Outpatient Facial Contouring Through the Use of Facial Implants

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Over the last 10 years, the complexity of facial augmentation procedures has been rapidly expanding to include the use of multiple varieties of facial implants that not only replicate the tissue for which they substitute but also are anatomically correct in size. The subtleties of implant design and placement are a major challenge for the facial plastic surgeon. At the same time, the rewards for the patient as well as the surgeon are enormous. The art and science of facial contouring involves not only a complete analysis of the patient's facial anatomy, but also an understanding of the patient's desires and ultimately matching this to the use of facial implants that are correct in size, shape, and density.

BIOMATERIALS

The knowledge of appropriate biomaterials to be used as a substitute for facial deficiencies requires not only a knowledge of host response but also an understanding of any potential adverse reactions to given materials. The stabilization of these implants and their ability to either be encapsulated or fixed in place for the lifetime of the patient is also important. The characteristics of implant materials, such as silicone elastomer, which readily forms a capsule, and the Gore S.A.M., which to a lesser degree encapsulates, is important when considering these materials for implant purposes.

THE IDEAL IMPLANT

The ideal implant should have the following characteristics:

Like size and consistency to that tissue for which it is substituting
Lifelong longevity
No toxicity
High resistance to infections
Reasonable ease of placement by the trained facial plastic surgeon

FACIAL CONTOURING

In office-based or outpatient surgery, the surgeon must be prepared to have all anticipated designs, shapes, and/or materials available and must be prepared to modify the implant on an impromptu basis. Determining the size of the implant and the preparation of the recipient site also play a direct role in the success of the augmentation procedure. All faces are different; for example, a wide face will accommodate a certain

sized implant. However, for a narrow face, or in one where there is thin skin, the implant may either have to be trimmed or its thickness reduced.

The concept of facial contouring implies a change in the overall shape of the face. The face, like any other architectural structure, has distinctive promontories that are in balance. The individual configurations of the nose, malar–midface area, and mandible–jawline create the fundamental architectural proportions that determine the ultimate contour of the face. Harmony between these structures, as it relates to the overlying soft tissue structures, determines the ultimate balance.

Implants should be readily implantable with margins tapered to blend with the underlying surface of the recipient area. This implant should be malleable and should readily conform to the underlying structures in such a way that mobilization is difficult to incur. Modification of the implant to further customize it to the needed recipient area should be easily accomplished without destruction of the overall integrity of the implant.

Profileplasty can be applied to any of the facial structures. At the same time, a contemporary facial plastic surgeon will be treating the face as a whole and relating these structures to the underlying entity. The earliest profileplasty procedures were those of chin augmentation and rhinoplasty. Implants may be placed subcutaneous, sub-superficial musculoaponeurotic system, (SMAS), submuscular, and subperiosteal. Appropriate application of volume and mass in different anatomic regions produces the ideal balance of facial beauty.

PATHOPHYSIOLOGIC CONSIDERATIONS OF AGING

The facial structures, like the rest of the body, are in a state of constant flux and modification based on age, stresses to the individual structures, weight loss, trauma, and even excessive exercise. There are certain structural and contour defects that are associated with the aging process and that are frequently the subject of facial contouring. The overall flattening of the midface, thinning of the lips, formation of jowls, and changes in the overall shape of the face from perhaps an oval or square to an elongated appearance are all changes that bring a patient to the facial plastic surgeon. An understanding of all the possibilities of rejuvenation and corrective procedures to improve the overall contour, not only of the bony but also the overlying subsoft tissue structures, is inherent and necessary to the understanding of the facial plastic surgeon.

PREOPERATIVE ANALYSIS FOR FACIAL CONTOURING

In evaluating a face for possible facial contouring, three elements are necessary to determine the design shape, size, and possible positioning of any implant. The face can be divided into multiple zones in evaluating the individual facial contour, and ultimately these zones must be related.

Premandibular Jawline Zone

Contemporary augmentation of the premandibular jawline identifies all areas of deficiency by zone and augments these areas, either individually or collectively. Zone I constitutes the area between the mental foramina. Zone II constitutes the area from the mental foramina posteriorly to the oblique line of the horizontal body of the mandible. Zone III constitutes the posterior half of the horizontal body of the mandible, including the angle of the mandible and the first 2 to 4 cm of the ascending ramus (Fig. 32.1).

