

Porous High-density Polyethylene Implants (Medpor) for Nasal Dorsum Augmentation

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Background: As rhinoplasty techniques are refined, the search for a permanent augmentation material continues. Use of autologous material creates a donor site deformity, and the material may be phagocytized over a period of time. Use of alloplastic materials often results in extrusion and infection.

Objective: The purpose of this study was to examine the results of nasal augmentation using porous high-density polyethylene implants.

Methods: A Medpor porous high-density polyethylene implant is carved to the approximate desired size and contour. A pocket is made in the dorsum, and sometimes over the caudal border of the septum, to accommodate the dimensions of the implant. The implant is fitted, removed, trimmed, and refitted until the precise desired contour and position are attained. The implant is rinsed in antibiotic solution and placed in position. The mucosal surfaces are closed with absorbable sutures.

Results: Over the last 12 years, this technique has been used with satisfactory results in more than 30 patients. Two implants were subsequently removed because of partial implant exposure and possible infection. There were no other significant complications. Four typical cases are presented with up to 12 years of follow-up.

Conclusions: When substantial strength is needed, porous high-density polyethylene implants may be used for dorsal augmentation or correction of dorsal defects with satisfactory long-term results and limited complications.

As rhinoplasty techniques are refined, the search for an ideal permanent augmentation material continues. Although most surgeons prefer to use autologous material (bone or cartilage), this method creates donor site deformities. In addition, autologous materials have been known to be phagocytized by the body over variable periods of time. Materials including processed irradiated bovine cartilage and silicone rubber (in block form or injectable microspheres) have been used in nasal augmentation.^{1,9} In particularly difficult cases in which substantial strength is needed, porous high-density polyethylene (PHDE) implants may be used. The polyethylene implants are carved to fit and have shown good long-term results with few complications.

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Background

The nose is a difficult area for implantation because of the thinness of the tissue, the proximity of potentially contaminated mucosa, the prominence and mobility of the nose, and the fact that most cases requiring augmentation involve previous injury or surgery. For these reasons, the search for an ideal implant has been both difficult and continuous, and a plethora of autogenous and alloplastic materials has emerged. Unfortunately, each has been accompanied by its own drawbacks. For example, extrusion and infection often result from the use of alloplastic materials.¹⁰

Cartilage grafts can be taken from a number of locations, including the septum, ear, and ribs. Septal cartilage is preferred in many cases. Cartilage grafts can be placed in the columella, nasal tip, dorsum, and periform fossa. Technically, the use of cartilage grafts in rhinoplasties is a fairly simple operation. However, the risk of cartilage resorption, which decreases the size of the implant, counteracts its effectiveness.^{10,11} Bone grafts can be taken from autogenous costal, iliac, and cranial bones but are also subject to absorption by the tissue in which they are embedded; furthermore, they must be harvested from a remote donor site, which results in additional incisions and a compounded probability of postoperative morbidity.¹² Complaints of rib graft donor site pain often surpass complaints concerning the original nasal deformity. The degree of success attainable with the implantation of preserved homologous cartilage is limited because of the absorption factor as well as the material's susceptibility to warping and infection.¹⁰

When substantial strength is needed, PHDE implants may be used for dorsal augmentation or correction of dorsal defects. Previous reports of the use of such implants for dorsal augmentation have noted satisfactory results and limited complications.^{13,14} In the past 12 years, we have used Medpor PHDE implants (Porex Surgical Inc., College Park, GA) in more than 30 cases. This article reports 4 of those cases, with up to 12 years of follow-up, as well as 1 case involving complications. Surgical techniques and selected patient results are presented.

Surgical technique

Preoperative assessment is necessary to facilitate selection of the appropriate implant from a variety of shapes and sizes, which come sterile from the manufacturer. At the time of surgery, a form is carved with a no. 10 blade. It is



Figure 1. A, View of a 30-year-old woman with supertip swelling 18 months after initial rhinoplasty. C, View of the patient 4 years after initial rhinoplasty. B and D, Views of patient one month after insertion of a Medpor PHDE implant. The patient had undergone a separate face lift prior to insertion of the implant.

best not to use scissors because they tend to collapse the porosity, which is important for tissue ingrowth and fixation. A pocket is made in the dorsum and, if necessary, over the caudal border of the septum to accommodate the dimensions of the implant. The implant is then fitted, removed, trimmed, and refitted several times until the precise desired contour and position are achieved. The final piece is then rinsed in antibiotic solution and placed in position. The mucosal surfaces are closed with absorbable sutures. No transfixation sutures are used. Every attempt is made to avoid having sutures or other material in contact with the implant while it heals. Packing is never used, and Suture Strips (Genetic Labs Wound Care, Inc., Roseville, MN) are applied to the dorsum to exert gentle pressure in order to minimize swelling and distortion.¹⁵ Erythromycin 250 mg is given 4 times daily for 10 days postoperatively.

