – Drainage and Irrigation Daily monitoring was performed, maintaining active drainage and keeping the drain open on purpose to allow spontaneous elimination of exudate. The following was performed: • Irrigation with saline solution + topical gentamicin, • Maintenance of the drainage hole, preventing encapsulation and closed abscess. Test Results and Therapeutic Adjustment The antibiogram returned in 4 days, revealing infection by Pseudomonas aeruginosa, resistant to initial therapy but sensitive to Ciprofloxacin. Conduct Instituited (in conjunction with infectious disease specialists): Ciprofloxacin 750 mg – every 12 hours for 15 days.
4. Clinical Evolution: 8 days after the start of the new antibiotic treatment, in addition to daily drainage, there was complete resolution of the infectious condition. The auricle showed a reduction in hyperemia, normalization of local temperature, and gradual closure of the opening. Outpatient follow-up was continued until complete tissue stabilization.
5. Reconstructive Phase: 6 Months Post-Infection After a period of healing and immunological stability, the auricle reconstruction project was initiated, with prior evaluation of: quality of residual cartilage; perichondral vascular status; possibility of using conchal cartilage or external grafts; phased planning for anatomical and aesthetic reconstruction.
After clinical stabilization with antibiotic therapy and removal of the sutures, partial absorption of the helix and antihelix cartilage was observed, causing deformity of the upper third of the left ear, with structural collapse. After a minimum interval of six months for total resolution of the inflammatory process and scar maturation, we proceeded with the surgical reconstruction process. Figure 2.

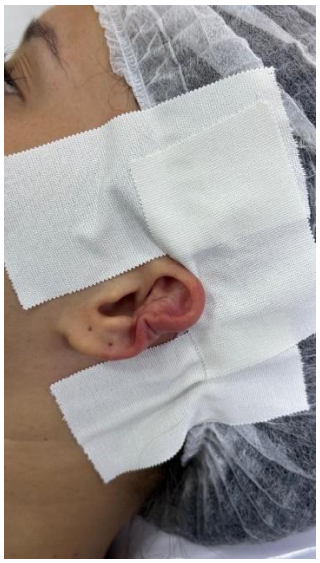
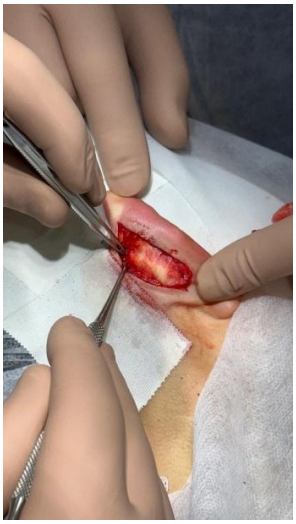
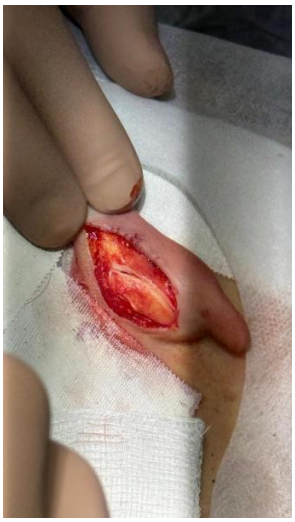
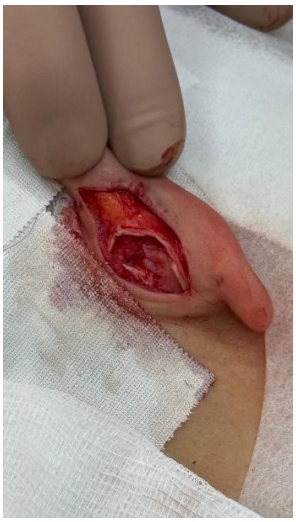
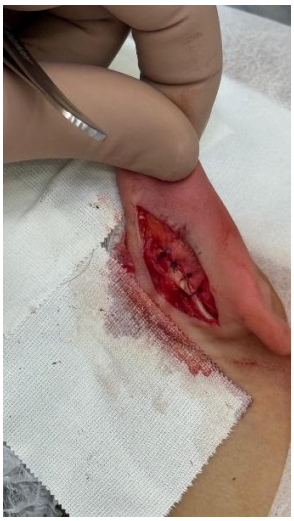


Figure 2. Initial appearance after perichondritis: partial absorption of the cartilage of the helix and antihelix and structural collapse. Source: the author.

