BULLETIN OF STOMATOLOGY AND MAXILLO-FACIAL SURGERY OF
Vol. 19, No. 2

DOI: 10.58240/1829006X-2023.19.2-95

CLINICAL ARTICLES

RECONSTRUCTION OF POST-TRAUMATIC DEFECTS OF THE EXTERNAL EAR AND NOSE WITH AUTOLOGOUS COSTAL CARTILAGE

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Received: *Feb. 24, 2023;* **Accepted:** *Mar. 24, 2023;* **Published:** *Apr. 15, 2023*

Abstract

Traumatic ear amputation and post-traumatic nose defect are aesthetic deformities that can have negative consequences (lead to psychological trauma), leading to a change in the quality of life.

The presented clinical case describes a protocol for the reconstruction of a partially amputated defect of the external ear and nose, which required various surgical steps; including the removal of cartilage from the ribs, followed by the creation of a cartilaginous model of the ear, the introduction of its subcutaneous region behind the ear, taking into account the anatomy of the outer ear as much as possible. The second stage after 1.5 months is the restoration of the amputated ear area with a combined superficial temporal fascial flap, costal cartilage with suturing to the amputated part of the ear and dorsal rhinoplasty using modeling costal autocartilaginous flap. The postoperative result is satisfactory with the restoration of a good aesthetic appearance of the ear and nose.

Reconstruction of the external ear after partial traumatic amputation and post-traumatic nose defect with autocartilage from the ribs provides a stable aesthetic result and becomes the method of choice for such injuries.

Keywords: *post-traumatic defects, external ear, nose, autologous costal cartilage, reconstruction*

Introduction

Although traumatic subtotal ear amputation (EA) is relatively rare, it is a serious aesthetic deformity that can have a huge negative impact on the patient's psychological state.[1]

Various surgical methods for EA reconstruction have been described in the literature, ranging from simple reattachment to microsurgical reconstruction of the damaged ear.[2]

The problem of reconstruction of Acquired defective auricles (UR) is one of the most difficult tasks of reconstructive and plastic surgery. On the one hand, this is due to the complex relief design of its cartilaginous frame, covered with delicate and thin skin, which is very difficult to recreate due to the lack of an "ideal" donor material. On the other hand, the UR is a paired organ that makes up the appearance of a person, the reproduction of which requires maximum similarity with the healthy side both in

terms of geometric proportion and symmetry, and in terms of overall shape.

The causes of traumatic subtotal ear amputation of the external ear are different: car accidents, accidents related to sports or work, attacks, animal bites, benign or malignant tumors, burns.

Luo et al[3]. classified acquired deformities of the ear depending on the affected tissue components, the size of the defect and the condition of the surrounding soft tissues into 5 types, for each of which different methods of reconstruction are used.

- Type I: severely scarred ear without cartilage deficiency;
- Type II: partial full-layer defects;
- Type III: most or complete ear loss, periauricular skin intact;
- Type IV: Major or complete ear loss, periauricular skin involved;
- Type V: Major or complete loss of healthy surrounding skin and soft tissue due to inaccessibility of TPF unavailability.

The residual ear helps maintain an elevated ear position, but results in an abnormal-looking connection between the normal and reconstructed ear. The anatomical complexity of the ear makes reconstruction particularly challenging, and postoperative results are often disappointing.

Reconstruction of acquired ear deformity is a complex operation and requires individual reconstruction.[4-7] The gold standard for ear reconstruction after trauma is the reconstruction using autologous costal cartilage proposed by Tanzer[8] and soft tissue covering of postauricular skin flaps. This was later by Nagata and Firmin.[9-14] The method developed by Nagata can only correct the upper helical area of a constricted ear.

The extreme variety of post-traumatic defects and deformities does not allow us to offer universal methods of surgery. Moreover, with seemingly identical defects in size and shape, surgeons offer various options for plastic surgery. There is considerable controversy regarding the determination of the definitive method of recovery from subtotal ear amputation. Surgical intervention in such cases is often the patient's last chance to return to a full life in society.

