Early Detection of Auricular Deformities in Newborns
May Allow Non-Surgical Correction

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ABSTRACT
Auricular deformities are commonly present in newborns and are regularly overlooked during newborn screening exams. Failure to identify these deformities in newborns centered on traditional beliefs that plastic surgery later in life was the only corrective option. High levels of maternal estrogen, which decline by six weeks of age, keep auricular cartilage soft and malleable, making early identification and correction by molding essential. A new alternative, the EarWell Infant Ear Correction System, provides a non-surgical method of correction of early-detected newborn ear deformities. If applied in the first few days of life, the EarWell System is an effective non-surgical technique in the treatment of auricular deformities. We report successful correction of a "lop ear" and "conchal crus" deformity in a newborn in El Paso, TX, with the EarWell System.

BACKGROUND INFORMATION
Auricular deformities are one of the most common anomalies present in newborns and are regularly overlooked during newborn screening exams. External ear deformations have a proven psychological and social impact on children. Children with any facial deformity are frequently tormented, ridiculed and bullied by peers; instilling low self-esteem and anxiety. As a primary facial feature, auricle deformities require aesthetic reconstruction to help children regain self-confidence and to lessen emotional despair. Failure to identify auricular deformities in newborns centered on traditional beliefs that plastic surgery later in life was the only corrective option. Non-invasive methods are now available to correct congenital ear deformities with the ability to mold newborn auricular cartilage, making early-detection essential for treatment. We present a case of a newborn who underwent successful non-surgical correction of early-detected bilateral congenital ear deformities with the use of the EarWell Infant Ear Correction System (Becon Medical, Tuscon, AZ). This report will discuss the importance of early-detection of auricular deformities and the procedure and rationale of ear molding.

CASE PRESENTATION
A healthy newborn male was born at term at a local hospital after an uncomplicated prenatal course. Shortly after birth, the newborn was noted to have a bilateral congenital ear deformation consistent with a mixed deformity of lop ear (complete downward folding of the helix and scapha) and conchal crus deformity (cartilage fold traversing the mid portion of the concha extending onto the vertical wall) (Figure 1). Since the structural deformity was discovered early with the patient presenting in the first few weeks of life, ear molding with the EarWell System was determined to be an effective method of correction.

The EarWell device consists of a posterior shell with a posterior conformer, helical rim retractors, a conchal former, and an anterior shell. A rim of hair was shaved around each auricle and the skin cleaned with alcohol pads, allowing adhesion of the posterior cradle footplate. The posterior conformer located in the retroauricular sulcus was aligned, guiding the antihelical fold to create the superior limb of the triangular fossa. Retractors shaped the helical rim while providing an anterior force on the scapha. The conchal former was placed in the conchal cavity to exert downward force at the conchal-mastoid angle. Compressible foam may be added to obtain appropriate height of the conchal former, but was not required in this case. Lastly, the anterior shell was affixed to the posterior cradle securing all components of the device while applying an anterior force.

On day 26 of life, 11 days after initial EarWell application, the infant returned for follow-up and replacement of the devices. Removal of the prosthesis revealed two small areas of localized pressure ulceration less than 2mm in diameter. A new set of EarWell devices was reapplied. Two weeks later, device replacement revealed ulcer recovery and correction of the conchal crus deformity.

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mity with remaining helical deformities. On follow up ten days later, considerable improvement was noted bilaterally. The devices were removed and replaced with retainers. One week later, splint removal revealed achievement of adequate auricle shape. On the final visit, following a total of 6 weeks of treatment with the EarWell System, the infant presented with normal external ear anatomy resolved of deformation (Figure 2).

Figure 2. Left lop ear and conchal crus deformity before (top left) and after (top right) treatment with the EarWell System. Right lop ear and conchal crus deformity before (bottom left) and after (bottom right) treatment with the EarWell System.