Midface Zones

Zone I includes the major portion of the malar bone and the first third of the zygomatic arch. Zone II overlies the middle third of the zygomatic arch. Zone III

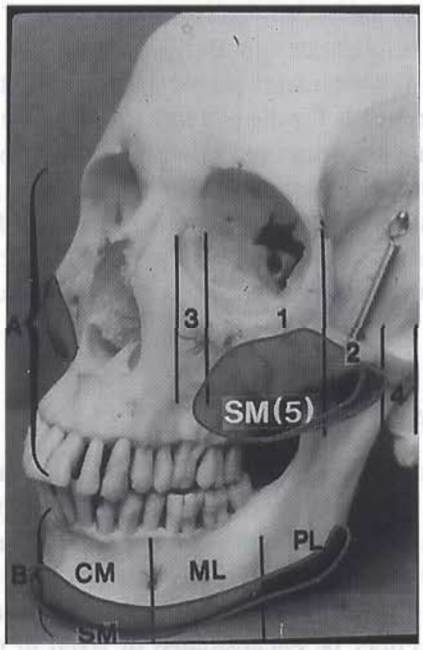


FIG. 32.1. Alloplastic facial contouring by zonal principles of skeletal anatomy: the three zones of premandibular skeletal anatomy and the five zones of midfacial skeletal augmentation. (Reprinted by permission of Binder and Schoenroek.[1]).

is the perinasal area lying midway between the infraorbital foramen and the nasal bone. Zone IV overlies the posterior third of the zygomatic arch. Zone V is the submalar triangle (Fig. 32.1).

ALTERNATIVE CLASSIFICATION OF MIDFACIAL CONTOUR DEFECTS

Topographic classification of the midface may be more useful as a reference for correlating anatomic patterns of deformity and relating those to specific implant correction (Fig. 32.2). Type I defines good midfacial fullness and insufficient malar skeletal development. Type II defines atrophy or ptosis of midfacial soft tissues in the submalar area and adequate malar development. Type III defines thin skin and very prominent malar eminences. Type IV defines malar hypoplasia and submalar soft tissue deficiency. Type V defines a ''tear-trough'' deformity—a limited deep grove at the junction of the thin eyelid and thicker cheek skin extending from the medial aspect of the canthus of the eye downward and laterally across the infraorbital rim and supraorbital component of the malar bone.

ZONAL ANATOMY: UPPER THIRD OF THE FACE

Zone I defines the orbital rims and glabellar complex. Deficiency in either of these areas leads to poor definition of the overall upper third of the face. Contouring of the glabellar area frequently involves a myectomy of the glabellar musculature and augmentation with a Gore S.A.M. patch, which is described in the context of soft tissue contouring, below (Fig. 32.3).

Zone II is temporal fossa deficiency. Again, soft tissue contouring may correct this problem.

Zone III is the central forehead between the temporal fossa. The hairline of the individual patient is highly variable and will significantly influence any alterations in brow position. With the advent of endoscopic forehead lifting and the use of titanium screws, or miniplate fixation, vector control of the individual segments of the brow has been increasingly accurate and the results refined as it relates to controlling the height of the hairline.

SUBCUTANEOUS DEFECTS OF THE FACE

Defects related to the soft tissue component of the face, whether it be the subcutaneous tissue, fat, or in some cases muscular defects—have been corrected with both autogenous tissue and on occasion synthetic implants. Materials such as collagen, Alloderm (Life Cell Corporation), and Gore S.A.M. are just a few of the implant materials that have been used and that are derived from other than the individual patient's body. The purpose of this discussion is to describe the use of Gore S.A.M. as a soft tissue implant and some of the surgical applications of its usage.

Expanded polytetrafluorethylene (trade name Gore S.A.M.) has been used in the human body in some form for approximately 26 years. There are now 4 million patients who in the 26-year period have had Gore S.A.M. vascular grafts without significant complications. This product's biocompatibility has been confirmed by this very large patient sampling. In the last 10 years, one of the authors has had the opportunity to review 3500 individual applications used on various patients with excellent results. The use of this implant will be described in detail in an upcoming publication by Flowers and Terino on facial implantation.

The properties of Gore S.A.M. have to be specifically recognized to anticipate its usage. These properties include mild to minimal ingrowth of tissue and, therefore, limited capsular formation; minimal potential for inflammation and rejection; and minimal potential for infection, and (depending on the form of Gore S.A.M. in many cases) limited retention of form. The placement of this product in a deep subcutaneous pocket, when used as a soft tissue implant, is mandatory. The surgical technique as it relates to the application of the soft tissue form of this implant, both from a closed and open approach, are described below.

SURGICAL TECHNIQUE

There are infinite variations of analytic analysis of facial contour; at the same time, there is not one format that allows a complete and directed understanding of individual deficiencies in the face. By dividing the face into the individual zones described above, both the skeletal and soft tissue deficiencies can more easily be segmentally analyzed and evaluated. At the same time, the overall analysis remains a difficult task for the facial plastic surgeon.