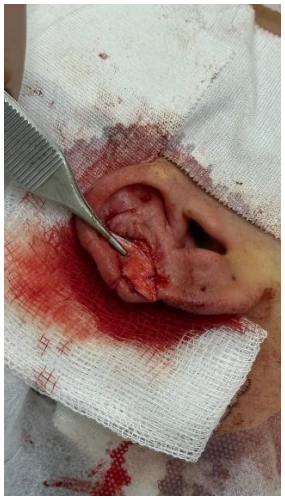
Surgical Technique
The procedure was performed in an outpatient setting, with the patient monitored, under local anesthesia with lidocaine combined with a vasoconstrictor.

Surgical Steps:
1. Retroauricular incision in the right ear (not previously manipulated – donor area). Resection of intact conchal cartilage, removed whole, preserving a large part of the perichondrium, and suturing with simple stitches using 4.0 PDS (polydioxanone) thread and skin suturing with 5.0 nylon thread. Figures 3, 4, 5, 6, and 7.

Figures 3, 4, 5, 6 and 7: donor area and removal of conchal cartilage graft. Source: the author.

2. Left retroauricular opening and dissection of fibrous tissue secondary to post-chondritis scarring. Preparation of the recipient pocket. Shaping of the conchal cartilage, divided into segments for simultaneous reconstruction of: new antihelix pillar; superior arch of the helix. Fixation of the segments with PDS suture, allowing stable anatomical curvature. 8. Positioning and fixation of the graft in the recipient pocket. Suturing of the layers and light compressive dressing. Figures: 8, 9, 10 and 11.

Figures 8, 9, 10, 11: Graft, fixation, and graft suturing. PDS 4.0 suture. Source: the author.

Postoperative Evolution

The patient presented a favorable evolution, without signs of infection or graft extrusion. Reconstruction of the upper third of the ear was noted with satisfactory anatomical architecture, good cartilaginous integration, and a natural result after 90 days. We believe that, according to his clinical evolution, the patient will need to undergo another reconstructive surgery. Figure 12.

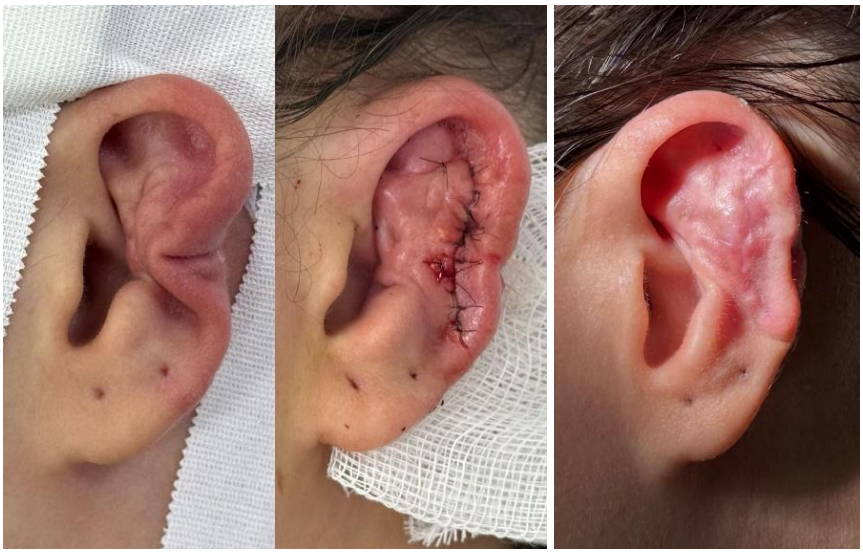


Figure 12. Initial clinical aspect, immediate postoperative and postoperative 90 days after suture removal. Satisfactory result. Source: the author.