DISCUSSION
Newborn auricular anomalies are classified as malformations or deformations. Malformations result from abnormal embryologic development during the fifth to ninth week of gestation generating an absence of cartilage or skin. Treatment of malformations requires aesthetic surgical correction generally beginning around school age when the auricle has reached mature size. In contrast, auricular deformations have fully developed components, but contain abnormal architecture. Auricular cartilage develops development by the ninth week of gestation, after which deformations may occur from intra- or extra-uterine forces. Ear deformities, if identified early, are generally receptive to ear molding procedures.

Auricular deformations can be classified according to the direction of force compressing the ear and limiting appropriate shape. Type 1 and type 2 are characterized by vertical and horizontal deformation, respectively. Type 3 encompasses focal deformation, with further classified into type 3a, which describe an inverted fold resulting from a single imprint; or type 3b, which are deformities caused by multiple imprints. Peripheral external ear structures, including the helix, antihelix, scaphoid and triangular fossa, are especially vulnerable to deforming forces. The external auditory canal connects with the base of the skull, providing firm support to less deformable structures: the concha, helical root and tragus.

This case presented a newborn with a Type 1 lop ear deformity, caused by vertical compressive forces, as well as deformation of the conchal crus. Deformational auricular anomalies also include prominent or cup ear (widened conchal-mastoid angle or absent antihelical fold), lidding (bent helical rim), Stahl’s Spock ear (transverse antihelical crus continuing to the helical rim), cryptotia (absence of retroauricular skin sulcus), helical rim deformities, and many other variants. Treatment of such anomalies requires corrective forces in opposition of the deforming force.

Ear molding is a non-invasive corrective method for deformation anomalies if utilized soon after birth. The ability to mold the neonatal ear is believed to result from high circulating maternal estrogen levels. Estrogen has been shown to increase levels of hyaluronic acid, an essential component of auricular cartilage elasticity, leaving the neonatal auricle soft and malleable shortly after birth. By weeks of age, estrogen levels rapidly decline, rendering cartilage resistent to molding. Because a short time period exists in which auricular cartilage can be molded, early identification of deformities and immediate correction is essential. A recent study revealed that only one third of ear deformities spontaneously correct during the first week of life. Delaying treatment to observe for self-correction only only the chance of a poor outcome. Improved aesthetic outcome was attained when molding was initiated in the first 5 to 7 days of life.

Ear molding has been utilized since 1988, with splitting a common technique presented in the literature. Many authors have used a flexible splint to produce molding forces with variable aesthetic results. Splinting products have been described to include wire, dental compounds, wax, Reston foam, Putty Soft (vinyl polysiloxane impression), clamps, as well as others. In 2010, the FDA approved the EarWell Infant Ear Correction System, revolutionizing the treatment of auricular deformations. Produced by Becon Medical, the soft, 4-component “ear muff” is applied as mentioned previously, and over weeks painlessly remolds ear cartilage. Follow-up visits should occur every 2 weeks to replace and adjust the device with a total treatment time of approximately 6-8 weeks. Most insurance policies are now covering the cost of the EarWell System, making it an affordable yet effective treatment approach. If treatment is delayed, surgical correction is the only remaining option. An otoplasty is almost never covered by health insurance, proving to be a more costly, painful and risky treatment modality achieving variable results.

Based on clinical results reported in the literature, correction of auricular deformities with the EarWell System is anticipated in over 90% of cases. The patient presented in this report reveals another case of the EarWell System’s aesthetic success. We believe that the EarWell system is a safe, non-invasive and effective option for the correction of auricular deformities. With early diagnosis of auricular anomalies and appropriate timing of treatment, good aesthetic outcomes may be achieved.

CONCLUSION
This case report highlights an effective, non-surgical technique in the treatment of auricular deformities that should be practiced more routinely in El Paso. Unfortunately, the EarWell molding system as a treatment option is unknown to most healthcare providers and the

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general public. Without awareness of this successful, cost-effective, non-surgical option, children are unable to be referred during the critical molding period in the first few weeks of life. It is hoped that this report will expose healthcare providers to the importance of identifying newborn ear deformities shortly after birth and alert them to the success of the EarWell System as a treatment option.

REFERENCES


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