Abstract

Objectives: To assess cellular viability of nasal septal cartilage after sculpting with cold steel, bovie electrosection and ultrasonic bone aspirator

Study design: After IRB approval, nasal septal cartilage was harvested from 3 patients who underwent septoplasty at our institution, and in this study.

Methods: A 2cm x 0.5cm rectangular segment of nasal septal cartilage was collected from three male patients undergoing septoplasty. Cartilage was harvested with the long axis parallel to the bony cartilaginous junction. Each rectangular piece of cartilage was then cut into four identical blocks measuring 0.5cm x 0.5cm. A partial thickness, central wedge was then carved out in three blocks using a scalpel, Colorado tip Bovie or ultrasonic bone aspirator with Payner tip. The fourth block served as a control. After fixation and staining with H&E, slides were evaluated by two blinded pathologists for histological analysis and cell counts.

Results: Overall, minimal disruption of the cellular integrity of nasal septal cartilage samples sculpted with each of the three techniques was noted compared to control. Cell counts revealed 96%, 97%, 97% and 97% viable nuclei in the scalpel, Bovie, ultrasonic bone aspirator and control groups, respectively.

Conclusion: The use of alternative cartilage sculpting techniques, such as Bovie electrosection and the ultrasonic bone aspirator, does not appear to impair cartilage structure or cellular integrity of nasal septal cartilage grafts in the immediate post-harvest period.

Introduction

Autogenous cartilage is the preferred type of grafting in cosmetic, functional and reconstructive nasal surgery given its longer-term survival, minimal warping potential, flexibility within the nose and availability and ease of harvest in the head and neck. The cartilaginous nasal septum is the natural choice for autogenous cartilage grafts as it is readily accessible during nasal surgery and is relatively stiff, permitting more extensive and precise sculpting to attain a desired result.

Although cartilage sculpting with a scalpel is the modality of choice amongst nasal surgeons for obvious reasons, alternative methodology for reshaping and contouring cartilage have emerged in practice as well as in the literature, including the use of electrosection devices and the ultrasonic bone aspirator. Although clinical experience amongst practitioners does not suggest any long-term adverse outcomes or short-lived effects from such techniques, there is nothing in the literature comparing the immediate effects of such technologies on the integrity of the native cartilaginous framework and chondrocyte population.

In this study, we decided to examine cellular viability of nasal septal cartilage after sculpting with cold steel, Bovie electrosection and the Sonopet ultrasonic bone aspirator (UBA; Stryker, Inc., Kalamazoo, MI, USA).

Methods and Materials

A 2cm x 0.5cm rectangular segment of nasal septal cartilage was collected from three male patients undergoing septoplasty. Cartilage was harvested with the long axis parallel to the bony cartilaginous junction. Each rectangular piece of cartilage was then cut into four identical blocks measuring 0.5cm x 0.5cm. A partial thickness, central wedge was then carved out in three blocks using a scalpel, Colorado tip Bovie (cut setting at 11 Watts) and the Sonopet ultrasonic bone aspirator (100% power, 50% suction, 15% irrigation) with Payner tip, respectively. The fourth block served as a control. Cartilage samples were fixed immediately thereafter and stained with Hematoxylin and Eosin. Slides were evaluated by two blinded pathologists for histological analysis and cell counts. Cartilage graft integrity was assessed and 100 chondrocyte nuclei were counted under optical light microscopy for each sample. Empty lacunae were not included as non-viable cells in our cell count as nuclei may not have been in the plane of sectioning. Only definitive non-viable chondrocyte nuclei were included in cell count.

Figure 1. Scultping instruments. From left to right: #15 scalpel, Colorado tip Bovie, Sonopet ultrasonic bone aspirator.

Figure 2. Harvested nasal septal cartilage. A 2cm x 0.5 cm rectangular segment of cartilage was harvested, divided into 4 equal blocks 0.5cm x 0.5cm for carving experiment.

Results

Overall, minimal disruption of the cellular integrity of nasal septal cartilage samples sculpted with each of the three techniques was noted. No zonal or peripheral necrosis was identified in any of the specimens. Cell counts revealed 96%, 97%, 97% and 97% viable nuclei in the Scalpel, Bovie, ultrasonic bone aspirator and control groups, respectively. One-way ANOVA for three independent samples showed no significant difference between the groups. Viable chondrocytes in all specimens were scattered throughout the tissue as is seen in normal hyaline cartilage.

Discussion

Although cold steel sculpting of autologous cartilage grafts is ubiquitous among nasal surgeons, alternative instruments such as Bovie electrosection and the ultrasonic bone aspirator have been gaining popularity for their ability to rapidly create smoother, more contoured solid cartilage grafts in aesthetic and functional rhinoplasty. We demonstrate that these differing techniques are comparable to cold steel sculpting in terms of preservation of cartilage integrity and chondrocyte viability and density in the immediate post-harvest period.

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References