JPRAS Open 15 (2018) 18–24

Contents lists available at ScienceDirect

JPRAS Open

journal homepage: http://www.journals.elsevier.com/jpras-open

Case Report

Treatment of a chronically infected nasal silicone prosthesis with continuous antibiotic irrigation and gentamicin-impregnated polymethylmethacrylate beads

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ARTICLE INFO

Article history:
Received 20 August 2017
Accepted 4 October 2017
Available online 26 October 2017

Keywords:
Rhinoplasty
Infection
Implant
Antibiotic beads
Nasal reconstruction
General reconstruction

ABSTRACT

Infected nasal alloplasts in revision rhinoplasty can be a complex problem, as timing between implant removal and reconstruction is the major limiting factor. Delaying reconstruction can result in loss of mechanical support, a constricted nose, and in severe cases, complete nasal airway collapse and respiratory compromise. In this case report, we describe a novel surgical approach for the management of a chronically infected nasal implant combining techniques used to treat biomaterial-associated infections: antibiotic-impregnated polymethylmethacrylate beads and a continuous catheter-based antibiotic irrigation system.

We report a case of a chronic alloplastic-associated infection following nasal reconstruction using a silicone implant. We utilized a two-staged approach. The involved nasal implant was removed and replaced temporarily with gentamicin-impregnated polymethylmethacrylate beads and a continuous closed irrigation and drainage system with local and parenteral delivery of antibiotics. Both modalities allowed

Oral presentation:
63rd Annual Scientific Meeting
The Robert H. Ivy Pennsylvania Plastic Surgery Society
April 22, 2017
The Inn at Penn
Philadelphia, PA
Clinical Science

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https://doi.org/10.1016/j.jpra.2017.10.001

for complete eradication of the infection. In addition, the gentamicin beads provided sufficient mechanical support in order to minimize the risk of skin contracture. Twelve days after her initial surgery, nasal reconstruction was performed using a cadaver bone graft. The patient was followed for two years postoperatively and has shown good results with no evidence of skin contracture or recurrent infection. This technique may allow for shorter delay in revision surgery and reduce the risk of long-term complications without compromising functional and aesthetic outcomes.

Introduction

Alloplastic nasal implants have been widely used for rhinoplasty for many years.[1–3] However, they have a much higher rate of infection compared to autologous bone and cartilage grafts.[1–3] The treatment of infected implants is complex and varies with the extent of infection and experience of the surgeon. Traditionally, a multi-staged approach would be offered with removal of the implant, debridement of devitalized tissue, treatment with antibiotics, and subsequent reconstruction. A dilemma often arises with such infections owing to the development of biofilms on the implant surface, which can limit antibiotic penetration and delay secondary reconstruction.[3,4] In addition, removing the implant without replacing it with a spacer may result in a constricted soft tissue envelope.[1,2]

In this report, we describe a novel surgical approach for the management of a chronically infected silicone implant combining two successful techniques used to treat biomaterial-associated infections in orthopedic and breast reconstructive surgery. The first approach involves the use of antibiotic-impregnated polymethylmethacrylate (PMMA) beads.[5–7] Their application has made them favorable in orthopedic surgery due to their mechanical and therapeutic properties—to maintain normal alignment after removal of infected prosthetic joints, and allow local release of antibiotics to the surrounding tissue.[5–7] Lastly, the authors report the use of a continuous catheter-based antibiotic irrigation system combined with systemic antibiotics, which has been used to salvage infected nasal cartilage and tissue expanders following breast reconstruction.[3,8]

Methods

The patient was a 38 year-old woman of Filipino origin who had undergone nasal reconstruction with a silicone nasal implant for a cleft lip and palate deformity, which was performed in the Philippines in 2003. Several years following her repair, she suffered recurrent sinus infections. In 2014, she was evaluated in the office. She was found to have an abscess cavity that lied in continuity with the implant. The external nose was deformed and swollen, and the columella was significantly retracted. Intranasal exam showed a right-sided abscess draining purulent exudate (Figures 1 and 2). She was then treated with oral Doxycycline as an outpatient. Despite weeks of suppressive therapy, she had minimal resolution of her symptoms. For this reason, it was decided that we needed to remove the implant and drain the abscess intraoperatively to prevent further infection.