III. DISCUSSION

To understand the area under study of the procedure, it is important to highlight that, in mammals, the ear – together with the auditory canal – is the organ responsible for hearing and is divided into three regions: the outer ear, the middle ear, and the inner ear. The first region is formed by the auditory canal and the auricle, which captures and conducts sound. In the middle ear, there is the eardrum and, finally, the organs responsible for capturing sound stimuli and for balance in the inner ear. There is also the spiral known as the organ of Corti, in whose region there are sensory cells responsible for capturing sound.[1,8]

The normal anatomy of the ear is widely known from previous anthropometric studies. The average length of the ear at its largest dimension is 63.5 mm in men and 59 mm in women, and the average width is 35.5 mm in men and 32.5 mm in women.[9,10]

Prominent ears are the most common congenital anomaly in the head and neck region. The estimated incidence is 5% in the Caucasian population. In about 60% of cases, it can be diagnosed at birth. The remaining cases will be diagnosed in early childhood. The exact etiology of auricular prominence is unclear and may be related to postural attitudes of newborns, hypotonia, structural alterations of collagen, genetic diseases, and familial incidence with a genetic pattern, affecting both sexes equally, with an autosomal dominant genetic transmission pattern of varying degrees of penetrance.[1,11,12,13,14]

Dieffenbach, in 1845, is credited with the first attempt to correct protruding ears by excising a spindle of retroauricular skin. Ely, in 1881, recommended the resection of the cartilage and the anterior and posterior skin of the ear, as did Morestin (1903) and Luckett (1910), who revolutionized the concepts at that time, demonstrating that protruding ears occur due to an increase in the scaphoconchal angle and not due to the angle between the scaphoid fossa and the mastoid process. Mustardé, in 1963, described the use of U-shaped sutures that are placed from the scaphoid fossa and/or triangular fossa to the concha and tied with sufficient tension to increase the definition of the antihelix fold, thus positioning the edge of the helix and the scaphoid fossa.[14,15,16,17]

The angle between the concha and the cranial mastoid can be reduced by positioning sutures between the concha and the mastoid fascia, as described by Furnas (1968). Baumgartner (1966) suggests excising a horizontal triangle of skin on the posterior side of the lobule to treat a prominent lobule.[14,16,18]

More than two hundred surgical techniques for correcting prominent ears have been documented with the aim of achieving "balanced" ears that appear natural, without leaving surgical scars. Due to the various factors that can cause prominent ears, there is no single effective method that resolves all deformities. Thus, it is up to the surgeon to choose the most appropriate surgical procedure to treat the prominent ear, taking into account the factors causing the deformity and their experience. The no-cut approach is a viable alternative to closed otoplasty or otomodelling (ear harmonization) in patients who present with an isolated and underdeveloped antihelix, as well as flexible auricular cartilages.[19,20,21]

Otomodelling or closed otoplasty (ear harmonization) consists of a minimally invasive approach, which, through infiltration and transcutaneous fixation of non-absorbable sutures, proposes the treatment of protruding ears. The main complications of the technique are: development of edema, ecchymosis, hematoma, recurrence, exposure of sutures, asymmetry between the ears, periodontitis and necrosis.[1,11,]

Otomodelling requires some specific care regarding the execution of the case. Different types of ears require an individualized diagnosis and planning for each case. The final result depends on the professional's skill and the patient's collaboration after the procedure, taking into account the expectation generated by him, which varies specifically from person to person.[11]