Despite the variety of proposed methods of otoplasty, there is no single standard for the optimal solution of this problem.[15,16]

Among the defects of the nose, a saddle type of nose is often found, in which the aesthetics of the face are disturbed, which makes the patient turn to the rhinoplasty method.[17,18]

Autologous costal cartilage is widely used in plastic surgery procedures (such as rhinoplasty, ear microtia reconstruction, and skull reconstruction) because it does not lead to complications.[19-21]

Autogenous costal cartilage can be extracted in large quantities and poses few problems during healing.[22]

The technology of the entire cartilaginous sheath is evolving, reflecting an improvement in shape, each time including new framework elements.

Autologous cartilage is the preferred source of material for dorsal rhinoplasty as it ensures the quality of the cartilage.[23,24] During surgery for aesthetic reasons, an autologous rib often serves as a source of plastic material; it can be successfully used as a donor graft in patients with a dorsal nasal defect.

The current variety of methods for eliminating defects in UR and dorsal rhinoplasty indicates the absence of an optimal method, the results of which would suit surgeons and patients.[25-27]

To date, according to the literature, there is no system for choosing the optimal material for the reconstruction of the dorsal nasal defect, depending on the clinical situation.

All of the above indicates the relevance of this problem, which requires a detailed scientific study in order to develop optimal reconstruction methods depending on the type, location and size of the defect.

In the presented clinical case, the author describes a protocol for the reconstruction of a partially amputated external ear, and a post-traumatic deformity of the nose, which required various surgical steps.

Clinical case

The patient complains about the absence of the upper 1/3 of the ear, due to post-traumatic deformity of the nose (figure 1).

Figure 1. Lateral profile of the patient with absence of the upper 1/3 of the ear, post-traumatic deformity of the nose

Treatment plan

1. Reconstruction of the missing part of the upper 1/3 of the ear with own cartilage (autograft)
2. Recovery free flap
3. Nose reconstruction

The guiding principle is to create a template of the normal ear and transfer it to the affected ear in order to assess the extent of the defect and determine which ear contours are missing. For the reconstruction of the upper third, a mastoid skin flap was used with a cartilage graft selected taking into account the size of the defect and the need for a cartilage graft.

At the first stage, a model is made, printed from a mirror image of the scan of the other ear (figure 2). After adjustment, the template is aligned symmetrically to the contralateral ear using the ear-to-nose ratio, lateral bevel angle, and lobe position.

Figure 2. Model printed from a mirror image of the scan of the other ear

Surgical procedures

Rib preparation and frame fabrication

First, the chest wall in the projection of the ribs, 8,9, the incision site is marked (figure 3). Incision was made through the 8 intercostal space to split the rectus abdominis and expose the ribs 8,9 and osteotomized ribs 8 with a piezotome (figure 4). A negative pressure drain was placed at the donor site, and the rectus abdominis, fascia, subcutaneous tissue, and skin were sutured using 3-0, 4-0 Vicryl, and 5-0. From the resulting rib graft, an ear skeleton was formed on the ear model (figure 5).

Figure 3. On the chest wall in the projection of the ribs 8.9, the incision site is marked

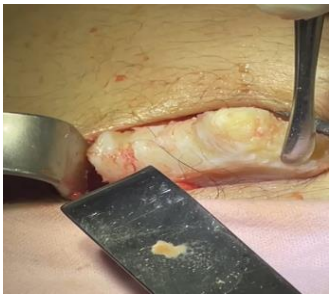

Figure 4. Expose the ribs 8 and osteotomized with piezotome

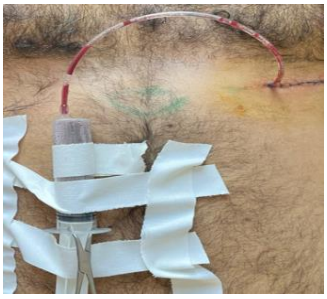

Figure 5. Drain was placed at the donor site, and skin were sutured using 3-0, 4-0 Vicryl, and 5-0

Received a block of the cartilage of the eighth rib, trying to avoid damage to the pleura (figure 6 a, b, c, figure 7). A curved incision is made along the hairline over the intended ear region in accordance with the previously marked superficial temporal artery. After making a pocket in the back of the ear region, the prepared auricle frame with the missing parts was implanted under the skin, after which the wound was sutured (figure 8). Part of the remaining rib was preserved in solution for use in rhinoplasty.

