Total Skeletal Reconstruction of the Nasal Dorsum

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Objective: To review the outcomes of rhinoplasty in patients who underwent full-length dorsal reconstruction.

Design: Retrospective review.

Setting: Private-practice facial plastic surgery clinic.

Patients: Thirty-seven patients in a consecutive series of 1273 rhinoplasty cases.

Interventions: In all patients, a single high-density porous polyethylene implant was used to span the full length of the nasal bridge as part of their rhinoplasty reconstruction.

Main Outcome Measures: Retrospective review of medical charts and preoperative and postoperative photographs to identify any complications, including infection, extrusion, movement, or displacement, and examination of the aesthetic outcome. A telephone survey was performed to assess patient satisfaction regarding the appearance and sensation of the nose.

Results: In all cases, the full-length dorsal implant provided a smooth bridge contour without leaving an inverted V deformity or focal irregularities. There were no cases of infection or extrusion. In 2 cases, revision surgery was required to enhance cosmetic outcome.

Conclusions: The high rate of patient acceptance, safety, and success of full-length dorsal reconstruction in providing a natural frontal contour challenges the minimal indications for using this type of reconstruction as opposed to using smaller grafts. As with all alloplasts, long-term follow-up is required.


The Front View of the Nose is the main view that is seen when we look at ourselves in the mirror or when we are talking to others, but it can be the hardest to preserve or reconstruct after rhinoplasty. Even subtle defects of the nasal dorsum after surgery can be heightened in incident lighting and prove to be visually distracting. Consequently, reconstruction or preservation of the dorsal subunit demands meticulous attention.

The ideal front view is defined by symmetrical, uninterrupted contour lines that extend from the superciliary ridges to the lateral tip of the nose. These lines mark the zone of transition between the dorsum and the nasal sidewalls. These symmetrical lines provide an “absolute yardstick” such that any irregularity or defect on one side becomes imbalanced with respect to the other side. Interruption of both these lines, seen with dorsal defects such as the inverted V deformity, further disrupts the dorsal light reflection and gives the nose a washed-out or collapsed appearance. Furthermore, the dorsal surface itself should have a smooth, even graduation to the nasal tip as even subtle irregularities can cast surface shadows, which can interfere with the aesthetic appearance.

Surgical principles dictate that a conservative approach be applied to the correction of partial nasal dorsal defects where possible. In general, small- to medium-sized defects can be managed using carefully sculpted, discrete camouflage grafts, commonly of septal or auricular cartilage. However, it may be difficult to sculpt and secure these materials to provide the perfect 3-dimensional graft placement that will restore symmetry and continuity. Movement, warping, or resorption can also complicate graft placement and shape over time. Furthermore, the thin skin of the rhinion showcases the skeletal structure, making even the slightest irregularity or asymmetry more noticeable.

Larger defects can prove to be even more challenging and require complex grafting techniques that can also expose the patient to potential donor site complications. Such potential complications and suboptimal aesthetic outcomes that can result from such partial grafting techniques led us to look for a more holistic and reliable option. This is particularly relevant for a contemporary population that increasingly demands better surgical results.

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Total skeletal reconstruction of the nasal bridge is a procedure generally restricted to the management of major bridge abnormalities, such as saddle nose deformity. Over the past decade, the senior author (M.M.) has used rib, iliac crest, calvarial bone, and various alloplastic implants for such reconstructions. Of these, the solid, high-density, porous polyethylene dorsal implant has become the favored method for a number of reasons. Available as a single strut matching the contours of the dorsal profile, this implant can be sculpted to match the individual's shape and size and can be inserted as a single piece that extends over the bony and cartilaginous dorsum. In recent years, we have used this material for the reconstruction of the entire dorsum in a number of cases and have observed a remarkable enhancement of the front view with restoration of the dorsal aesthetic lines, results that were often noted to be superior to those in cases in which partial reconstruction was performed for lesser bridge defects. The excellent results obtained raised the issue of whether this type of reconstruction should be considered for smaller defects.

This article reviews the cases of patients who underwent full-length dorsal reconstruction with a high-density, porous polyethylene graft in our unit and focuses on the procedure's safety along with patient satisfaction.