It is recognized that the safest level of dissection is the subperiosteal plane, where nerves and blood vessels are avoided. At the same time, not all implants can be placed at this level, and, particularly when it comes to the placement of soft tissue implants, subcutaneous placement must be considered. A complete understanding of the facial anatomy is essential for any successful facial plastic surgeon anticipating facial implant place-

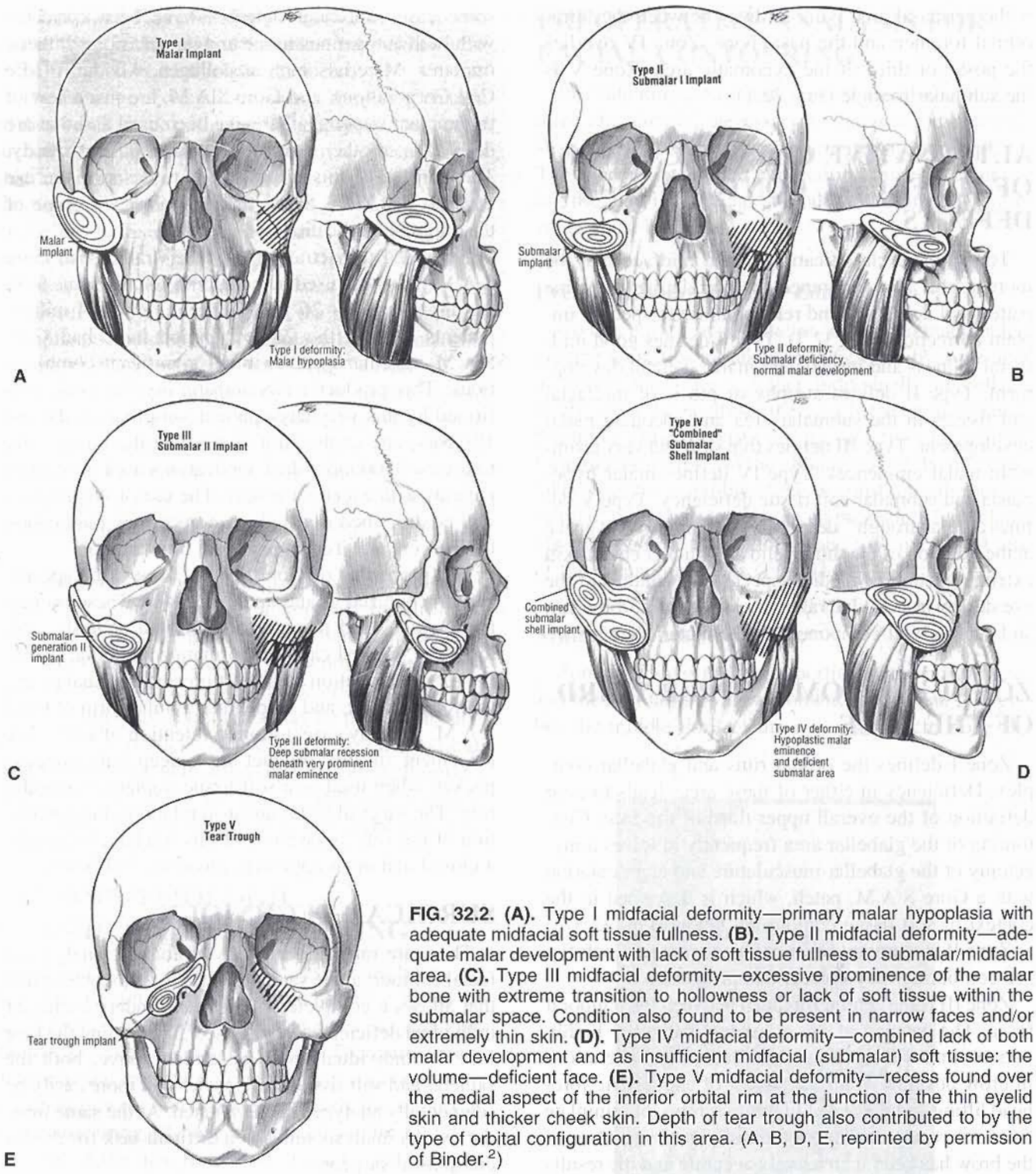


FIG. 32.2. (A). Type I midfacial deformity—primary malar hypoplasia with adequate midfacial soft tissue fullness. **(B).** Type II midfacial deformity—adequate malar development with lack of soft tissue fullness to submalar/midfacial area. **(C).** Type III midfacial deformity—excessive prominence of the malar bone with extreme transition to hollowness or lack of soft tissue within the submalar space. Condition also found to be present in narrow faces and/or extremely thin skin. **(D).** Type IV midfacial deformity—combined lack of both malar development and as insufficient midfacial (submalar) soft tissue: the volume—deficient face. **(E).** Type V midfacial deformity—recess found over the medial aspect of the inferior orbital rim at the junction of the thin eyelid skin and thicker cheek skin. Depth of tear trough also contributed to by the type of orbital configuration in this area. (A, B, D, E, reprinted by permission of Binder.[2])

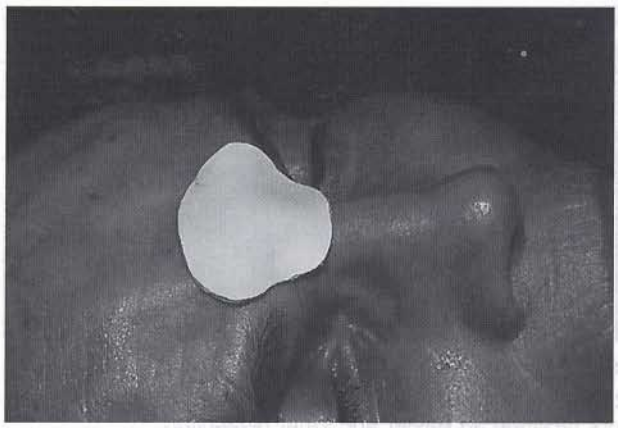


FIG. 32.3. Patient with Gore S.A.M. to glabellar area.

