Functional and esthetic reconstruction of microtia and congenital aural atresia: a case report

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Reconstruction of microtia and congenital aural atresia is a challenging surgery that requires experience and thorough knowledge. The goals of auricular reconstruction and atresiaplasty are to improve the cosmetic appearance and rehabilitate the acoustic function. There are several options for reconstruction of the external ear. Here, we present a case of microtia and congenital aural atresia in an 18-year-old woman. The two-stage auricular reconstruction using autologous costal cartilage and atresiaplasty were performed. The first stage of auricular reconstruction included fabrication and placement of the costal cartilage framework in the subcutaneous pocket. The second stage of auricular reconstruction involved elevation of the cartilage framework and a split-thickness skin graft. In the third stage, atresiaplasty involved reconstructions of the external auditory canal and tympanic membrane. Autologous microtia reconstruction with atresiaplasty is a good option to achieve improving the cosmetic appearance and acoustic function in patients with microtia and congenital aural atresia.

Keywords: aural atresia; congenital microtia; hearing; reconstructive surgical procedures

Introduction

Microtia is the abnormal development of the external ear that results in auricular malformation. This deformity ranges from mild distortion of the auricular landmarks to the total absence of the auricle. Congenital aural atresia (CAA) is the abnormal development of the external auditory canal, commonly associated with microtia. The severity of CAA is generally proportional to the severity of microtia [1]. The development of the middle ear is often affected with CAA and microtia because of the same embryologic source. However, inner ear pathologies are infrequent because they are derived from a separate embryonic source than other ear components [2]. Patients with microtia and CAA reveal primarily cosmetic problems and need surgical reconstruction. Moreover, hearing rehabilitation is required for those patients. Here, we report a case of microtia and CAA, focusing on functional and esthetic reconstruction.

Case report

An 18-year-old woman was referred to our clinic for the surgical treatment of microtia and CAA. Physical examination revealed a small lump in the deformed auricle and lack of concha, tragus, and external auditory canal in the right ear (Fig. 1A). She had a normal left ear and no family history of head or neck malformations. The two-stage auricular reconstruction for microtia was scheduled before external auditory canal reconstruction. In the first stage, the sixth to ninth costal cartilages were obtained. The base frame was constructed from the sixth and seventh costal cartilages, and helix and antihelix were constructed from...
the eighth and ninth costal cartilages. The tragus was constructed from the remnant sixth and seventh costal cartilages. Each constructed unit was fixed with white nylon. The W-shaped incision from the lateral portion of the lobule to the mastoid surface was employed. The remnant ear cartilage was removed completely (Fig. 1B). The anterior lobule flap was designed by splitting the vestige lobule (Fig. 1C), and skin was undermined for formation of a subcutaneous pocket. Insertion of the cartilage framework and meticulous skin closure were performed. Two suction drains were placed for giving negative pressure to the skin envelope and preventing hematoma formation (Fig. 1D). The second stage of the operation for ear elevation was performed 6 months later. The skin was incised 3 mm from the outline of the constructed ear. The wedge-shaped costal cartilage was fixed to the posterior surface of the constructed ear and mastoid surface with 4-0 nylon (Fig. 2A). The cartilage was covered with the temporoparietal fascia flap (Fig. 2B). Finally, a full-thickness skin graft was obtained from the groin area and grafted on the fascia flap (Fig. 2C). Atresiaplasty was performed 6 months after auricular reconstruction. The anterior based flap was made at the appropriate location for external auditory canal reconstruction. After elevation of soft tissue down to the bone, drilling was performed medially until the bony atretic plate was identified. The atretic plate was removed gently with curettage. The fused malleoincudal complex was identified, and fixation site was removed (Fig. 3A). A temporalis fascia graft was placed over the malleoincudal complex to create the tympanic membrane (Fig. 3B). A thin split-thickness skin graft (0.008") was used to cover the new bony canal (Fig. 3C). A small disk of a thick silastic sheet was placed over the temporalis fascia graft and overlapping skin graft to prevent lateralization of the tympanic membrane. Pieces of Merocel (Medtronic Xomed Inc., Jacksonville, FL, USA) packing were placed in the external auditory canal and expanded with ofloxacin eardrops (Fig. 3D). The packing and silastic disk were removed after 14 days. The results after auricular reconstruction and atresiaplasty have

Fig. 1. The first-stage operation of auricular reconstruction. (A) Preoperative photograph in an 18-year-old woman who has microtia and congenital aural atresia. (B) The remnant cartilage is removed completely. (C) A subcutaneous pocket is formed for the insertion of the costal cartilage framework, and lobule transposition is performed. (D) The cartilage framework and suction drains are inserted. (E) The appearance of the auricle after completion of the first stage is seen.

