A augmentation of the chin is a long-standing and effective technique for facial enhancement. We have used preformed expanded polytetrafluoroethylene (Gore-Tex) implants for chin augmentation for several years. For this study, we collectively pooled data detailing our experiences with this material. From January 1, 1998, to March 30, 2001, a total of 324 Gore-Tex chin implants were placed. No resorption or visible movement of any implant occurred. Two (0.62%) of the 324 implants became infected and were ultimately removed. No other complications occurred. This complication rate compares favorably to other reports. Five implants (1.5%) were removed or changed in size due to patient requests. All remaining patients (97.8%) were satisfied with their result. We also describe technical points and procedure modifications that have helped us achieve beneficial results for our patients. Gore-Tex is a reliable implant material that helps the surgeon to achieve a high degree of patient satisfaction in chin augmentation.

Augmentation of the retrusive chin, either as a sole procedure, or in combination with other procedures such as rhinoplasty and face-lift, frequently provides the cosmetic surgery patient outstanding benefit. Commonly used materials include Silastic (solid silicone; Michigan Medical Corporation, Santa Barbara, Calif), Mersilene mesh (polyester fiber sheeting; Ethicon, Somerville, NJ), and Gore-Tex (expanded polytetrafluoroethylene; W. L. Gore and Associates, Flagstaff, Ariz). While the basic technique of implant insertion is straightforward, appropriate patient selection and identification of key anatomic features such as labiomental sulcus height and depth and dental occlusal relationships are essential for success.2,3

The authors of this study are all facial plastic surgeons who have routinely used preformed Gore-Tex chin implants for over 3 years. A detailed questionnaire regarding surgical experience with this material was developed by one of us (M.G.). The questionnaire was given to all of the other authors, who agreed to pool their experiences with these implants for the present study.

METHODS

A detailed questionnaire regarding clinical experience with Gore-Tex chin implants was distributed to all authors of this study. Each of the 6 authors collected and reviewed his own surgical case logs and patient charts, and all completed the questionnaires. The data were then compiled and analyzed. Follow-up questions to some of the authors for clarification or more information were made. A review of the medical literature on the subject of chin augmentation using materials in common use today was performed, and information gathered for the purpose of comparison with the present study.

RESULTS

We collectively performed 324 chin augmentations using preformed Gore-Tex chin implants between January 1, 1998, and March 31, 2001. We used these implants exclusively during the study period. Three hundred eight implants (95%) were placed through a submental approach, and the remaining 16 (5%) were placed transorally. There was no sign of resorption of any implant. All of us also reported that there was no movement of any implant after placement.

Two (0.62%) of the 324 implants became infected and ultimately were removed after multiple courses of antibiotics failed to
resolve the infections. One of the implants that became infected had been placed through a submental incision, the other through a transoral incision. Other complications, not requiring implant removal, did not occur.

Five of (1.5%) 324 patients requested that their implants be removed. Four of these requests resulted from dissatisfaction with appearance and 1 from a sudden, emotional aversion to the presence of a foreign material in her body. Two of these patients underwent reimplantation with larger implants, and were pleased with the increased augmentation. The remaining 3 patients were satisfied with their ultimate result after the implants had been removed.

The 317 patients (97.8%) who maintained their original implants were pleased with the results of chin augmentation. Examples of the improvements that were achieved are shown in Figure 1 and Figure 2.

TECHNICAL CONSIDERATIONS

A series of questions regarding surgical techniques and preferences was presented to the authors. The results are as follows:

Which size implants did you use and with what frequency? The authors showed a wide difference in the size of implants they prefer to place. Small and medium implants were placed most often, but one author placed large implants in 75% of cases (Table 1).

By what approach did you place the implants? Five of 6 authors placed the implants through a submental approach only. One author placed 25% of implants through a transoral approach, and 75% through a submental approach.

What percentage of implants did you modify by carving? The average of responses was 55%, but the range was wide. One author carved 100% of implants, another 90%, another 55%, another 20%, and 2 authors shaped the implants in only 5% of cases.

When did carve implants, which areas did you carve? All 6 of the authors shaved the central area of the implant to decrease forward projection when necessary. Three of 6 authors carved the ends of the “arms” to soften the transition of the implant to the mandible, and 3 of 6 shaved the upper and/or lower edges of the implant to decrease the vertical component of augmentation.

What areas of the mandibular periosteum did you raise or leave intact? All 6 authors did not raise the midline mandibular periosteum, but did create subperiosteal tunnels to accommodate the implant “arms.”

Did you soak the implant in antibiotic solution prior to placement? Three surgeons did not, 2 surgeons used gentamicin solution, and 1 used bacitracin solution. One of the 2 implants which became infected in this study was soaked in gentamicin solution; the other was not soaked in an antibiotic solution.

Figure 1. Preoperative (A) and 1-year postoperative (B) views of a 25-year-old patient who underwent chin augmentation with preformed expanded polytetrafluoroethylene (Gore-Tex) implants and rhinoplasty.
How did you close the incisions? All 6 surgeons closed the submental incisions in layers, using absorbable sutures deep to permanent ones.

Do you favor a central hole in the implants, and if so, why? Five of 6 surgeons favored the return of a central hole to the implant. Four of these 5 used the hole to anchor the implant to the periosteum with permanent suture. All 5 found the hole useful to mark the center of the implant during surgery.