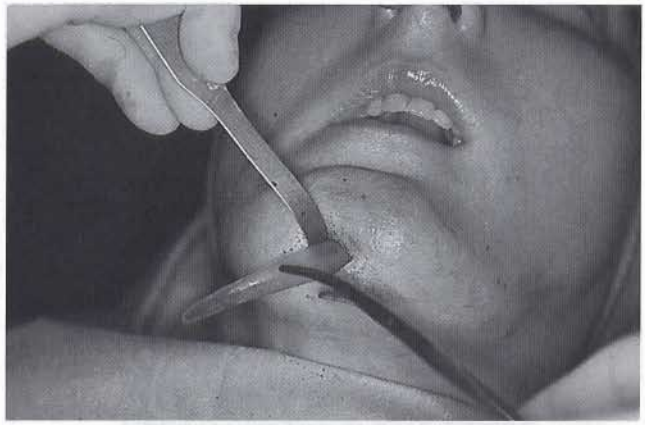


FIG. 32.4. The external route of mandibular augmentation. The incision is usually not greater than 1 to 1.5 cm in width. The advantage of using silicone elastomer implants in this approach is the ability to bend the implant and insert it through small openings.

ment. Specific computer graphics and computer-assisted design–computer-assisted manufactured (CAD-CAM) computer modeling is frequently helpful in analyzing and determining the deficiencies in difficult cases. The approach to the placement of implants is always an important consideration to avoid trauma to vital structures as well as concealment of the actual incision for that approach.

Mandibular Augmentation

Five basic technical rules are described for safe and accurate augmentation:

1. Stay on bone through the subperiosteal approach, which creates a firm and secure attachment for the implant to the bony skeleton.
2. Elevate the soft tissues in the nonbony area gently.
3. The dissection space should be slightly larger than the prosthesis, with the pocket made using sharp dissecting instruments on the central bone, but using blunt instruments laterally.
4. Mental nerves are to be avoided. At the same time it is possible to have temporary hypesthesia for several days to several weeks after surgery. Permanent nerve damage is rare.
5. A dry operative field is essential for accurate visualization, precise dissection, and proper implant placement.

Incisional Choice

Either an intraoral or external approach can be used. The external approach has the advantage that there is no intraoral bacterial contamination and that direct visualization of the pocket and the mental nerves are obvious (Fig. 32.4). The intraoral approach has the advantage of avoiding external incisions and, additionally, it maintains the inferior shelf of tissue along the mandibular border and respective periosteal pockets for retention of the implant in a precise location. Additional need for suture fixation is easier to secure through the external approach compared with the internal approach.

Selection of Premandibular Implants

Selection of the premandibular implant depends on whether the situation demands extension into the mid, lateral, and parasymphyseal zones for either increasing projection or widening the lower third of the facial segment. The average lateral and midlateral projection is between 6 and 9 mm for men and 4 to 7 mm for women. Occasionally, patients who have true micrognenia will require even larger implants up to 10 to 12 mm in projection to create appropriate profile and broader jawline (Fig. 32.5).

Mandibular Angle Implant

Access to the angle of the mandible is achieved through a 2-cm mucosal incision at the retromolar trigone placed approximately 8 mm lateral to the angle. The dissection is performed on bone in a subperiosteal plane beneath the masseter muscle and around the posterior angle of the mandible, up along the ramus, and anteriorly along the body of the mandible. Direct, accurate placement of the angle implants, which are specifically designed for the posterior bony border of the adja-

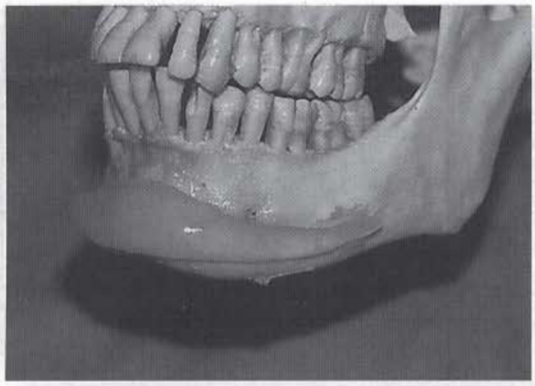


FIG. 32.5. Chin implant on skull. Alloplastic facial contouring by zonal principles of skeletal anatomy. Examples of contemporary anatomic design of premandibular implants.

cent ascending ramus, is achieved, and fixation is carried out with titanium screw fixation (Fig. 32.6).

Malar and Midface Contouring

Subperiosteal plane, again, is the safest plane for malar augmentation. Various approach routes include intraoral, subciliary, rhytidectomy, zygomatic or temporal, transcoronal, and transconjunctival.