Figure 6 a. Obtained block of cartilage of the eighth rib

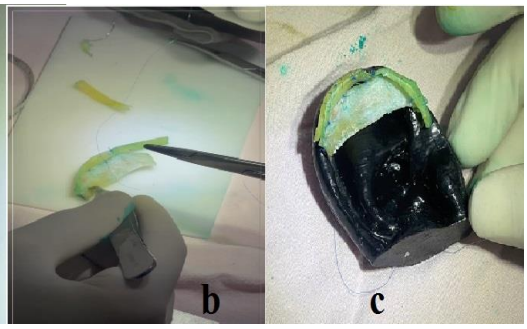

Figure 6 b, c. From the obtained rib graft, an ear skeleton was formed on the ear model

Figure 7. Formed ear frame tried on the ear

Figure 8. Prepared auricle frame with the missing parts was implanted under the skin

The second stage in 1.5 months

For exposing costal cartilage, the incision site is marked on the skin behind the ear region. After the incision, the formed costal cartilage of the formed missing part of the ear is exposed. Facial surface - with pedicle, Posterior surface - fascia + free flap combining superficial temporal fascial flap with costal cartilage graft removed. After refreshing the edges of the residual part of the ear, the superficial temporal fascial flap with a graft of costal cartilage was sutured on the amputated part of the ear, thereby restoring the anatomical shape of the injured ear. The pedicled flap was chosen to avoid severe congestion (figure 9 a, b, c, d). Drain was placed at the reception site, skin was sutured using 3-0, 4-0 Vicryl, and 5-0 (figure 10).

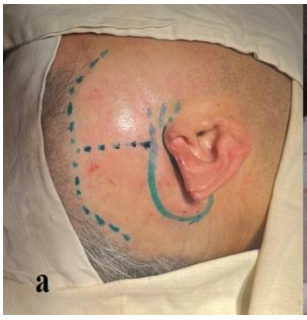

Figure 9a. Incision site is marked on the skin behind the ear region

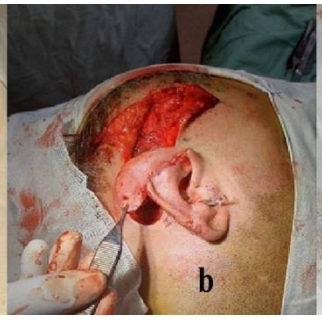

Figure 9b. After the incision, the formed costal cartilage of the formed missing part of the ear is exposed

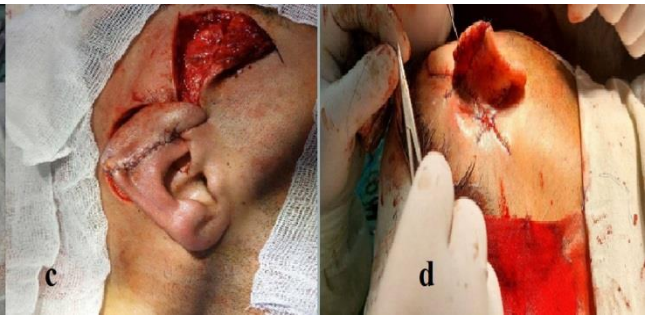

Figure 9 c, d. Combining superficial temporal fascial flap with costal cartilage graft removed and sutured on the amputated part of the ear

Figure 10. Drain in reception site, skin was sutured using 3-0, 4-0 Vicryl, and 5-0

Nose reconstruction

To design an implant for dorsal augmentation the cartilage is periodically soaked in saline for 10-20 min to carefully monitor signs of warping. Once warping is evident, the remaining peripheral concave portion of the cartilage is cut out keeping the central core figure (Figure 11). The final dorsal graft is a canoe-shaped graft when seen from above. When seen from the lateral view, it has a slightly concave side that comes into contact with the nasal dorsum, and the skin side is slightly convex (Figure 12).