Fig. 2. The second-stage operation of auricular reconstruction. The costal cartilage block is fixed underneath the ear framework for elevation (A) and covered with the temporoparietal fascia flap (B). (C) A full-thickness skin graft is utilized to cover the posterior surface of the elevated ear over the fascia flap.
been satisfactory and maintained for 12 months without any complications (Fig. 4).

Discussion

Microtia and CAA are congenital anomalies that require intervention for cosmetics and hearing. Reconstructive options for microtia are subcutaneously placed autologous costal cartilage, implanted artificial material, including a porous polyethylene (Medpor; Stryker, Kalamazoo, MI, USA), and a prosthetic ear by osseointegrated implants [3]. The patient should be presented with the options and involved in decision-making regarding reconstructive treatment. We used the Nagata two-stage technique, spaced 6 months apart. The first stage includes cartilage framework placement with lobule transposition and tragus reconstruction. The second stage involves elevation of the framework and covering of posterior defects with a temporoparietal fascia flap [4]. The auricle reaches approximately 95% of the adult size by 6 years of age, and costal cartilage develops from at least 6 years [5]. For costal cartilage microtia repair, the preferred age to meet the requirements of framework carving is 9 years. The costal cartilage is prone to becoming hollow during the rapid pubertal growth and is gradually calcified in adulthood. Ultrasound examination before repair can determine whether the costal cartilage is hollow or calcified. Porous polyethylene microtia repair is recommended after 5 years of age and has good esthetic results without donor-site morbidity. However, the porous polyethylene microtia repair has potential risks of extrusion [3]. As the alloplastic material demonstrates higher rate of extrusion, autologous repair is favored.

The canal reconstruction surgery before costal cartilage microtia repair compromises tenuous vascularity of the skin flap over the cartilage framework [6]. The canal reconstruction surgery after porous polyethylene microtia repair risks infection and extrusion of the polyethylene graft [7]. Therefore, surgery for CAA is safer in combination with or after costal cartilage microtia repair and before porous polyethylene microtia repair. The main objective of CAA surgery is to improve hearing. Patients who undergo CAA surgery must have normal inner ear function and well-developed middle ear, which can be evaluated using the Jahrsdoerfer grading scale. The CAA surgery should be performed for patients scoring 7 or more, which suggests an 85%–90% chance for postoperative hearing restoration [8]. In children with bilateral CAA, use of a softband bone conducting hearing device is necessary as early as possible for normal language development before CAA surgery. If the patient does not want to undergo atresiaplasty or is a poor candidate for surgery, implantable hearing devices, such as bone anchor-
ing hearing aids, Bonebridge (Medel, Innsbruck, Tyrol, Austria), Vibrant Soundbridge (Medel), are additional options for hearing rehabilitation. Implanting surgeries are allowed above 5 years age and should be performed in a favorable position for auricular reconstruction [9].

The reconstructed auricle, auditory canal, and tympanic membrane should be evaluated for infection, skin necrosis, and auditory canal stenosis. Skin- and implant-related infections can complicate wound healing and expose the graft framework. Poor hearing outcomes usually result from canal restenosis and tympanic membrane lateralization [10].

In conclusion, surgery for microtia and CAA should enhance functional hearing and improve esthetics. Patients should be counselled appropriately about the options for surgical reconstruction of the external ear and hearing rehabilitation. Auricular reconstruction with the autologous costal cartilage, followed by atresiaplasty, can achieve the best possible functional and esthetic outcomes.

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Conflicts of interest

The authors have nothing to disclose.

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