

Immediate Reconstruction of Extruded Alloplastic Nasal Implants With Irradiated Homograft Costal Cartilage

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Objective: To describe a novel surgical protocol for the management of patients presenting with extruded nasal implants. **Study Design:** Retrospective chart review. **Methods:** Analysis of consecutive patients presenting with extruded nasal implants from 1986 to 2000. Patients were selected from a large database of revision rhinoplasty cases. Inclusion criteria were: 1) at least one previous rhinoplasty procedure, 2) an extruded nasal implant that was documented preoperatively, 3) immediate reconstruction that was carried out with irradiated homograft costal cartilage (IHCC), and 4) at least 1 year of follow-up recorded, including standard postoperative rhinoplasty photographs. A total of 18 patients met the inclusion criteria and form the basis of this study. Data gathered from the charts included date of surgery, last date of follow-up, location of implant extrusion, alloplastic material, specific use of IHCC for reconstruction, percent of clinical IHCC resorption at last follow-up, and presence of warping of the IHCC. **Results:** All 18 patients were satisfied with the cosmetic outcomes of their nasal reconstructions. The most common extruded alloplast was Silastic, followed by Gore-Tex (W.L. Gore & Associates, Inc., Flagstaff, AZ). There were no cases of extrusion or infection of the IHCC implant subsequent to immediate reconstruction of the extruded alloplast. Clinical resorption of the IHCC was minimal, with a mean follow-up of 26 months. Only one patient had a complication, warpage, resulting in removal of the IHCC. In that patient, the IHCC still had carving markings on the implant after 2 years in vivo. **Conclusions:** In

this series of patients, a novel surgical protocol was used. The extruded implant was removed and immediate reconstruction with irradiated rib cartilage was done. All patients were evaluated for postoperative infection, graft extrusion, and satisfaction with cosmetic result. There was one major complication in this series of 18 patients, warping of the IHCC, which necessitated removal and replacement. This approach appears to be a reasonable method for reconstruction of extruded nasal alloplasts. **Key Words:** Implants, extruded, nasal reconstruct.

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INTRODUCTION

Alloplastic materials have been used in nasal dorsal augmentation and structural reconstruction for many years. Most alloplastic materials have been abandoned in the United States and Europe because of the high rates of infection or extrusion. Alloplastic implants for dorsal projection and narrowing, primarily made of medium-density Silastic do, however, remain popular throughout Asia, particularly in Thailand and Japan. Thus, patients who have previously had implants inserted in these countries continue to be seen in this country (Figs. 1-7). The most devastating complication, extrusion, has been well described in the literature, with rates of extrusion varying with the experience of the surgeon, length of follow-up, and the composition of the alloplast.¹⁻³

The treatment of extruded nasal implants is complex. Removal of the alloplastic implant, the nidus of infection, is paramount. Antibiotics are generally recommended, certainly if infection is clinically present. The dilemma in the authors' minds has been what to do with the defect left by removal of the implant and the appropriate timing of reconstruction.

Traditional methods of management of extruded implants usually involve removal of the implant to allow resolution of inflammation and then reconstruction at a later date.⁴ Patients are frequently devastated, not only about the extrusion, but also about their appearance while they are "unreconstructed" to allow for resolution of inflammation. Moreover, the skin/superficial muscular aponeurotic system (SMAS) envelope inevitably contracts down to the void left by the removal of the implant. In a

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TABLE I.
Patient Data.

Patient No.	Duration of Follow-up (mo)	Location of Extrusion	Alloplastic Material	Percent of Clinical Resorption	Complications
1	13	Rhinion	Supramid	<5%	None
2	25	Tip	Silastic	<5%	None
3	29	Tip	Silastic	<5%	None
4	36	Nasal valve	Gore Tex	<10%	None
5	27	Rhinion	Gore Tex	<15%	None
6	18	Tip	Silastic	<5%	Warped IHCC
7	43	Tip and glabella	Silastic	<5%	None
8	19	Sidewall	Gore Tex	<5%	None
9	48	Tip	Silastic	<5%	None
10	23	Rhinion	Supramid	<5%	None
11	16	Tip	Silastic	<5%	None
12	22	Tip	Silastic	<5%	None
13	19	Tip	Silastic	<5%	None
14	28	Nasal valve	Gore Tex	<5%	None
15	14	Tip	Silastic	<5%	None
16	42	Rhinion	Gore Tex	<10%	None
17	36	Tip	Silastic	<5%	None
18	18	Nasal valve	Gore Tex	<5%	None