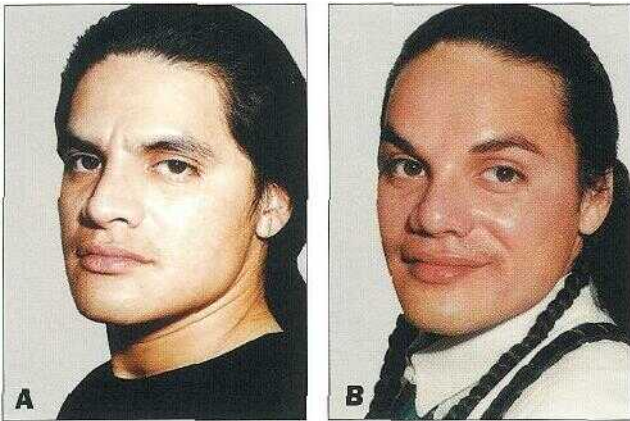


Figure 2. **A,** Preoperative view of a 32-year-old man complaining of difficulty breathing and a severely deviated septum. **B,** Postoperative view 3 years after rhinoplasty and brow lift. Note the blunt tip and lack of projection. **C,** Postoperative view 1 year after insertion of a Medpor PHDE implant.

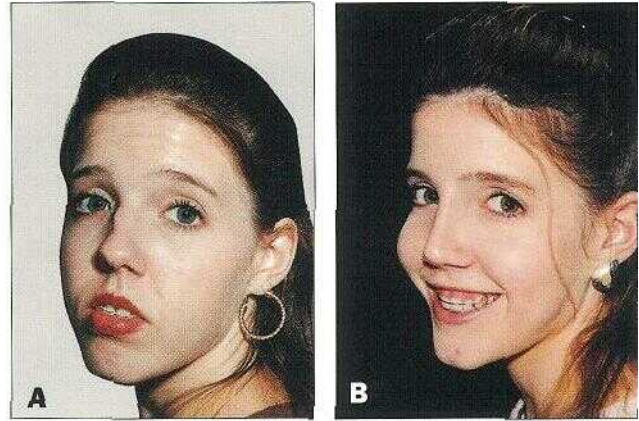
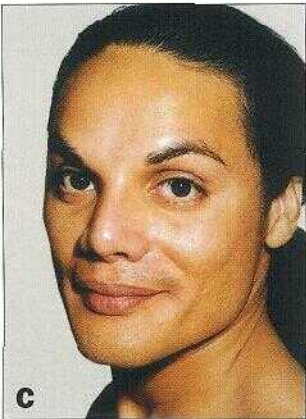


Figure 3. **A and C,** Preoperative views of an 18-year-old woman demonstrating difficulty breathing, sinus inflammation, and a grossly deviated septum. **B and D,** Postoperative views 1 year after implantation of an L-shaped Medpor PHDE implant carved to fit the length of the nose (this was the third procedure performed on the nose).

Clinical Results

Patient 1

This woman (Figure 1) originally sought treatment at the age of 29 years to correct her substantially deformed nostrils and restricted airway, which had resulted from a previous operation performed at another clinic. After the nasal reconstruction had been performed, the patient returned to have the tip restored to its earlier postoperative sharp appearance. Through transcartilaginous incisions, the supertip area was released and a pocket was created. A Medpor implant measuring approximately 1.5 cm long, 0.3 mm deep, and 2 mm wide with an L-shaped member at the top measuring approximately 1.5 cm was carved to fit the pocket in the supertip area, and the implant was sutured in place.

The patient returned approximately 8 years later and had the mucosa and the exposed left side of the Medpor implant removed. Antibiotics were prescribed. Several months later, the patient again complained of nose odor and yellow drainage. Because of the chronic draining, the entire Medpor implant was removed. The nose healed without other complications, and the shape and size of the nasal tip were acceptable.

Patient 2

This 32-year-old man (Figure 2) had difficulty breathing through his left nostril and had a severely deviated septum. He sought to improve his nose physiologically and aesthetically. Through transcartilaginous incisions, access was gained to the dorsum, which was gently rasped smooth and straight. Three years later, the patient complained that the tip was too round and lacked projection. The original incisions were reopened, excess alar rim cartilage was removed, and some scar tissue was removed from the supertip area. This was limited to the cephalic border of the alar rim cartilage. A portion of the septum and the alar footplates were removed, and medial and lateral osteotomies were performed. During a subsequent operation, the tip projection and slight saddle nose were repaired with a Medpor implant. A small pocket was created through use of the Joseph periosteal elevator and fine scissors on the dorsum of the nose, and another pocket was created along the columella. To achieve the

desired tip projection and dorsum contour, 2 small pieces of Medpor were carved to fit the dorsum of the nose (6 x 1 x 0.3 cm) and the columella (3 x 0.5 x 0.3 cm). Both implants were introduced into their pockets after being soaked in gentamycin. 5-0 Dexon sutures (Sherwood-Davis and Geek, St. Louis, MO) were used to close the incision. At a 1-year follow-up, no complications had developed and the patient's nose was acceptable.