The majority of malar implants are placed through an intraoral approach because of the directness and safety, as well as concealment of the individual incision. Certainly, the potential for bacterial contamination as with the intraoral mandibular approach must be considered.

After infiltration of appropriate local anesthetic solution with adrenaline for vasoconstrictive properties, a 1 to 1.5 cm incision is made obliquely overlying the canine fossa and above the buccal-gingival line. A

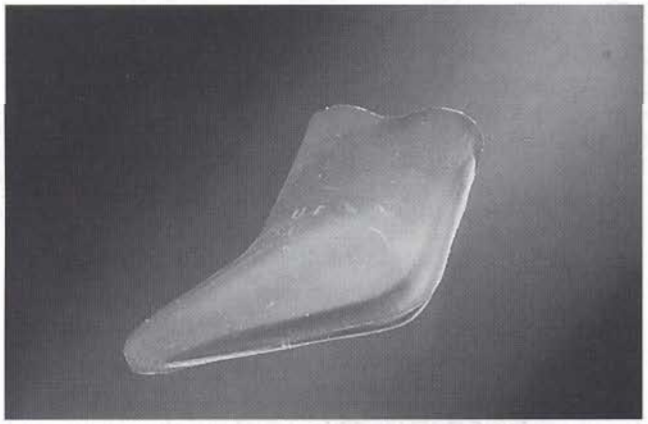


FIG. 32.6. A prefabricated mandibular angle implant that can be used to expand the mandible in a lateral and/or posterior direction. Approach for insertion of this implant is via the intraoral route.

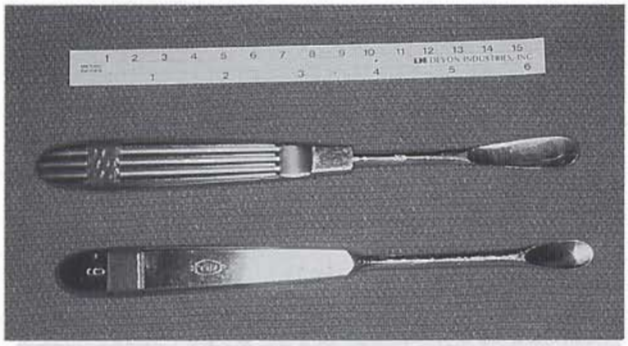


FIG. 32.7. Flat and curved periosteal elevators. The elevators are a minimum of 10 mm in width. Use of the wider elevators facilitate an easier and safer dissection.

large, broad-based Tessier elevator, which is at least 10 mm wide, is used for subperiosteal elevation and development of the pocket (Fig. 32.7). Elevation is carried out avoiding the infraorbital nerve, and then dissection is performed directly over the maxillary buttress and malar eminence. The size and direction of elevation is proportional to the zone of intended augmentation. In the case of the submalar space, soft tissues are elevated inferiorly over the tendonous attachments of the masseter along the zygoma (Fig. 32.8). Previous external markings on the face determine the underlying area of elevation. The masseteric attachments not cut and left completely intact afford a framework on which the implant may rest. In this specific area, the implant is not on bone and floats directly over the masseteric attachments, or it may straddle both bone and tendon. As the dissection moves posteriorly along the zygomatic arch, the dissection becomes more

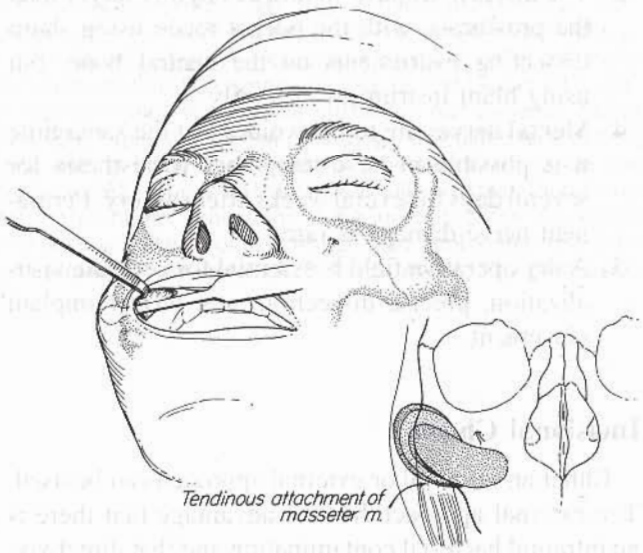


FIG. 32.8. Dissection for placement of malar implant.

difficult because of the tightness of the space. *The ultimate pocket must be slightly larger than the implant,* since a small, lateral pocket will force the implant medially and out of the desired area of placement. The use of sizers will allow a topographic representation of not only the zone, but the degree of augmentation required. In most cases, the zonal area of augmentation, as well as size, can be estimated by the experienced facial plastic surgeon.