IHCC = irradiated homograft costal cartilage.

delayed fashion, after significant contraction, it becomes difficult to create an adequate pocket in the scar contracture to reconstruct the defect.

The senior author (T.A.C.) has taken a different approach. For the past 20 years, in patients with extruded nasal implants, at the same time as removal of the extruded alloplast, the defect has been reconstructed with irradiated homograft costal cartilage (IHCC). This approach has been successful. The purpose of this article is to review the outcomes in a series of patients in whom this strategy of management was used.

MATERIALS AND METHODS

A retrospective analysis of consecutive patients presenting with extruded nasal implants from 1986 to 2000 forms the basis of this study. Patients were selected from a large database of revision rhinoplasty cases performed by, or under close supervision by, the senior author (T.A.C.).

Inclusion criteria was: 1) at least one previous rhinoplasty procedure, 2) an extruded nasal implant that was documented preoperatively, 3) immediate reconstruction that was carried out with irradiated homograft costal cartilage (IHCC), and 4) at least 1 year of follow-up recorded, including standard postoperative rhinoplasty photographs.

A total of 18 patients met the inclusion criteria and form the basis of this study. Data gathered from the charts included date of surgery, last date of follow-up, location of implant extrusion, alloplastic material, specific use of IHCC for reconstruction, percent of clinical IHCC resorption at last follow-up, and presence of warping of the IHCC (Table I).

RESULTS

Of the 18 patients in the study, 17 were satisfied with the cosmetic outcome of their reconstruction. One patient, in whom warping of the IHCC was noted 6 months after

her surgery, requested replacement of the IHCC. This was performed and another graft was carved of IHCC of the same dimensions as the original graft. In that patient, the



Fig. 1. Close-up frontal view of patient no. 7, demonstrating extrusion through the tip and the glabella.



Fig. 2. Planning of excision of inflamed skin around the extrusion site.

IHCC was found to still have carving markings on the implant after 2 years in vivo. This was the only graft that was available for inspection after placement in this series. At follow-up 14 months after replacement of the warped IHCC with another IHCC graft, she was also satisfied with her cosmetic outcome.

Clinical resorption of the IHCC was minimal, with a mean follow-up of 26 months.

The most common extruded alloplast was Silastic, followed by Gore-Tex (W.L. Gore & Associates, Inc., Flagstaff, AZ), which was followed by Supramid (S. Jackson, Inc., Alexandria, VA). There were no cases of extrusion or infection of the IHCC implant subsequent to immediate reconstruction of extruded alloplast.

Only one patient had a complication, the warped IHCC that, as stated previously, resulted in removal of the IHCC.

DISCUSSION

The unfortunate patient who presents with an extruding nasal implant is vexed with the following major problems: 1) inflammation with or without infection requiring removal of the implant in most cases, 2) a significant resultant cosmetic defect if the implant is removed and no effort is made to immediately reconstruct the defect, and 3) a progressive, relentless contraction of the skin/SMAS envelope around the void left by removal of the alloplast. Ideally, immediate reconstruction would be offered to the patient, sparing him or her the deformity left by removal of the implant. However, most surgeons presented with this problem have opted for removal of the implant and delayed reconstruction, after the inflamma-