Figure 11. A dorsal onlay graft carved from a rib cartila

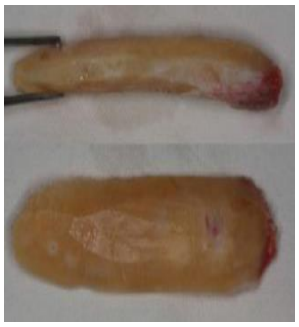

Figure 12. Modeled costal autocartilage final graft has a canoe-like shape from the frontal view and a slightly convexity in the dorsal side when seen from the lateral view

After an internal incision and exposure of the dorsal part of the deformed nose, the molded costal autocartilage graft was placed on the recipient site in the area of the defect (Figure 13,14).

Figure 13. Exposure of the dorsal part of the deformed nose

Figure 14. Insertion of the dorsal graft, the molded costal autocartilage graft was placed in the defect

At the end of the operation, the skin flap was returned to its normal anatomical position and closed with 5/0 nylon sutures. The final position of the graft was corrected by external manual manipulations (Figure 15).

Figure 15. The skin flap was returned to its normal anatomical position and closed with 5/0 nylon sutures

To minimize soft tissue edema and graft displacement at the end of rhinoplasty, a Steri-Strip bandage was applied to the entire back of the nose for a week, the length of stay in the hospital was 2.4 days. Antibiotics of the third-generation cephalosporin series are used for prophylaxis; no other treatment is used to suppress the immune system. Patients were observed the next day after the operation, then every 2 days, then 2, 6 and 12 months after the operation. Aesthetic results of ottoplasty dorsal rhinoplasty were assessed by preoperative and postoperative photographs, as well as by visual examination (Figures 16, 17, 18). Reconstructed by our method showed good results without deformation during the first year after the operation.

Figure 16. Preoperative photographs lateral profile of the patient

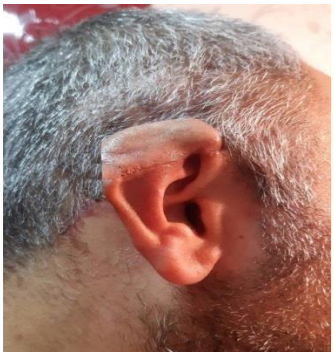

Figure 17. Photographs lateral profile of the patient, after ottoplasty

Figure 18. Lateral profile of the patient, after dorsal rhinoplasty

Disscussion

The presence of deformities and defects of the auricles, nose, in addition to a physical defect, leads to psychological trauma, the result of which is a change in the quality of life.[28,29] This is expressed in the limitation of social contacts, low self-esteem, anxiety, changes in personal attitudes and values.

Alloplastic scaffolds do not always take root in UR plastics, and the use of cartilage in the opposite UR does not allow for an adequate complete reconstruction.[30,31]

After injury, various ear defects are observed, partial, subtotal or total, which require complex contour reconstruction. The main principle is to create a template of the normal ear and transfer it to the affected ear. If the defect is less than a quarter and two planes of the ear are missing, then a fibrocartilage graft can be used to reconstruct the defect. If more than two planes or more than a quarter of an ear are missing, costal cartilage is required for reconstruction. In cases of subtotal and total amputation, costal cartilage is required for reconstruction. The presence and quality of local skin will determine if any fascia is required, indirect tissue expansion, and the number of steps to achieve the desired end result.

In the presented clinical case, the effectiveness of the reconstruction of the missing part of the upper 1/3 of the ear and the reconstruction of the bridge of the nose using an autocartilage graft is reported, presentes some principles and guidelines that will enable an accurate surgical treatment plan to be drawn up.

Evaluation of the results of operations performed using a cartilage graft showed a low antigenicity of cartilage tissue, the use of this material made it possible to achieve stable positive aesthetic and functional results. Cartilage graft selection criteria for esthetic rhinoplasty of the dorsal nose, such as microstructure, biochemistry and mechanics, contribute to good procedure results with the least graft resorption.