Final placement of the selected implant must correspond to the external topographic defect, and, in the case of submalar augmentation, the implant must reside below the zygoma and zygomatic arch over the masseteric tendon, overlapping both bone and the tendon. The larger malar shell-type implants reside primarily on bone in a more superior/lateral position and may extend partially into the submalar space. The combined (malar-submalar) implants will occupy both areas, and preoperative determination of deficiency and desire for augmentation of these areas should be adhered to. Patients who have noticeable facial asymmetries, thin skin, or extremely prominent bone structure may require customization of the implant to reduce its thickness or length and to avoid potential ridging or abnormal projection.

Once the implant position has been established, it is often necessary to secure it, which can be accomplished with internal fixation sutures approximated to adjacent periosteum, with stainless steel or titanium screws through the implant, or through external fixation using lateral suspension sutures, which are usually 2-0 Ethilon sutures approximated on a large Keith needle and placed through the tail of the implant and then inserted through the pocket and directly laterally through an exit site percutaneously, posterior to the temporal hairline. These sutures are then tied over a bolster, exerting traction on the tail of the implant. Outpatient procedures also require that everything be done to prevent complications. We have found the use of the compression mask to be extremely valuable in reducing postoperative swelling (Fig. 32.9).

Patients with gross asymmetries, or in which the implants are placed in the midfacial or submalar area, may be fixated through a direct external fixation technique in which the implants are positioned directly to correspond with marks on the skin and double-armed sutures with 1-inch straight needles are then passed through the two medial fenestrations of the implant from a posterior to anterior direction and then advanced perpendicularly through the skin and exit at the respective, or external, markings and are fixated over an external bolster (Fig. 32.10; patient example, Fig. 32.11).

FIG. 32.9. One of the authors (W.I.B.) has found the immediate application of pressure over the entire midface by using a full face compression garment considerably reduces the risk of hematoma, seroma, and swelling and consequently the postoperative complications related to fluid accumulation within the pocket.

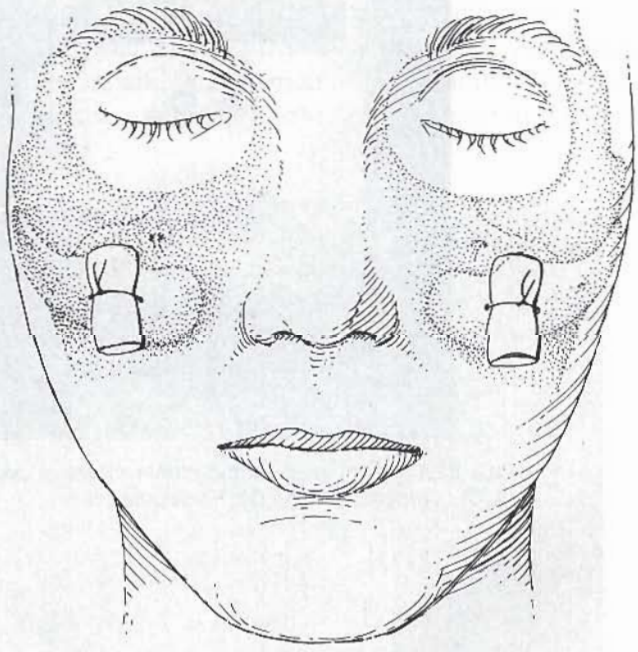


FIG. 32.10. The implant is stabilized directly by tying the suture directly over an external bolster (comprised of two cotton rolls). The sutures and bolsters are removed by the third postoperative day. (Reprinted by permission of Binder.[2])

