Original Investigation

A Novel Technique for Sculpting Costal Cartilage in Microtia Repair and Rhinoplasty

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IMPORTANCE Transforming a block of costal cartilage into a complex 3-dimensional framework that reflects the contours of a normal ear or nasal bridge requires the creation of many subtle curves, concavities, and convexities. Thus, specialized instruments for microtia repair and rhinoplasty, with specifically curved sharp blades, are used for delicate carving without the need for excessive force, which can damage the framework. Several challenges are associated with these specialized instruments.

OBJECTIVE To describe a novel alternate technique using disposable skin punch biopsy instruments for sculpting cartilage, which have the potential to decrease cost, ensure consistently sharp blades, and provide a variety of sizes to allow precise, controlled contour changes.

DESIGN Surgical technique adapting a commercially available skin punch tool for costochondral sculpting.

SETTING Academic tertiary care medical center.

PARTICIPANTS Patients undergoing microtia repair and rhinoplasty requiring sculpting of costochondral cartilage.

MAIN OUTCOMES AND MEASURES Feasibility and reliability of cartilage contouring.

RESULTS This novel technique has been used in microtia repair and rhinoplasty with excellent results.

CONCLUSIONS AND RELEVANCE This alternate technique of costochondral sculpting should be included as an additional tool in the reconstructive surgeon’s armamentarium.

LEVEL OF EVIDENCE NA.

Sculpting costal cartilage into a complex 3-dimensional auricular framework for microtia or a smooth dorsal onlay graft for rhinoplasty requires meticulous, precise contouring to reflect many subtle convexities and concavities of a normal ear or a nasal bridge.1-4 Transitions must be smooth because unwanted irregularities of the cartilage may be evident once the overlying skin heals. Microtia reconstruction most commonly involves using the cartilaginous synchondrosis of the sixth, seventh, and eighth ribs to create the concha, scaphoid fossa, and triangular fossa, as well as an additional floating rib to form the helical rim. In rhinoplasty, dorsal augmentation sometimes demands the use of contoured costochondral cartilage that must be sculpted to fit the underlying framework while reflecting the shadow and highlights of a nice dorsum. After harvesting the costochondral cartilage, one of the most critical steps to achieve an optimal cosmetic outcome is the meticulous designing and sculpting of the framework on the back table in the operating room. Therefore, an effective cartilage carving instrument set is crucial for this operation. Specifically curved sharp blades with long handles typically are used for precise sculpting of the framework. These blades must be kept extremely sharp; dull instruments require more force, thereby diminishing surgical precision. Moreover, the use of superfluous force potentially increases the risk of cracking, bending, or warping the cartilage when attempting to carve delicate contours.
Microtia carving instruments present several challenges. The incidence of microtia is only 1 in 5000 births worldwide, and even in the highest volume centers for microtia repair, the rarity of these cases fails to justify the purchase of multiple sets of standardized, costly, highly specialized instruments. In some institutions, microtia repairs are performed in operating rooms in different campuses across the hospital depending on the age of the patient, thereby requiring multiple, infrequently used instrument sets. Sending out instruments for sharpening or maintenance must also be timed so that they are not away when needed.

We recently have found an excellent alternative for the sculpting instruments that provides exceedingly precise and sharp contouring of the cartilage graft. Disposable circular punch biopsy cutting instruments, used for the biopsy of skin lesions, come in different sizes, typically ranging from 1 to 8 mm in diameter (Figure 1). The round shape of the blade provides an excellent match for creating concave and convex contours, including the medial portion of the helical rim or smoothing the edges around the triangular fossa and scaphoid fossa depressions. The use of new punches for each case provides the surgeon with an array of consistently sharp cartilage carving instruments of various diameters that can be used selectively based on the age of the patient and the size of the contralateral ear. Similarly, disposable punches for each rhinoplasty case allows the surgeon to choose the best size carving tool to match the size of the nasal dorsum. Logistically, they are comparatively inexpensive, sterile, and readily available in any clinic or general hospital operating room.

For sculpting of the auricular framework, the skin punch tool is extremely effective in sharply carving concavities of the concha, scaphoid fossa, and fossa triangularis (Figure 2). After assembly of the auricular construct, further definition can be created with the skin punch tool without the risk of cracking or disrupting the framework. Minimal force is required when sculpting with the skin punch tool because of its extreme sharpness. We now routinely use these punch biopsy instruments for microtia cases and have been pleased with the sharpness of the blades and the precise contours they allow the surgeon to create. Even when a specialized microtia carving set is available, the biopsy skin punch tools are oftentimes preferable because of their predictable sharpness. This method of cartilage sculpting also is useful in rhinoplasty. For dorsal onlay rib grafts, sculpting a concavity on the undersurface of the graft allows a better fit with the underlying native framework, which minimizes side-to-side drift of the graft (Figure 3). The skin punch tool is ideally suited for creating such a concave contour. It also allows one to precisely carve out thin, curved strips of rib cartilage for delicate tip grafting.

Figure 1. Skin Punch Biopsy Instrument in Various Sizes

Figure 2. Steps of Carving the Auricular Framework

Figure 3. Contouring the Deep Surface of a Dorsal Onlay Graft
In conclusion, we describe a unique and novel use of a disposable, inexpensive punch biopsy instrument to potentially replace or augment the armamentarium of the microtia reconstructive tools. We have successfully used this technique in microtia repairs and rhinoplasties with excellent results.

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REFERENCES