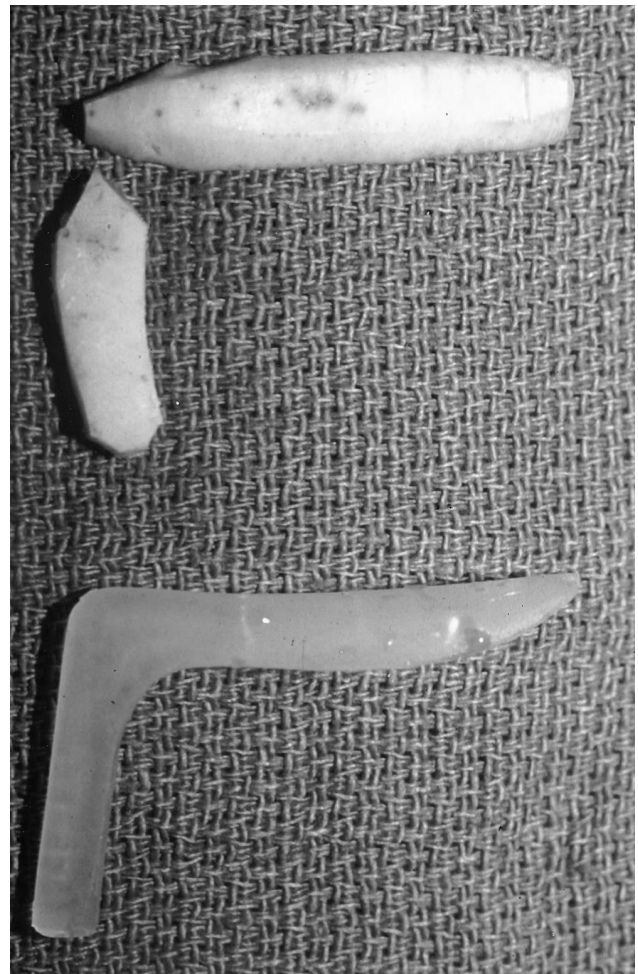


Fig. 3. Extruded Silastic and articulated IHCC graft.

tion has abated, usually a period of at least 6 months or longer.⁴

For the past 20 years, the senior author (T.A.C.) has taken a different approach to patients with this difficult



Fig. 4. Front view of extruding Silastic in patient no. 7.



Fig. 5. Front view of patient no. 7 3 years after immediate reconstruction with IHCC.

problem. The protocol is as follows. Patients are given two options. One is the traditional method of removing the implant and waiting for 3 to 6 months, then implanting an autograft or homograft cartilage. The other option forms the basis for this series of patients. Patients are given oral antibiotics for a minimum of 2 weeks before removal of the extruded implant. At the time of removal of the alloplast, a graft is carved from IHCC and used to fill the defect left by removal of the alloplast. The defect in the skin at the site of extrusion is closed primarily after freshening the



Fig. 6. Lateral view of extruding Silastic in patient no. 7.



Fig. 7. Lateral view of patient no. 7 3 years after immediate reconstruction with IHCC.

edges. There is great care taken to provide for tension-releasing subcuticular sutures, because the extrusion wound is always under a significant amount of tension (Figs. 3–11).

Using this approach in our study, 18 patients were offered and accepted this protocol. All 18 patients were satisfied with their cosmetic outcome. In one patient, there was warping of the IHCC noted 6 months after her surgery. She requested replacement of the IHCC. This was performed and another graft was carved of IHCC of the same dimensions as the original graft. At follow-up 14 months after replacement of the warped IHCC with another IHCC graft, she was also satisfied with her cosmetic outcome.

Clinical resorption of the IHCC was negligible. Examination of follow-up standard photographs revealed no appreciable loss of dorsal height or tip projection. There were no cases of extrusion or infection of the IHCC implant subsequent to immediate reconstruction of the extruded alloplast.