Patient 3

This 18-year-old woman (Figure 3) had a grossly deviated septum, deviating first to the left and then to the right. She also had difficulty breathing and showed symptoms of sinus inflammation. The patient agreed to have nasal reconstruction with septoplasty and antrostomies. A portion of the septum measuring 2 x 3 cm was removed, and irregular bone and cartilage fragments were removed from the vomer. The patient returned for a touch-up nasal revision with osteotomies. A small Medpor block was carved to correct the collapsed dorsum and was placed in a form-fitted pocket. On a follow-up visit, it was observed that some redness and a slight elevation of the dorsum of the nose had developed. The patient indicated that there had been some drainage of a clear liquid. During another touch-up 7 months later, the bridge was rasped, the left superolateral cartilage was thinned, and the original Medpor implant was replaced with a full-length L-shaped piece carved to fit the length of the nose. The fact that the drainage was clear indicated that it was mucous drainage, and we were concerned that we might have altered the architecture of the nose so that it no longer drained posteriorly. There was no evidence of infection.

Patient 4

This 19-year-old woman (Figure 4) wished to improve her appearance by thinning her nose, which was rather flat and wide. The tip was thinned by reducing the alar domes and we added bridge height and columella support with a carved Medpor L-shaped implant. It has now been 12 years since implantation, and the implant remains stable.

Discussion

Many substances, including cartilage, bone, and silicone, provide benefits for nasal dorsum augmentation. Autogenous septal cartilage is very useful in correcting minor projection flaws of the tip and dorsum. Rib cartilage can be used in cases in which septal cartilage is inadequate (such as cases involving severe deformities); it is easy to carve and available in relatively large quantities.

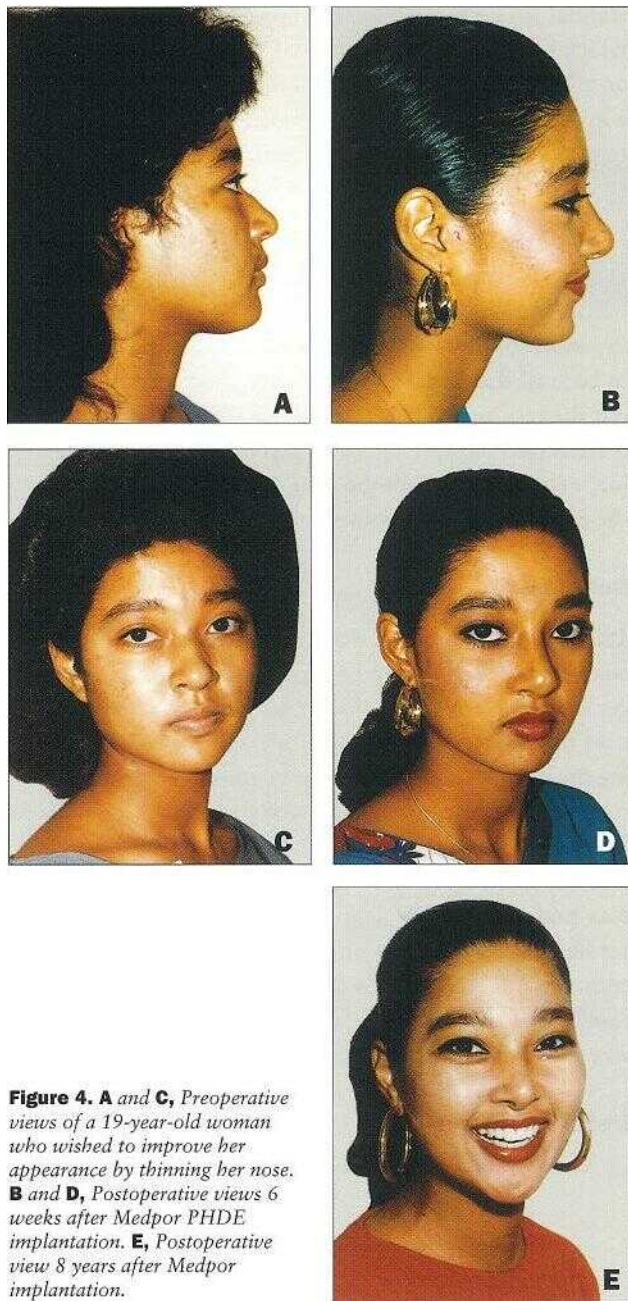


Figure 4. **A and C,** Preoperative views of a 19-year-old woman who wished to improve her appearance by thinning her nose. **B and D,** Postoperative views 6 weeks after Medpor PHDE implantation. **E,** Postoperative view 8 years after Medpor implantation.