METHODS

We performed a retrospective review of all cases of rhinoplasty in which a high-density, porous polyethylene implant was used to cover the full length of the nasal bridge. We reviewed case notes for complications such as infections or extrusions, movement, or displacement. A telephone survey was performed to assess patient satisfaction regarding the appearance and sensation of the nose.

RESULTS

From February 2000 to May 2005, 1273 patients underwent rhinoplasty procedures in our unit. Of these, 37 patients underwent full-length dorsal reconstruction using the high-density, polyethylene implant. Twenty of these patients were female. The patients' mean age was 39 years (range, 17-65 years). In 10 cases, the implant was a 0.85-mm-thick polyethylene sheet that was sculpted to match the nasal dorsum, but in the other 27 patients, a solid polyethylene dorsal strut was inserted.

In all cases, the single-unit reconstruction provided a smooth and contoured bridge with preservation of the normal bridge contour and shape. There were no cases of focal irregularities or contour deformities based on a review of photographs and patient comments.

COMPLICATIONS

Revision surgery was required in 2 patients for purely aesthetic reasons. Both patients had achieved very good outcomes with which they were satisfied; however, there was a slight mismatch between the width of the graft and the donor bed in 1 patient and between the length of the graft and the length of the donor bed in another. Both mismatches were corrected by removal and replacement with a more suitably matched graft. Revision surgery was fairly straightforward in each case, simply involving removal of the old graft and replacement with a new one in the existing graft pocket.

No patients experienced any infections or extrusions of the polyethylene implant following its placement in the nasal dorsum.

PATIENT SATISFACTION

Thirty of 37 patients were successfully contacted by telephone after surgery. In total, 29 of these patients expressed happiness with the appearance of their nose following reconstruction with the polyethylene implant. Twenty-three patients said that their nose felt normal despite the presence of a bridge implant. Two of the remaining 7 patients said that the bridge of their nose felt slightly numb; 3 more, 1 of whom had undergone surgery only 3 months previously, commented on increased firmness. Graft mobility was commented on by the remaining 2 patients, in whom 1 the implant had been placed right up to and involving the nasal tip (it was subsequently decided not to place future grafts beyond the supratip and thus separate from the highly mobile nasal tip).

These 3 cases represent patients with severe, moderate, and mild deformities. All patients underwent single-unit grafting from nasofrontal angle to the supratip region.

CASE 1

A 33-year-old man had a severe dorsal deformity despite 2 previous attempts at reconstruction using iliac crest and rib grafts. On frontal view, both dorsal aesthetic lines were disrupted, giving the dorsum a collapsed and crooked appearance (Figure 1A). On lateral and base views, he had a severe saddle nose deformity (Figure 1B). Reconstruction involved the removal of a deformed rib graft from the nasal bridge; under the graft the bridge was found to be asymmetrical. Reconstruction was then performed with a single dorsal polyethylene strut that was molded to fit the underlying bridge. The decision to perform this type of reconstruction was determined by the severity of the dorsal deformity along with the background of previous failed autogenous graft placement. Postoperative views demonstrate a reconstructed dorsum with continuous, symmetrical dorsal aesthetic lines (Figure 1D-F).

CASE 2

A 20-year-old man had sustained a previous nasal injury. The front and lateral views of his nose demonstrated interruption of the dorsal aesthetic lines consequent to an inverted V deformity of the nasal dorsum, giving the bridge a collapsed appearance (Figure 2A and B). An external septrhinoplasty was performed, which demonstrated a significantly irregular bridge. Cor-


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rection required the reduction of the bony dorsum and reconstruction with a single polyethylene dorsal strut, which afforded sufficient volume for restoration of the bridge height and avoided the potential for alternative graft harvesting. Postoperative views demonstrate the symmetrical balanced appearance of the nasal dorsum along with restoration of the dorsal aesthetic lines (Figure 2C and D).
CASE 3

A 37-year-old woman presented with a mild inverted V deformity of the nasal bridge caused by trauma many years earlier. Preoperative views are shown in Figure 3A-C. On front view, there was interruption of the dorsal aesthetic lines and a saddle nose deformity on lateral view (Figure 3B). Although reconstruction of this deformity could have been achieved with alternative partial graft techniques, a dorsal polyethylene strut was used for reconstruction because of the superior results achieved in other cases. Postoperative views demonstrate restoration of the dorsal contour (Figure 3D-F).