The results of this approach for the management of extruded nasal implants are comparable to previous re-

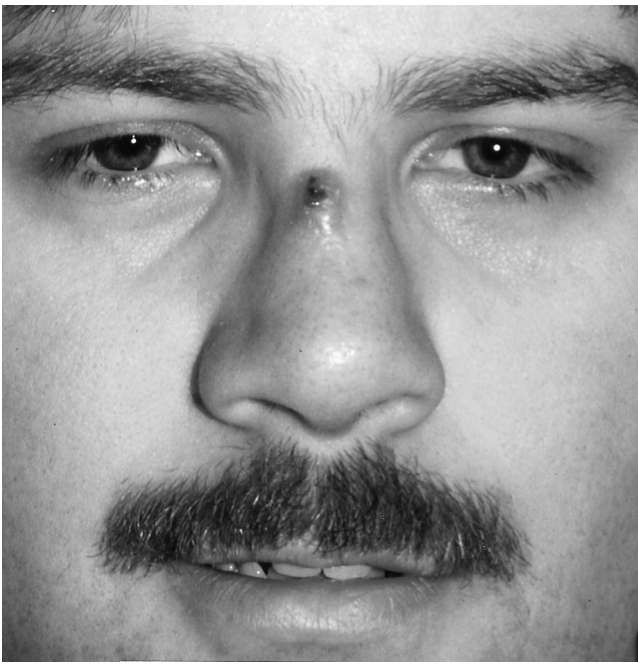


Fig. 8. Front view of extruding Gore-Tex at rhinion in patient no. 5.

ports of using IHCC in revision rhinoplasty. Dingman and Grabb^{5,6} were the first to report successful use of irradiated rib homografts in over 600 implants over a 15-year period. Schuller et al.⁷ then reported successful use of IHCC in a series of 145 patients, 32 of which had maxillary implants placed through an intraoral incision. They commented that the infection rate (6.1%) was not significantly different than the overall infection rate (4.1%) and that based on that observation, the material is not easily infected, even when inserted into a contaminated wound. Murakami et al.⁸ reported a series of 18 patients in whom IHCC was successfully used to create an articulated dorsal and caudal strut to reconstruct collapsed dorsum and tip supports.

The use of IHCC is certainly not without controversy. The most widely cited reference criticizing its use is Welling's report⁹ of long-term follow-up on Schuller's original series. In Welling's report, less than 50% of the patients were available for follow-up from the original series, but they found that most of the implants had progressively resorbed. However, they did not correlate the *location* of the implant in the face with the degree of resorption. In the three cases in which the location was specified as the nasal dorsum, the estimated absorption was 0%, 25%, and 25% after a follow-up period of 18 months, 5 years, and 10 years, respectively. The average amount of estimated resorption would be 17% in those patients with an average follow-up of 5½ years. They state in their conclusions that fibrous scar tissue provides bulk that may result in a satisfactory aesthetic result, which is the reason for using the graft.

Many authors⁸⁻¹⁰ have observed that resorption of IHCC is minimal in sites of minimal motion, such as the nasal dorsum. In our overall experience with over 175 patients in which IHCC was limited to dorsal and caudal

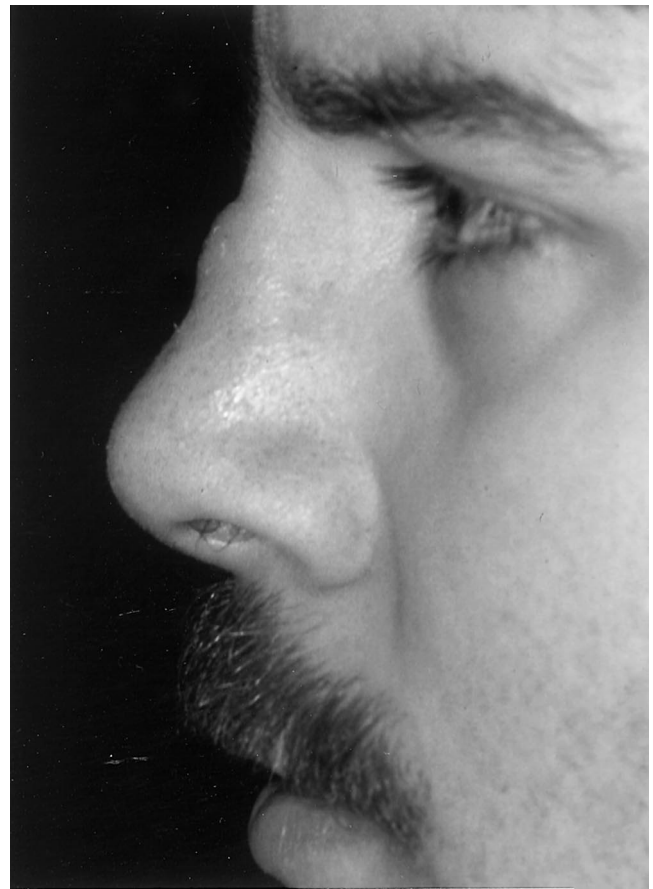


Fig. 9. Lateral view of extruding Gore-Tex at rhinion in patient no. 5.