Bone grafts provide immediate results that are often quite pleasing.^{10,16} In addition, autogenous material has obvious immunologic compatibility. Unfortunately, the combined complications of these autologous materials (such as donor site morbidity, limited amount of donor tissue, burdensome carving dilemmas, and uncertain graft resorption and remodeling) frequently counter their advantages.^{10,17} As a result, the number of surgeons who have turned to alloplastic materials as onlay implants has increased.¹⁷ We find that in difficult cases in which sub-

stantial strength is needed to support the nasal tip or in which there has been a failure of smooth silicone block or other prostheses, PHDE is a reasonable substitute for autologous tissue. Although an occasional revision is required many years later, we feel that this falls within the safe limits of risk-reward ratio.

During the past 12 years, in more than 30 cases in which PHDE was used, we have removed 2 implants because of partial implant exposure through the mucosal surface of the inside of the nose and possible subsequent infection. In both of those cases, we did not replace the implant, but the resulting scar tissue was sufficient to provide a reasonable contour. We have never had a case of warping, extrusion through the skin, or infection other than the 2 cases discussed above.

Conclusion

The ideal nasal implant would be endowed with certain characteristics. It would be nonallergenic, noncarcinogenic, chemically inert, able to maintain size and shape over time while remaining pliable, and capable of resisting mechanical stress. It would be tolerated by the surrounding tissue without immunologic reaction, remain unaltered when faced with infection, be easily carved, and be readily available.¹⁷ Although individual surgeons may prefer certain implant materials, an implant has not yet been developed that satisfies this description in its entirety. PHDE block is a reasonable alternative as an exogenous material for nasal dorsum and tip support when substantial strength is needed. •

References

1. Ersek RA, Rothenburg MD, Denton DR. Clinical use of an improved

processed bovine cartilage for contour defects. *Ann Plast Surg* 1984;13:44-55.

2. Ersek RA, Beisang AA III. Bioplastique: a new biphasic polymer for minimally invasive injection implantation. *Aesthetic Plast Surg* 1992;16:59-65.
3. Ersek RA. Bioplastique: specific technical advice on its use and possible complications. *Aesthetic Plast Surg* 1992;16:67-68.
4. Ersek RA, Beisang AA III. Mammalian response to subdermal implantation of textured microimplants. *Aesthetic Plast Surg* 1992;16:84-90.
5. Ersek RA, Beisang AA III. Bioplastique: a new textured copolymer microparticle promises permanence in soft tissue augmentation. *Plast Reconstr Surg* 1991;87:693-702.
6. Ersek RA. Minimally invasive implantation on microparticles for tissue augmentation. *Minim Invasive Ther* 1992;1:71.
7. Ersek RA, Choi HY, Stovall RB. Minimally invasive injection surgery with textured microparticles. *Asian J Surg* 1993;16:157-163.
8. Ersek RA, Stovall RB, Vasquez-Salisbury A. Chin augmentation using minimally invasive technique and bioplastique. *Plast Reconstr Surg* 1995;95:985-992.
9. Ersek RA, Gregory SR, Vasquez-Salisbury A. Bioplastique at six years: clinical outcome studies. *Plast Reconstr Surg* 1997;100:1570-1574.
10. Gunter JP, dark CP. Internal stabilization of autogenous rib cartilage grafts in rhinoplasty: a barrier to cartilage warping. *Plast Reconstr Surg* 1997;100:161-169.
11. Ortiz-Monasterio F. The use of cartilage grafts in primary aesthetic rhinoplasty. *Plast Reconstr Surg* 1981;67:597-605.
12. Gunter JP, Rohrich RJ. Augmentation rhinoplasty: dorsal onlay grafting using shaped autogenous septal cartilage. *Plast Reconstr Surg* 1989;86:39-45.
13. Ersek RA, Navarro JA. The physiologic wound closure. *Contemp Surg* 1989;35:64-70.
14. Sclafani AP, Romo T III. Alloplasts for nasal augmentation. *Facial Plast Surg Clin North Am* 1999;7:43-54.
15. Romano JJ, Sclafani AP, Sabini P. Use of porous high-density polyethylene in revision rhinoplasty and in the platyrrhine nose. *Aesthetic Plast Surg* 1998;22:211-221.
16. Planas J. The twisted nose. *Clin Plast Surg* 1977;4:55-67.
17. Mavili E, Akyurek M. Use of bone wax as a template for intraoperative evaluation of facial defects and shaping of polyethylene implants. *Plast Reconstr Surg* 1997;100:1247-1253.