The Crumpled-Ear Deformity

Steven G. Wallach, M.D., and Ravelo V. Argamaso, M.D.

Bronx, N.Y.

The common characteristics of the crumpled-ear deformity, the steps for surgical correction, and the authors' experience are described in this article. Commonly, the ear has a folded-over appearance; a normal length and width when unfurled; and wrinkling of the skin and cartilage of the helical rim, scapha, antihelix, and concha. Principles of correction of this deformity include (1) superficial scoring of the concave segments of the cartilage to open the wrinkled segments, (2) creating the antihelical fold by a mattress-suture technique, (3) repositioning of the helical rim, and (4) repositioning of the prominent ear lobe, if present. A total of 12 crumpled ears were evaluated in six patients, three of whom underwent surgery during their teenage years. No complications have been observed. A new classification of an ear deformity has been proposed based on morphology that to the authors' knowledge has not been described in the literature. Identification of the common features of the deformity allows for precise correction using already well-defined techniques. (Plast. Reconstr. Surg. 108: 30, 2001.)

We propose a new classification for a congenital deformity of the ear that to our knowledge has not been described in the literature. We call it the crumpled ear; it may represent a subset of the lop ear, microtia, or the Stahl ear. The purpose of this article is to present our experience with six patients with bilateral crumpled ears, describe the common characteristics of the deformity, and outline the steps for surgical correction.

The word "crumple" is defined by Webster's New Collegiate Dictionary as "a wrinkle or crease made by crumpling" or, when used as a verb, "to press, bend, or crush out of shape." It is with this definition in mind that we describe the crumpled ear.

The underlying cartilage of the crumpled ear has a wrinkled appearance, similar to an accordion, often resulting in a folded-over appearance (Fig. 1). Ridging is present in the relatively thin cartilage of the helical rim, the scapha, the antihelix, and the concha. Furthermore, the overlying skin remains "crumpled" even after being freed from the underlying cartilage during surgery. When unfurled, the ear has a length and width that are within normal limits. Additionally, the helical rim and the ear lobe may be prominent. The crumpled ear has only been observed bilaterally. In the patients in this series, there was no history of trauma or associated anomalies.

The lop-ear deformity is characterized by a folded-over appearance that extends to the darwinian tubercle and involves a malformed helix and scapha. There is often conchal excess and an associated malformation of the antihelix. The lop ear, when unfurled, does not seem to be constricted. Similarly, the crumpled ear is not deficient of skin. Classically, ridging found in the cartilage and skin is not a common component of the lop-ear deformity.

There are several grades of microtia, varying from mild deformities of the auricle and cupping of the ear to complete absence of the auricle and the presence of only small remnants of the lobule. Microtia is usually unilateral, although bilateral deformities occur in 10 percent of patients. Stenosis of the external auditory canal is more common in severe forms of microtia, with deafness sometimes present in the affected ear. For the crumpled ear, structures are crumpled rather than truly hypoplastic. Additionally, microtic ears are deficient of cartilage and skin; these characteristics are not present in the crumpled-ear deformity. Furthermore, in the patients with crumpled ear that we have seen, there is a bilateral component and no evidence of hear-
ing loss. Still, the crumpled ear may represent a mild form of microtia.

The Stahl ear is characterized by the appearance of a third crus that originates near the origin of the inferior crus and usually runs transversely to the helical rim. Often, there is absence of the superior crus with flattening of the helix and a deformity of the scaphoid fossa. It is often unilateral but may be bilateral in up to 20 percent of patients. Crumpling is not a common attribute of the Stahl ear. Depending upon the extent of the deformity, the inferior and superior crura may not be recognizable in the crumpled ear.

**Patients and Methods**

We present a series of six patients with 12 crumpled ears. In this group, three patients underwent surgical correction by the senior author (R.V.A.).

**Operative Technique**

The lateral transhelical approach employed for correction of prominent ears is also applicable for correction of the crumpled-car deformity. This technique has been previously described for use in otoplasty. The initial incision is made along the proposed helical sulcus and parallel to the margin of the folded ear. It is made full-thickness through the lateral

ear skin and the helical rim cartilage, extending from the crus helicus to the ear lobe. The helical rim cartilage remains attached to the medial ear skin, and the remaining cartilage is left adherent to the lateral skin. For prominent ear deformities, modifications of ear contour-employing techniques for excising concha or scapha and suturing techniques to define the crus helicis are performed along the medial aspect of the ear cartilage still attached to the lateral ear skin. For the crumpled-ear deformity, the cartilage is relatively thin and "crumpled" with wrinkling of the cartilage. Once the cartilage is dissected, the principles of correction of this deformity include (1) superficial scoring of the concave segments on the medial side of the cartilage to open the wrinkled segments (Fig. 2), (2) creating the antihelical fold by a mattress-suture technique using nonabsorbable sutures (Fig. 3), (3) repositioning the helical rim, and (4) repositioning the prominent ear lobe, if present. A follow-up of 25 years’ experience with this technique for prominent ears in 66 patients has revealed no instances of suture extrusion.