augmentation, we have found comparably low rates of resorption.¹¹ Other disadvantages include potential for warping and potential for disease transmission. Warping has not been found to be a problem in our patients as long as the perichondrium is completely removed, the outer "cortex" of the IHCC is removed, and the principle of symmetric carving is followed. The risk of transmission of disease, with the rigorous testing of donors and sterilization protocol, appears to be asymptotic to zero. There have been no reports of transmission of infection from IHCC in the literature.

Autograft cartilage is the most commonly used grafting material in rhinoplasty, is associated with the fewest complications, and remains the gold standard against which other materials should be compared.¹²⁻¹⁴ Although algorithms vary from surgeon to surgeon, most agree that septal cartilage is the first choice, followed by conchal cartilage for dorsal augmentation. In patients who have had alloplastics placed in prior rhinoplasty, unfortunately, these resources are usually unavailable. The algorithms diverge when there is insufficient septal or conchal cartilage.

For many rhinoplasty surgeons, autograft costal cartilage is the next choice after autograft septal and auricular cartilage.¹⁵ The advantages are replacing like tissue with like tissue (i.e., cartilage for cartilage), similar "feel" of the reconstructed nose as a result of the likeness of the

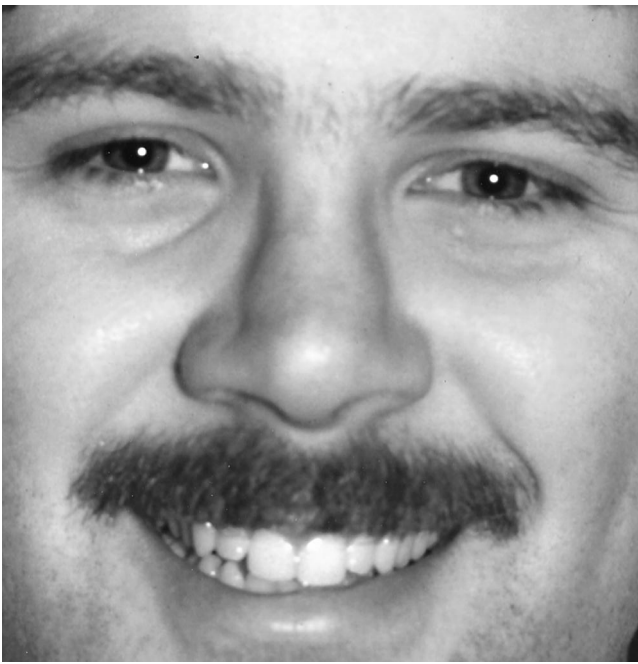


Fig. 10. Front view of patient no. 5 2 years after immediate reconstruction with IHCC.

material, and an abundance of the available material. Other proposed advantages, such as ease in carving of the material and the ability to harvest simultaneously while proceeding with other rhinoplasty maneuvers, are non-advantages when compared with our third choice, homologous costal cartilage. Disadvantages of autograft costal cartilage are increased postoperative pain at the donor site, potential for warpage, increased operating time (if the operation is performed by a single surgeon), risk of pneumothorax, and variable rates of resorption.

Another option for dorsal augmentation in rhinoplasty has been split calvarial bone. Advantages are less postoperative pain (debatable), no risk of warpage, and availability of the material in the same operating field. Disadvantages of calvarial bone are risk of dural or cerebral damage, intracranial hemorrhage, risk of resorption, and difficulty carving and contouring the grafts. In our minds and in the minds of our patients, the biggest disadvantage is the rigid "feel" of the nose that has been reconstructed/augmented with calvarial bone.