On January 9, 2015, the patient underwent complex removal of the infected silicone implant, exploration and drainage of the abscess, irrigation using an indwelling catheter-based irrigation system, and placement of the antibiotic-impregnated PMMA beads. Incision at the glabella, nasal tip and columella were made due to significant adhesion of the implant to the surrounding soft tissue. The silicone implant was then explanted and the purulent material was cultured. The pocket was subsequently drained and cleaned of granulation tissue with a curette.

Figure 1. Pre-operative frontal photograph of the patient who presented with erythema, skin erosion of nasal tip, and purulent drainage from an abscess located on the columella.

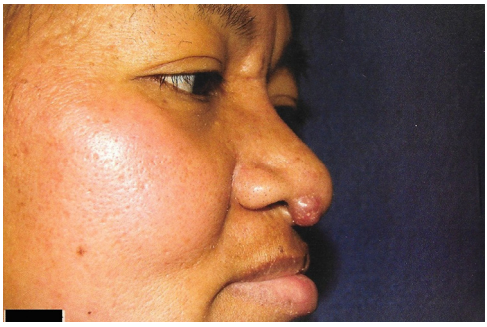

Figure 2. Lateral photograph of the patient who presented with erythema, skin erosion of nasal tip, and purulent drainage from an abscess located on the columella.

Continuous-catheter based antibiotic irrigation system

At time of surgery, the indwelling catheters were constructed from two seven French Round Jackson-Pratt drains. The irrigation system was powered by an intravenous infusion pump and attached to a wall suction device to allow for pressurized drainage. An irrigation drain placed on the left side of the nose allowed continuous flow (80 mg of gentamicin and 100,000 units of bacitracin—rate of 5 mL/hour) through the pocket drain on the right side of the nose (Figure 3).

Non-degradable antibiotic-impregnated polymethylmethacrylate (PMMA) beads

The antibiotic beads were made pre-operatively by operating room staff using polymethymacrylate powder and gentamicin. The antibiotic-loaded cement was molded into small, spherical beads and threaded into chains using 5-0 Prolene suture (Figure 4). After hardening, they were placed within the nasal pocket.

Cultures from the implant and abscess grew *Serratia marcescens, Klebsiella oxytoca, Streptococcus agalactiae,* and *Staphylococcus* species, which were sensitive to gentamicin. The patient was admitted to the hospital for eight days to receive continuous irrigation in conjunction with parenteral antibiotics. During her hospital course, the irrigation system was temporarily discontinued in order to perform an additional culture. This was followed by cessation of irrigation based on the absence of clinical signs and symptoms of infection (i.e. surrounding erythema, tenderness, and purulent

Figure 3. The patient is shown with the indwelling irrigation catheter in place. The irrigation system was constructed from 7-French Round Jackson Pratt tubing and powered by an intravenous infusion pump. One end was attached to a wall suction to allow for pressurized drainage. Continuous gentamicin-bacitracin antibiotic irrigation (rate 5 mL/hr) was continued post-operatively for six days.

Figure 4. Gentamicin-impregnated polymethylmethacrylate beads are shown. They were made intraoperatively using acrylic resin (polymethylmethacrylate) powder and gentamicin. The beads were molded into small, pearl-sized beads and threaded into chains using 5-0 prolene suture. Multiple chains were folded and inserted into the nasal cavity for the dual purpose of providing antibiotic therapy and mechanical support.

exudate). The irrigation apparatus was converted to a single closed suction drain attached to a compressible Jackson-Pratt bulb. She was then discharged on culture-sensitive oral antibiotics, Levaquin and Clindamycin.