Importantly, although the cartilage may be scored to open the wrinkled segments in the same area in which the antihelical fold will be created, placement of the mattress sutures is not necessarily influenced by the location of the scoring. In other words, the location of the proposed antihelical fold is determined and the nonabsorbable mattress sutures are placed to create the new antihelical fold.

The patients were returned home in a protective head dressing either the day of surgery or 1 day after surgery. The head dressing and skin sutures were removed in the office 1 week later. No further postoperative dressing was required (Fig. 4).

**Results**

A total of six patients (four male and two female) with 12 crumpled ears were evaluated; three of the patients had undergone surgery as teenagers. Only one patient had a first-degree family member with a mild form of the crumpled-ear deformity. The patients had no evidence of previous trauma, associated hearing loss, or other anomalies. There were no complications. Preoperative and postoperative photographs of two patients are shown (Figs. 5 through 12).
Fig. 2. Lateral transhelical approach with full-thickness incision through the cartilage and superficial scoring of the concave segments of cartilage to open the wrinkled segments.

Fig. 3. Mattress-suture technique used to create the antihelical fold.

**Discussion**

The term “crumpled” has been used to describe ear anomalies associated with Beals syndrome. This is a condition associated with a marfanoid habitus, arachnodactyly, crumpled ears, multiple joint contractures, and scoliosis. As in patients with Marfan syndrome, these patients may have associated cardiac anomalies and bilateral ectopia lentis, although these findings are not as common.

The definition used by some authors to de-
Fig. 5. A 13-year-old boy with bilateral crumpled-ear deformity. (Left) Preoperative anterior view. (Right) Postoperative anterior view.

Fig. 6. Same patient as in Figure 5. (Left) Preoperative view of the right ear. (Center) Preoperative view of the left ear. (Right) Postoperative view of the left ear.

scribe crumpled ears in Beals syndrome patients is a “crumpled appearance of the external ears in which the upper helix is folded, the crura are prominent, and the concha is shallow.”15-17 Wrinkling or creasing of the ear cartilage is not mentioned. The examples of the crumpled ear that we have described have some of these components; however, an important feature is the actual wrinkling of the ear cartilage. Furthermore, the photographic examples used in articles describing Beals syndrome suggest a mild lop ear in some patients13,14,17 and anomalies similar to those found in velocardiofacial syndrome18 in others.14,16 In none of their examples is there any wrinkling of the ear cartilage as described here.14,16,17

Rogers1 in 1968 reviewed the experience with ear deformities at one institution and attempted to clarify the use of terminology for four categories: microtia, lop ear, cup ear, and protruding ear. He discussed the embryologic development of the ear (which led to suggestions for the cause of these deformities), re-
viewed the possible genetic inheritance, and presented photographic examples throughout the discussion. Interestingly, Rogers stated that “it soon became apparent to me that microtia, lop ears, cup ears, and protruding ear deformities often shared some physical characteristics more frequently than they differed from each other.” We agree with the above and therefore it is difficult for us to ignore the similarities of the crumpled ear to the lop ear, microtia, and the Stahl ear.

The proposed classification system is based on morphology for an ear deformity that may represent a subset of the lop-ear deformity, a mild form of microtia, or the Stahl ear. Although generally in agreement with Rogers’s categorizations, we have found reason to describe this anomaly of the ear because surgical treatment for this deformity varies from treat-
ment for the four categories mentioned above. One inherent problem seen in attempting to correct this ear deformity by the techniques we describe is that the crumpling along the helical rim is not completely corrected. If significant scoring of the cartilage is performed in this area, notching of the rim will occur, which may lead to greater irregularity of the rim.

Although our patients requested treatment in their teenage years, correction can be performed using the same age criteria as we use for other ear anomalies, commonly between ages 4 and 7 years. However, nonsurgical correction using molding, as described by Matsuo et al., may be tried if the patient is diagnosed early; however, the benefits of
molding have not been proved for this anomaly.

The lateral transhelical approach is a versatile method used by the senior author to correct most ear deformities and has also been employed for correction of the crumpled ear. Using already described techniques for repair of other ear anomalies, a simple plan of treatment can be constructed to achieve correction for this uncommon deformity. A medial or posterior approach for exposure of the cartilage should be acceptable, provided that similar techniques for treating the underlying cartilage are employed.

Steven G. Wallach, M.D.
103 East 78th Street
New York, N.Y. 10021
sgwallach@aol.com