Table 1. Frequency of Implant Size Placement by Authors

<table>
<thead>
<tr>
<th>Implant Size</th>
<th>Frequency of Use, %</th>
<th>Range, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>37</td>
<td>2-95</td>
</tr>
<tr>
<td>Medium</td>
<td>36</td>
<td>0-95</td>
</tr>
<tr>
<td>Large</td>
<td>27</td>
<td>3-75</td>
</tr>
</tbody>
</table>

Figure 2. Preoperative (A and B) and postoperative (C and D) views of 60-year-old man 14 months after midforehead lift, upper eyelid blepharoplasties, face-lift, and large preformed expanded polytetrafluoroethylene (Gore-Tex) chin implant.
et al. reported a 2.2% infection rate. This was identical to the infection rate of 0.62% reported in this series. Other published studies have shown no difference in complication rates between submental and transoral routes of chin implant placement. A recent article by Zide et al., reviewing 100 postoperative chin implant problems, stated, “almost all chin implant problems that the senior author has seen were caused by implants placed transorally.” These authors went on to assert that disruption of the origin of the mentalis muscle from the mandibular symphysis led to problems with implant positioning and the ultimate location and appearance of the labiomental sulcus.

The authors were asked to describe any additional surgical steps that they routinely take to achieve success. One surgeon advocated vacuum impregnation of the implant in gentamicin solution using positive and negative pressure while the implant was in a syringe. One surgeon placed permanent sutures through the implant into the periosteum: 1 in the center and 1 on each side 1 cm lateral to the midline. The other authors stabilized the implants using a single midline permanent suture from the implant to the periosteum.

Table 2. Comparison of Chin Implant Complication Rates Reported by Several Authors

<table>
<thead>
<tr>
<th>Material</th>
<th>Beekhuis, 1984</th>
<th>McCollough et al., 1990</th>
<th>Gross et al., 1999</th>
<th>Present Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>Polyamide</td>
<td>Polyester fiber (Mersilene)</td>
<td>Polyester fiber (Mersilene)</td>
<td>ePTF (Gore-Tex)</td>
</tr>
<tr>
<td>Infection, %</td>
<td>0.8</td>
<td>2.5</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Displacement, %</td>
<td>1.3</td>
<td>0.7</td>
<td>1.8</td>
<td>0</td>
</tr>
<tr>
<td>Overall complications</td>
<td>3.3</td>
<td>3.2</td>
<td>2.2</td>
<td>0.6*</td>
</tr>
</tbody>
</table>

Abbreviation: ePTF, expanded polytetrafluoroethylene.
*Five implants (1.5%) were removed or replaced at patient request.

**ADDITIONAL TECHNICAL POINTS**

The authors were asked to describe any additional surgical steps that they routinely take to achieve success. One surgeon advocated vacuum impregnation of the implant in gentamicin solution using positive and negative pressure while the implant was in a syringe. One surgeon placed 3 permanent sutures through the implant into the periosteum: 1 in the center and 1 on each side 1 cm lateral to the midline. The other authors stabilized the implants using a single midline permanent suture from the implant to the periosteum.

One (0.3%) of the 308 implants that were placed through a submental incision and 1 (6.25%) of the 16 transorally placed implants became infected. While this difference in percentages is large, it is of limited significance given the small number of infections reported in this study. Published studies have shown no difference in complication rates between submental and transoral routes of chin implant placement. A recent article by Zide et al., reviewing over 100 postoperative chin implant problems, stated, “almost all chin implant problems that the senior author has seen were caused by implants placed transorally.” These authors went on to assert that disruption of the origin of the mentalis muscle from the mandibular symphysis led to problems with implant positioning and the ultimate location and appearance of the labiomental sulcus.

The frequency of implant infection necessitating removal in this series is low (0.62%) and compares favorably with other published studies. In a series of 137 Gore-Tex implants placed during rhinoplasty over 6 years, Godin et al. reported a 2.2% infection rate. This was identical to the complication rate described in other articles in all areas of the face according to a comprehensive medical literature review contained within the same article. The same authors continued to follow up and added to their series of patients, reporting 309 rhinoplasties using Gore-Tex over a 10-year period. The infection rate had increased to 3.2%, but a significant difference was found between infectious complications in primary surgical procedures (1.2%) and revision surgical procedures (5.4%). It is the intention of the authors of the present study to continue to follow up our patients receiving Gore-Tex chin implants over time to see if the complication rate changes.

Results of the present study compare well to those of other published series of chin implants in regard to complications (Table 2). We did not consider the 5 implants that were removed due to patient preference to be true surgical complications or failures of the material; rather, these were errors in communication between surgeon and patient. Chin augmentation produces an immediate and substantial change in appearance that the patient must desire. Three of these 5 patients were pleased with their appearance after implant removal to the extent that they did not wish further surgery. The authors observed that scar tissue formation in the area where the implants had been placed and then removed provided a degree of augmentation that was aesthetically beneficial. In the other 2 patients, more augmentation was desired, and the implants were simply exchanged for larger ones.

In response to the question about a central hole in the implant, most of the authors favored one. Gore-Tex chin implants previously had a small central hole near the upper and lower edges of the implant. The holes were discontinued due to difficulties encountered with them during the manufacturing process. While it is a simple matter to pass a suture needle through the solid implant to anchor it to the periosteum, the hole did serve another useful purpose—it marked the midline of the implant. This was helpful in positioning the implant within the pocket over the mandible. W. L. Gore and Associates is currently exploring the feasibility of incorporating a midline colored stripe throughout the substance of the implant to serve the same function.

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**REFERENCES**