Most rhinoplastic surgeons agree that alloplastic materials should be reserved for rhinoplasty cases in which there is insufficient autologous cartilage for grafting. Others, citing increased donor site morbidity, opt for alloplastic materials, usually Silastic or polytetrafluoroethylene (ePTFE).^{16,17} Because few surgeons would consider using alloplasts in the face of extrusion, we will limit our discussion of alloplasts. The interested reader is directed to excellent reviews of the subject by Staffel and Shockley,¹ Lovice et al.,² and Maas et al.³

In summary, offering the patient faced with removal of an extruded alloplast the option of immediate reconstruction with IHCC appears to be a reasonable approach, as long as the patient is well-informed. The avoidance of

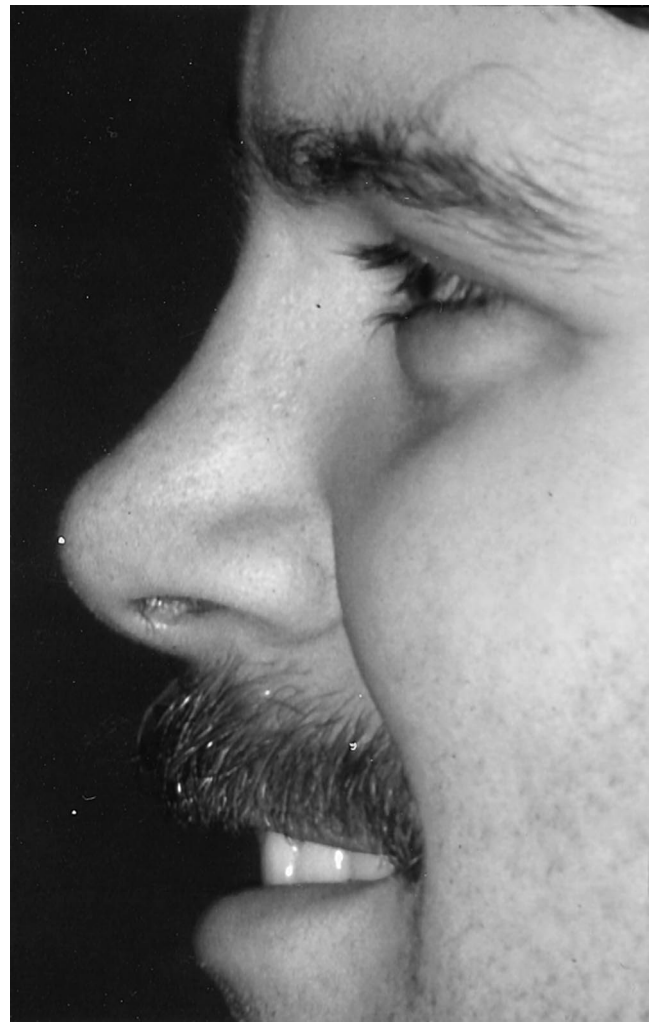


Fig. 11. Lateral view of patient no. 5 2 years after immediate reconstruction with IHCC.

an unreconstructed defect for a long period of time is, of course, well received by most patients. More importantly, the avoidance of a shriveled, scarified, contracted skin/SMAS envelope makes immediate reconstruction technically easier than delayed reconstruction, and in our hands yields a better cosmetic outcome. The choice of grafting material for immediate reconstruction was limited to autogenous or IHCC, because in virtually no cases was there adequate septal or conchal cartilage available. The additional operating time and morbidity of harvesting autologous costal cartilage was avoided by using IHCC instead. In our patients, there was minimal absorption, minimal warping, no extrusion, and no cases of disease transmission from the homograft.

CONCLUSION

A study examining immediate reconstruction of extruded nasal implants has not previously been reported. Our results suggest that immediate reconstruction with IHCC may be a viable alternative to delayed reconstruction, thereby sparing the patient the morbidity of an ex-

tended period of time with a nasal defect. The morbidity of this approach was minimal in our series of patients.

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