In our experience, conservative partial graft techniques do not reliably create an ideal front view in all patients. In our search for a better outcome we have used single onlay grafts for the total reconstruction of the nasal bridge, achieving excellent results to the satisfaction of our patients. Initially, such a technique was used for cases in which there were significant disruptions or multiple irregularities and for patients with thin skin or poor skin quality. However, the superior results of this full-length, high-density dorsal polyethylene implant to reconstruct complex defects of the nasal bridge has challenged us to determine the minimal indications for such a procedure, particularly as we find ourselves dealing with a more discerning public who demand better results.

The excellent results of this technique also raised the question whether the entire subunit of the dorsum should be reconstructed for a wider range of partial bridge defects, particularly as disturbance of symmetry or contour within a subunit is visually very distracting to the eye. Replacing the entire subunit in cases of partial deformity is a well-accepted concept applied to the reconstruction of partial skin defects of the nose or face.8 One of the concerns with this procedure is the long-term impact of using an implant in the nose. Previous stud-
Figure 3. Mild nasal deformity.
A, Preoperative front view.
B, Preoperative lateral view.
C, Preoperative base view.
D, Postoperative front view.
E, Postoperative lateral view.
F, Postoperative base view.
ities have noted a low incidence of infection with the polyethylene implant, and we have yet to see any infection or rejection in our patients, although such complications have been noted to arise many years after surgery. We have used various steps to reduce this risk, such as preparation of the internal and external nose with povidone-iodine (Betadine; Mundipharma BV, Amersfoort, the Netherlands), use of antibiotic prophylaxis, instrumental handling only of the graft, and placement of incisions away from the graft site. This can require trimming the graft near any incisions where possible, the use of an external approach, or use of only marginal incisions to access the bridge. Intercartilaginous incisions are avoided where possible to reduce the risk of contamination from the nasal cavity.

Various steps secure fixation of a dorsal graft, including matching the graft undersurface to the donor bed to maximize the surface area of contact and increase stability. Larger grafts have greater surface area in contact with the nasal bed and are less likely to move compared with smaller grafts. The nasal dorsum is prepared by removing any hump or dorsal irregularities. The graft shape is sculpted carefully to match the required size of the donor bed. The graft is often removed and replaced to make slight modifications until the ideal shape is reached. The graft is always made very thin at the nasofrontal angle to reduce the feeling of a step deformity. Once the graft sits securely and evenly on the nasal bed, no further fixation is required as the rough surface of this material adheres to the nasal bed and is stabilized further only by intensive contour taping of the skin and a conforming plaster cast, which are removed after 1 week. No sutures or screws are required to fixate a carefully sculpted graft, and the porous features of the polyethylene implant allow for soft tissue ingrowth, which adds stability over time. We have not yet seen graft migration or twisting in any patient.

Notwithstanding that the technique of total bridge reconstruction with the high-density, porous polyethylene graft is faster than making natural products fit the nose, it also avoids the potential for donor site complications that can be associated with harvesting of autografts, thus lending itself ideally to outpatient surgery. Therefore, although surgical principles generally dictate conservative techniques where possible, full-length reconstruction of the nasal dorsum using a high-density, porous polyethylene implant may provide superior aesthetic rhinoplasty results, and such superior results create a dilemma of choice for the rhinoplasty surgeon wanting to produce the best aesthetic results for even small deformities of the nasal dorsum.

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REFERENCES


Correction

Omission in Affiliation. In the Original Article by Yoo et al titled “An In Vivo Evaluation of Docetaxel Delivered Intratumorally in Head and Neck Squamous Cell Carcinoma,” published in the May 2005 issue of the Archives (2005;131:418-429), an author affiliation was omitted. In addition to the affiliation listed, Ho-Sheng Lin, MD, is also affiliated with the Department of Surgery, John D. Dingell Veterans Affairs Medical Center, Detroit, Mich.