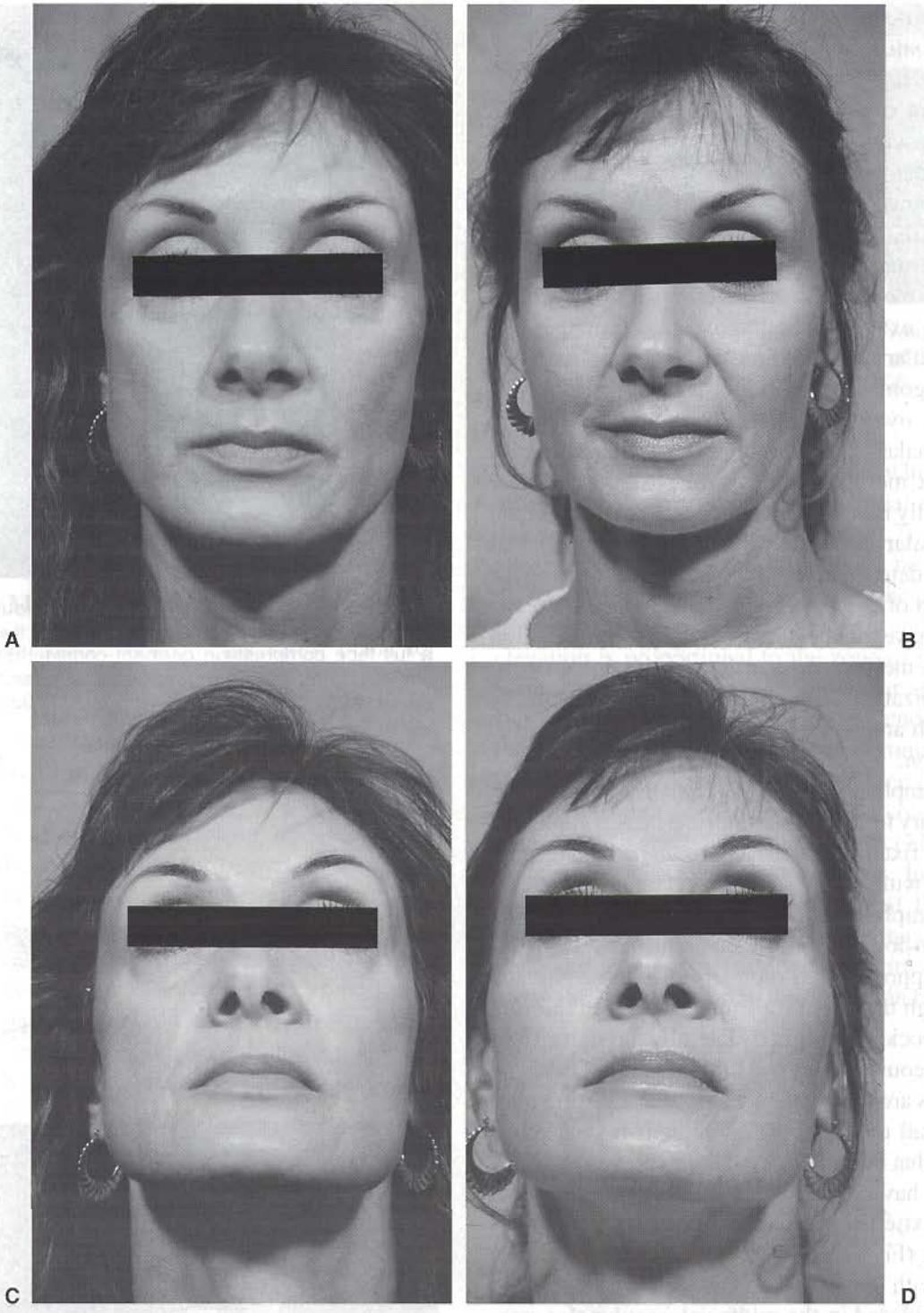


FIG. 32.11. Pre- and postoperative views of patient after use of combined submalar-shell implants. **(A,C).** Preoperative. **(B,D).** Postoperative.

The subciliary, rhytidectomy, zygomatic, temporal, coronal, and transconjunctival approaches are described elsewhere.

Placement of Expanded Polytetrafluorethylene (Gore S.A.M.)

The closed surgical technique has been used by this author in over 3,500 applications. Gore S.A.M. fabric has been surgically placed as a substitute for soft tissue defects in all aspects of the face. The attributes of this implant, including its lack of capsular formation and low reactivity, make it an ideal soft tissue implant.

The closed surgical technique with a 14-gauge trocar affords application of the multistrand Gore S.A.M. material with minimal instrumentation, minimal handling of the fabric, and minimal trauma to the patient. A standard tray includes at least two lengths of 14-gauge trocars, mosquito clamps, scissors, Bishop-Harmon forceps, 17 Beaver blade, and appropriate Gore S.A.M. strip material (Fig. 32.12).

Standard steps for the closed technique include

1. Mark the patient's areas of subcutaneous deficiency in the face, with the patient in a sitting position.
2. Block the individual area with appropriate local anesthetic.
3. Use a 75 Beaver blade to make a 1.5 to 2 mm incision at the extremes of the anticipated augmentation site. In the case of the nasolabial folds, the anticipated augmentation is just medial to the crease.
4. Pass a 14-gauge trocar subcutaneously, avoiding any adhesion or trauma to the dermis from entrance to exit.
5. Remove the lancet segment of the trocar.
6. Apply a pull-through suture to the trocar, either through a small perforation in the end of the trocar or spread into the actual trocar itself.
7. Retract the trocar, in continuity with the multistrand expanded polytetrafluorethylene material, and place it in the tunnel.
8. Reduce the pursestring effect of the tissues by stretching the tissue around the multiple 1-mm fibrils of the implant.
9. Trim the implant in a beveled fashion at the entrance and exit sites.
10. Place the expanded polytetrafluorethylene in the subcutaneous tissue with the Bishop-Harmon forceps, avoiding any dermal approximation.
11. Close the incision with a single 6-0 Prolene suture.

Figure 32.13 shows nasolabial augmentation with Gore S.A.M. strips.

Perioral Application

Gore S.A.M. has been used in the upper and lower lips for both restorative and aesthetic purposes. Multiple other materials have been used, including Alloderm, collagen injections, fascia, dermis, and autofat.

The implant must be placed in a deep subcutaneous tissue, and its entrance and exit sites are frequently at the wet line, 2 to 3 mm medial to the lateral commissure of the mouth. Implantation of the vermillion and philtrum also allows for further enhancement of the lip.