In the otomodelling technique, based on closed osteoplasty, for the correction of "protruding ears," which has as its main characteristics not having incisions or rasping at the cartilage level, using subcutaneous transfixation of non-absorbable and permanent sutures, it allows for a more promising result with more advantages for the professional and patient. The technique proves to be conservative, simple, and versatile, presenting a high degree of patient acceptance, a low recurrence rate, and optimization of surgical time when performed within the correct indications and surgical technique.[1,11]

Following protocol and planning is crucial for the success of each case. One of the factors is respecting the anatomical characteristics and being aware of their limitations. Preoperative preparation, including adequate prophylaxis and the use of sterile surgical drapes, reduces the risk of infection during suture insertion into the ear.[11,14,23]

External ear perichondritis refers to inflammation of the cartilage in the outer ear, resulting from trauma followed by infection. This condition requires prompt and effective treatment to prevent deformities of the outer ear and reduce the chances of systemic and soft tissue infections. Several causes of ear inflammation exist, including recurrent polychondritis, cellulitis, otitis externa, and otic herpes zoster. External ear perichondritis is distinct from these clinical conditions because it generally preserves the earlobe, which lacks cartilage. The trauma that most frequently causes auricular perichondritis results from a perforation affecting the ear cartilage. This type of trauma can lead to microfractures in the cartilage and detachment of the perichondrium, which can trigger devascularization, infection, necrosis, and the formation of a space that can accumulate serous fluid, blood, or pus. The two microorganisms that most commonly worsen this condition are Pseudomonas aeruginosa and Staphylococcus aureus, with the former being more likely to cause an abscess requiring drainage.[4,24]

Antibiotic therapy is the primary treatment for perichondritis of the external ear. Treatment varies depending on the severity and presence of an abscess. For cases without abscesses, oral fluoroquinolones on an outpatient basis are usually appropriate. An example is levofloxacin, which is effective against staphylococci and pseudomonas. If an abscess is present, surgical drainage and administration of a fluoroquinolone are necessary. Abscesses are treated similarly to a hematoma in the ear, involving incision, irrigation, application of a compressive dressing, and possibly placement of a drain.[4,25]

Infectious perichondritis represents a serious complication after aesthetic auricular procedures, potentially leading to partial cartilage destruction due to loss of perichondral nutrition. This process frequently occurs after trauma, excessive compression by wires, or inadequate immobilization, as reported in late complications of otomodelling. The choice of autologous conchal cartilage is supported in the literature as the ideal material for partial auricular reconstruction due to: natural curvature similar to that of the helix; thickness compatible with the upper ear structures; low donor site morbidity; and excellent integration capacity.[26,27]

After cleaning, preparing, and anesthetizing the patient's surgical wound, repair can begin. Tissue resection should be minimized, removing only visibly devascularized tissue before repair. The fundamental principles for repairing a complex wound or surgical site in the ear are the correct alignment of the cartilage (graft) to maintain aesthetics and ensuring that the overlying skin can adequately cover the cartilage. Cartilage itself is avascular and depends on skin coverage for its blood supply. To begin repair, ensure that the skin can cover the exposed cartilage. Stabilization with PDS sutures is widely used in cartilage reconstructions because it offers slow absorption, maintains cartilage memory, and has a lower risk of extrusion compared to non-absorbable sutures.[28,29]

This case stands out in the literature for involving a late complication of otomodelling in a pediatric patient, followed by anatomical reconstruction with a fully satisfactory result, considering the large initial deformity and other surgeries that may be necessary.

IV. CONCLUSION

Partial reconstruction of the upper third of the ear with autologous conchal cartilage proved to be effective and safe after infectious perichondritis secondary to otomodelling. This case reinforces the importance of proper management of auricular complications and the judicious indication of aesthetic procedures in pediatric patients. The findings contribute to the literature on reconstructive techniques in acquired ear defects, especially in the context of post-otomodelling complications.

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