Our technique can provide good surgical results in traumatic cases where one third of the upper helix is lost. The operation is a safe and reliable technique in traumatic cases.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

The study was approved by the Institutional Review Board and performed in accordance with the principles of the Declaration of Helsinki. Written informed consents were obtained.

Patient consent

The patient provided written informed consent for the publication and the use of their images.

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ԱՐՏԱՔԻՆ ԱԿԱՆՋԻ և ՔԹԻ ՀԵՏՎՆԱՍՎԱԾՔԱՅԻՆ ԱՐԱՏՆԵՐԻ ՎԵՐԱԿԱՆԳՆՈՒՄ ԿՈՂԱՅԻՆ ԱՃԱՌՈՎ. ԿԼԻՆԻԿԱԿԱՆ ԴԵՊՔ

Ռաֆիկ Գ. Շահպարոնյան [1]

[1] պլաստիկ և դիմածնոտային վիրաբույժ, պլաստիկ և դիմածնոտային վիրաբուժության բաժանմունքի վարիչ, Սուրբ Գուրիգոր Լուսավորիչ բժշկական կենտրոն, Երևան, Հայաստան

Ամփոփում

Արտաքին ականջի վնասվածքային անդամահատումը և քթի հետվնասվածքային արատը էսթետիկ դեֆորմացիաներ են, որոնք կարող են ունենալ բացասական հետևանքներ՝ (հոգեբանական տրավմա) հանգեցնելով կյանքի որակի փոփոխության:

Ներկայացված կլինիկական դեպքը նկարագրում է մասամբ անդամահատված արտաքին ականջի և քթի արատի վերականգնման արձանագրություն, որը պահանջում էր տարբեր վիրաբուժական քայլեր՝ ներառյալ

կողերից աճառի ստացում, որին հաջորդում է ականջի աճառային մոդելի ստեղծումը՝ հնարավորինս հաշվի առնելով արտաքին ականջի անատոմիան, ականջի հետևում ականջի աճառային մոդելի ենթամաշկային շրջանի ներմուծում: Երկրորդ փուլում՝1,5 ամսից հետո, ամպուտացված ականջի վերականգնումն է համակցված մակերեսային ֆասցիալ և կողային աճառով և ռինոպլաստիկա՝ օգտագործելով մոդելավորված կողային աճառ: Հետվիրահատական արդյունքը գոհացուցիչ է ականջի և քթի լավ էսթետիկ տեսքի վերականգնմամբ:

Արտաքին ականջի վերականգնումը մասնակի վնասվածքային անդամահատումից և քթի հետվնասվածքային արատից հետո կողոսկրերից ավուտոճառով ապահովում է կայուն էսթետիկ արդյունք և դառնում ընտրության մեթոդ նման վնասվածքների դեպքում:

РЕКОНСТРУКЦИЯ ПОСТТРАВМАТИЧЕСКИХ ДЕФЕКТОВ НАРУЖНОГО УХА И НОСА АУТОЛОГИЧНЫМ РЕБЕРНЫМ ХРЯЩОМ

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Абстракт

Травматическая ампутация уха и посттравматический дефект носа являются эстетическими деформациями, которые могут иметь негативные последствия (приводить к психологической травме), приводящие к изменению качества жизни.

Представленный клинический случай описывает протокол реконструкции частично ампутированного дефекта наружного уха и носа, потребовавший различных хирургических этапов; включая получение хряща из ребер с последующим созданием хрящевой модели уха максимально учитывая анатомию наружного уха, внедрением его подкожной области за ухом,. Второй этап через 1,5 месяца восстановление области ампутированного уха комбинированным поверхностным височным фасциальным лоскутом с реберным хрящом с подшиванием на ампутированную часть уха и дорсальной ринопластикой с использованием L-моделированного реберного аутохрящевого лоскута. Послеоперационный результат удовлетворительный с восстановлением хорошего эстетического вида уха и носа.

Реконструкция наружного уха после частичной травматической ампутации и посттравматического дефекта носа аутохрящом из ребер обеспечивает стойкий эстетический результат и становится методом выбора при таких повреждениях.