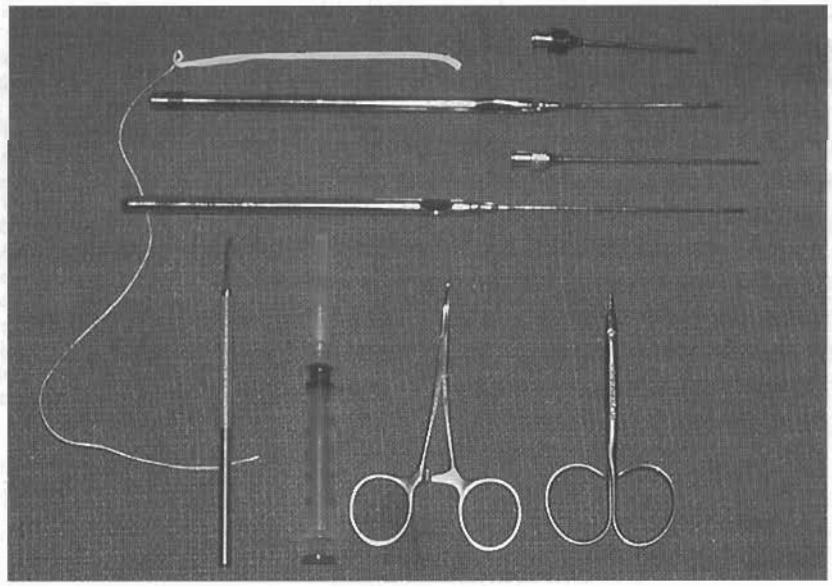
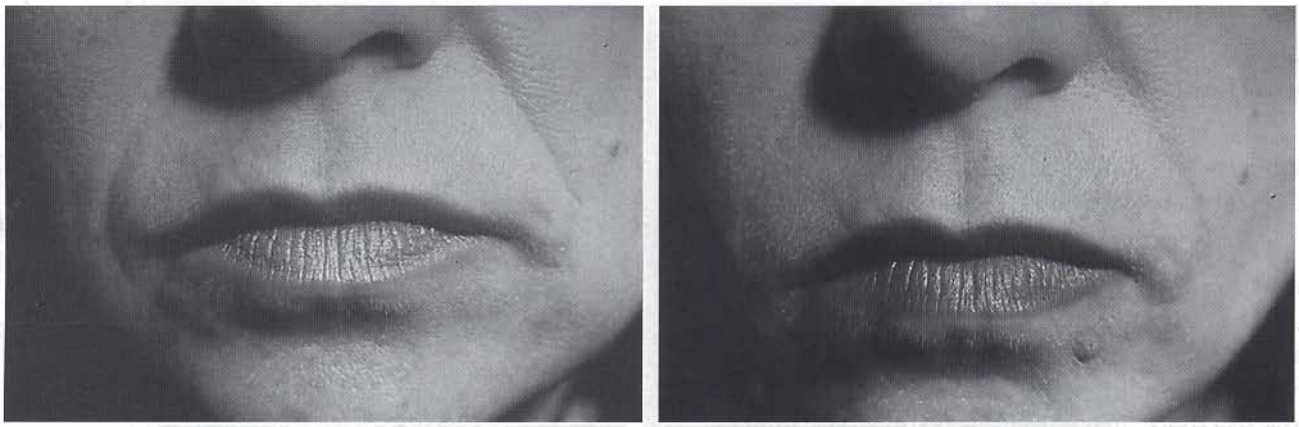


FIG. 32.12. Gore S.A.M. instrument tray.



A B

FIG. 32.13. (A). Preoperative view of Gore S.A.M. to the nasolabial crease. **(B).** Postoperative view of Gore S.A.M. to the nasolabial crease.

Glabellar Augmentation

The Gore S.A.M. material can be used in conjunction with an endoscopic forehead lift or as an isolated procedure through a transbrow, transblepharoplasty, or transexternal nasal incision. In each of these cases, it can be placed in the glabellar area to augment any deficiencies. An appropriate width of the Gore S.A.M. fabric must be selected.

The premaxilla and anterior nasal spine is an area where a small incision made lateral to the ala on each side allows entrance and exit of the trocar, and tubular Gore S.A.M. appropriate to the area can be layered and used to augment and improve the nasolabial area and to augment the premaxilla. A preformed, premaxillary, and peripyriform silicone elastomer implant can also be used in this situation.

COMPLICATIONS

Complications of facial implants include bleeding, hematoma formation, infection, exposure, extrusion, malposition, displacement, fistula formation, seromas, persistent edema, abnormal prominence, pain and inflammatory reaction, and nerve damage. The real potential for complications is limited by the surgeon's understanding of the characteristics of the implant and the necessity of a precise surgical placement. Dissection of the subperiosteal pocket, where appropriate, must be adequate for the implant and should not compromise and be smaller than the actual implant. Potential for nerve injury is limited by the approach used for the placement.

CONCLUSIONS

Facial implant procedures, in most cases, can be performed easily as an outpatient operative procedure and in many cases with local intravenous sedation anesthesia. The rewards to the patient in terms of producing increased harmony and proportion of the face are unlimited.

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