Harvesting Rib Cartilage in Primary and Secondary Rhinoplasty

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KEYWORDS

• Rib cartilage graft • Costal cartilage • Rhinoplasty • Secondary rhinoplasty • Technique

KEY POINTS

- The rib offers an abundant supply of cartilage for use in virtually every aspect of rhinoplasty and is the preferred donor site when rigid support is necessary.
- The most significant advantage of rib cartilage is that grafts can be produced with considerable versatility with respect to shape, length, and width.
- Rib cartilage allows reconstruction of the nasal framework in patients with virtually all types of functional and aesthetic requirements.

INTRODUCTION

Satisfactory and consistent long-term results in primary and secondary rhinoplasty rely on adequately supporting or reconstructing the nasal osseocartilagenous framework. Septal cartilage is generally considered the preferred grafting material in rhinoplasty; however, severe deformities or a paucity of available septal cartilage often requires an alternative source of grafting material. This is particularly true in secondary rhinoplasty when structural deformities result from overresection of the osseocartilaginous framework during previous procedures.[1–3]

Alloplastic materials have the advantages of being easy to use, readily available, and having an unlimited supply. Unfortunately, many of these alloplastic materials are fraught with long-term complications, such as infection, migration, extrusion, and palpability.[4–7] Thus, autogenous tissue continues to be our preferred source of grafts.

Autogenous rib cartilage has been our graft material of choice for major nasal reconstruction when sufficient septal cartilage is not available. Rib provides the most abundant source of cartilage for graft fabrication and is the most reliable when structural support is needed.[1,3] To avoid warping of smaller grafts, we follow the principle of carving balanced cross-sections originally described by Gibson and later substantiated by Kim and colleagues.[8,9] The use of internal K-wire stabilization in columellar struts and dorsal onlay grafts should be avoided owing to the increased risk of late complications such as infection, broken or bent K-wires, and extrusion of the K-wires.

TREATMENT GOALS AND PLANNED OUTCOMES

The rib offers an abundant supply of cartilage for use in virtually every aspect of rhinoplasty and is the preferred donor site when rigid support is necessary. Dorsal augmentation with rib cartilage grafts has proven useful in the secondary rhinoplasty patient. It is also useful in patients with congenital deformities, posttraumatic deformities, or in primary rhinoplasty patients who require a

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significant amount of structural support. The most significant advantage of rib cartilage is that grafts can be produced with considerable versatility with respect to shape, length, and width. This facilitates reconstruction of the nasal framework in patients with virtually all types of functional and aesthetic requirements.

PREOPERATIVE PLANNING AND PREPARATION

The choice of rib to harvest depends on the planned use because the amount of cartilage required dictates whether the cartilaginous segment needs to be harvested from 1 rib, 1 rib and a portion of another, or the entire cartilage segments of 2 ribs. In general, the surgeon should choose the cartilaginous portion of a rib that provides a straight segment because it is often possible to construct all required grafts from a single rib. For augmentation with dorsal onlay grafts, we harvest the cartilage from the fifth, sixth or, on occasion, the seventh rib, depending on which rib feels the longest and straightest. If additional grafts are needed, a part or the entire cartilaginous portion of an adjacent rib may be harvested.

In older patients, ossification of the cartilaginous rib is a significant concern, and a limited computed tomography scan of the sternum and ribs with coronal reconstructions is recommended in those patients where there is a high index of suspicion. Despite appropriate preoperative screening, occasionally patients will present with premature calcification of the cartilaginous rib. Frequently, this is limited and occurs commonly at the junction of the osseous and cartilaginous portions of the rib. Small foci of calcification may also be found within the body of the rib cartilage itself. This can impair the preparation of individual grafts as well as act as a site of weakness often having a tendency to fracture during graft harvest. We have found that the use of a smooth diamond burr can also prove useful in contouring areas of calcification to salvage these uncommon circumstances.

PATIENT POSITIONING

Rib cartilage harvesting is performed with the patient in the supine position under general anesthesia. The rib cartilage graft may be harvested from either the patient's left or right side.

PROCEDURAL APPROACH

In female patients, the incision is marked approximately 5 mm above the inframammary fold and measures 3 to 5 cm in length (**Fig. 1**). The incision should not extend beyond the medial extent of the inframammary fold. This avoids postoperative visibility of the incision if the patient wears low-cut clothing. In males, placement of the incision is not as important, and the incision is usually placed directly over the chosen rib to facilitate the dissection.

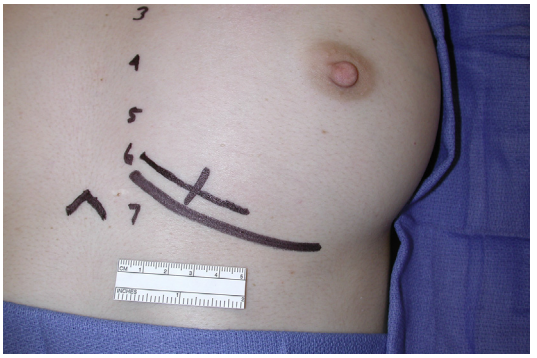

Fig. 1. Incision marking. In female patients, the incision is marked approximately 5 mm above the inframammary fold and measures 3 to 5 cm in length.

The skin is incised with a scalpel, and the subcutaneous tissue is divided with electrocautery. Once the muscle fascia has been reached, the surgeon palpates the underlying ribs and divides the muscle and fascia with electrocautery directly over the chosen rib (**Fig. 2**). The dissection should be carried medially until the junction of the rib cartilage and sternum can be palpated. The most lateral extent of the dissection is demarcated by the costochondral junction. Identification of the junction is facilitated by the subtle change in color at the interface; the cartilaginous portion is generally off-white in color, whereas the bone demonstrates a distinct reddish-grey hue.

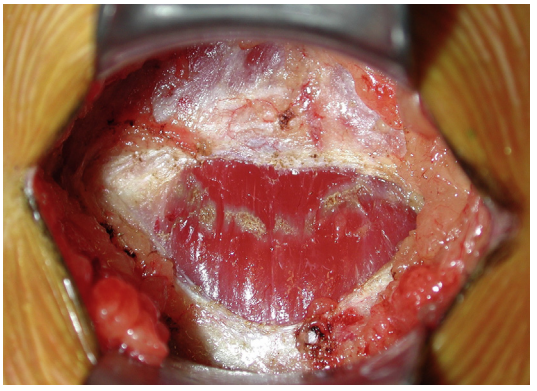

Fig. 2. Dividing fascia. Once the muscle fascia has been reached, the surgeon palpates the underlying ribs and divides the muscle and fascia with electrocautery directly over the chosen rib.