On January 21, 2015, the patient underwent her definitive surgery. The gentamicin beads were removed, and the pocket was irrigated and debrided**.** The pocket was examined, which contained granulation tissue with no infected tissue or exudate present. However, confirmatory cultures were obtained prior to placement of the bone graft, which were negative. The patient refused to provide her own cartilage and bone for an autograft given the associated morbidity from donor site retrieval. Therefore, her nose was reconstructed using an L-shaped cadaver iliac bone graft, which was positioned to the exact dimensions of the dorsum to the caudal septum. Bilateral rotation advancement bipedicle flaps were created to reconstruct the columella and nasal dorsum that were incised during her initial procedure. The patient tolerated the procedure well and recovered without significant complications. There was no occurrence of re-infection, bone graft resorption, or skin contracture during her twenty-nine months of follow up. Her nose maintained its postoperative shape without aesthetic and respiratory compromise (Figures 5–7).

Figure 5. Post-operative frontal and lateral photographs taken twenty-five months after removal of the silicone nasal implant and reconstruction with L-strut cadaver bone graft. The images show improved nasal appearance with minimal scarring at the abscess site and no resorption of the bone graft.

Figure 6. Post-operative frontal and lateral photographs taken twenty-five months after removal of the silicone nasal implant and reconstruction with L-strut cadaver bone graft. The images show improved nasal appearance with minimal scarring at the abscess site and no resorption of the bone graft.

Discussion

The use of alloplastic implants in nasal reconstruction has been controversial owing to the risk of infection.[1–3] Such materials are prone to the development of bacterial biofilms, which provides protection against host immune defenses and antibiotic therapy.[4] Once infection is established in the nose, significant aesthetic and functional deformity can result from progressive destruction of the underlying cartilage support and vascular supply.[3,4] Therefore, aggressive intervention is often needed in order to salvage any chance for successful reconstruction.

To date, there are no standardized protocols for managing chronically infected nasal prostheses. The major limiting factor in dealing with such patients is timing of revision surgery. Some experts report delayed reconstruction, which involves implant removal, extensive debridement, and antibiotic therapy for weeks or months to minimize the risk of re-infection.[3] However, this approach presents

Figure 7. Post-operative frontal and lateral photographs taken twenty-five months after removal of the silicone nasal implant and reconstruction with L-strut cadaver bone graft. The images show improved nasal appearance with minimal scarring at the abscess site and no resorption of the bone graft.

with considerable drawbacks. The skin and underlying soft tissue have a tendency to contract down to the void left by the implant, which can result in significant aesthetic and respiratory compromise.[1,2]

In our case report, successful revision was highly contingent on eradicating the infection and maintaining stable internal framework all within a short time frame. The infection was treated using a combination of antibiotic-PMMA beads and a continuous antibiotic irrigation system through an indwelling catheter with local and parenteral antibiotic therapy. Traditional measures were also implemented to minimize infection, including removal of the infected implant along with necrotic and devitalized tissue, and use of antibiotics before and after revision surgery.

Literature reports the use of catheter-based continuous irrigation for multiple purposes including salvage of infected autologous cartilage graft and infected tissue expanders following breast reconstruction.[3,8] Moreover, one the most commonly employed local antibiotic delivery systems, polymethylmacrylate, has shown to be an appropriate alternative to treat chronic prosthetic infections.[5–7] Distinct from its therapeutic applications, antibiotic-impregnated PMMA can be utilized as spacers to eliminate dead space and maintain soft-tissue tension. As a result, revision surgery would be less complicated by soft tissue contracture and disuse osteopenia.[7]

We were successful in our efforts to treat a complicated case associated with a chronic biomaterial-related infection. This method has shown good results with no evidence of skin contracture or recurrent infection.

Conflict of interest

None.

Funding

None.

Consent

Patient consented to have images published as shown.

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