Management of Extered Porous High-density Polyethylene Implant in the Internal Nasal Valve

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Summary: Porous high-density polyethylene (PHDPE) has been used since the 1990s as an alternative to autologous grafts. Implant extrusion is a rare but well-known complication of PHDPE and other alloplastic implants. This article discusses the case of PHDPE implant extrusion in a 69-year-old man with unsuccessful previous alar batten graft placement for internal nasal valve insufficiency. We detail the surgical techniques engaged in removing the implant from the internal nasal valve, postoperative results, and care, and present a histologic study of the removed implants. (Plast Reconstr Surg Glob Open 2022;10:e4647; doi: 10.1097/GOX.0000000000004647; Published online 21 November 2022.)

Porous high-density polyethylene (PHDPE) has been used since the 1990s in craniofacial surgery1 and subsequently in rhinoplasty,2,3 as an alternative to autologous grafts. PHDPE is a dependable implant material, and animal models have indicated decreased resorption when compared with regenerated cellulose.4 Extrusion is a rare but well-known complication of PHDPE and other alloplastic implants.5

CASE REPORT

The patient is a 69-year-old man, who presented for nasal airway obstruction (NAO). The patient reported a history of bilateral functional nasal surgery without improvement in his NAO. His main concern was his right nostril as his ability to breathe from that side gradually deteriorated several months after the procedure. Over the last 3–4 years, he developed intermittent episodes of severe pain in the right side of his nasal pyramid, associated with edema in the right cheek that improved with a course of antibiotics.

His medical history included hypertension, Barrett’s esophagus managed with serial endoscopies, and chronic obstructive pulmonary disease managed with as needed inhalers. The bilateral nasal valve repair with PHDPE alar batten grafts was performed 9 years before this presentation. The patient recalled severe postoperative bleeding after the procedure.

On examination, a partially extruded implant was noticed on anterior rhinoscopy, obstructing the area of the internal nasal valve. The left nasal cavity appeared unremarkable on inspection. Nasal endoscopy confirmed the above findings and was otherwise unremarkable (Fig. 1). Modified Cottle maneuver was positive on the left and omitted on the right due to obvious obstruction. Our laboratory workup included coagulation studies (prothrombin time/INR, partial thromboplastin time, platelet count, and von Willebrand factor panel), which were within normal range. A preoperative coronary tomography reported mild mucosal thickening in maxillary sinuses and a small right frontal sinus osteoma of no apparent clinical significance.

The removal of the implants was performed under general anesthesia. In the right nasal cavity, the partially extruded implant was identified, and a blade was used to extend an incision posterior to the implant. The implant was grasped with a hemostat, and careful dissection was performed to free the implant from the surrounding tissue. Dissection was tedious due to severe adhesions between the implant and the soft tissues. Once the implant was removed (Fig. 2), the residual cavity was copiously irrigated with normal saline with an angiocatheter. The incision was approximated with one 5-0 Vicryl suture and multiple interrupted 5-0 plain cut sutures for the deep and mucosal incisions, respectively. Meticulous care was provided to avoid raw surfaces that would increase the risk for cicatricial stenosis. Silicon oval-shaped “sandwich” splints were used in the internal nasal valve area, secured with 5-0 Nylon sutures. The procedure was repeated in the left nasal cavity in a similar manner. Although there

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was no extrusion of the implant on the left side, we followed the patient’s request for removal because he did not report any benefit. The patient returned to the clinic 7 days postoperatively, for nasal splints removal, and 4 weeks postoperatively (Fig. 3). He reported complete resolution of his NAO bilaterally and stated no further complaints.

The removed implants underwent histological evaluation, after decalcification ImmunocalTM. After hematoxylin/eosin staining (Fig. 4), polarization microscopy was performed for better demonstration of the implant. Cartilaginous elements were identified strictly adherent to the removed implant (Fig. 4), which demonstrated good fibrovascular integration in the surrounding tissues. There was no presence of inflammatory cells in the specimen.

**DISCUSSION**

PHDPE is a widely used alloplastic material in nasal reconstruction, which is 50% porous by volume and contains pores ranging from 100 to 250 μm in size, with an average of 150 μm. Among its advantages is its relatively easy carving into the desired form, after placement into hot water. After cooling, the implant will maintain its new shape. Additionally, possible bone resorption under the graft is minimal.

Although PHDPE is considered a reliable biomaterial with excellent qualities as a graft, several postoperative complications have been reported, including infection and implant extrusion (up to 19.2%), implant mobility, and irregularity or palpability of the implant at the implant-host interface. In our patient, implant extrusion was associated with severe deterioration of his NAO in the right nasal cavity and intermittent infections.

Before proceeding to the operating room, we discussed with the patient the possible need to replace the implant with autogenous cartilage. The patient only desired implant removal. Given our belief that the patient’s complaint was due to the mechanical obstruction of the nasal valve from the implant, we agreed that removing the implants without further supporting stability of the nasal valve was a reasonable plan.

PHDPE implants are known to have greater difficulty in implant removal if subsequent revision surgery is necessary, and the internal nasal valve is a critical area of the airway where scarring can have severe consequences in nasal breathing. In the literature, there are several reports of removing PHDPE implants from the head and neck, but in the present article, we highlight technical
details of the surgical procedure, which resulted in elimination of our patient’s NAO with excellent healing, that is, no scarring, noted 7 days postoperatively. We will continue to follow up with this patient to exclude symptom recurrence.

In accordance with a previous report, the histological evaluation revealed good fibrovascular integration of the implant in the surrounding tissues. This ingrowth of innate vasculature in the implant increased its mechanical stability but can make surgical removal of the implant challenging. In our specimens, residual cartilage elements were identified adherent to the implant, likely representing parts of the upper lateral cartilage. The weakening of cartilaginous support in this critical area of the nasal airway may increase the risk of internal nasal valve insufficiency.

CONCLUSIONS

PHDPE implants have been widely used as alar batten grafts in functional rhinoplasty, and implant extrusion is a well-established risk associated with their use. When indicated, implant removal should be performed with meticulous techniques as scarring in the internal nasal valve can have severe consequences in nasal breathing.

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