Submalar Augmentation: A Procedure to Enhance Rhytidectomy

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The use of submalar augmentation in facial rejuvenation surgery satisfies the need for enhancement of the midface to obtain longer lasting and better results from rhytidectomy. Submalar augmentation is a new surgical technique that positions anatomically designed silicone implants over the midthird of the face. It provides the appearance of restoring midfacial soft tissue and reduces the depth of anterior facial folds. The enhanced underlying bone structure avoids exerting excessive tension on the skin during face-lift surgery, thus preventing distortion of midfacial architecture.

Submalar augmentation is a procedure that has been used as a supplementary enhancement to rhytidectomy in 56 patients over six and one-half years. Only minimal complications have been reported, all of which have been satisfactorily resolved. To date, no implant has been rejected or permanently removed. In our experience, when performed in conjunction with rhytidectomy, submalar augmentation has greatly enhanced and prolonged the results of face-lift surgery, and has significantly increased patient satisfaction.

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Conventional rhytidectomy presents acknowledged limitations and sometimes subsequent problems as a sole facial rejuvenation technique. There are patients who are poor candidates for rhytidectomy, others for whom the face-lift procedure is only a partial solution to appearance problems, and still others who require follow-up enhancement of successful rhytidectomy.

Throughout history, each culture has formulated its own criteria for evaluating the beauty of its people. Perceptions of ideal facial proportions have changed over the centuries. Attempts to define the ideal facial form have, for the most part, been based on neoclassic doctrines [11]. However, detailed tables of standardized measurements do not necessarily represent the general population nor define the essence of beauty [28]. Therefore, it is important to emphasize that the only factor found as a constant in almost all historical definitions of beauty is the inclusion of that which exemplifies youth.

One of the strongest characteristics of youth is fullness of the cheeks, indicating presence of healthy midfacial soft tissues. In improving facial form, emphasis should therefore be placed on supplementing the midfacial area as well as smoothing out folds and tightening sagging skin.

Moderate to severe underdevelopment of the midthird of the face and degenerative soft tissue changes combine to produce signs of facial aging, which are difficult to treat. These changes are commonly revealed by the development of folds and cavitary depressions of the cheeks. Patients who prematurely exhibit these signs of aging become early candidates for facial rejuvenation procedures. Although the newer methods of rhytidectomy have made substantial progress in reducing jowls and submental pathology, they have had minimal success in reversing the degenerative signs of aging found in the midthird of the face.

Submalar augmentation, performed before rhytidectomy in patients with deficient bone structure or severe atrophy of overlying soft tissue, returns vibrancy and youthful fullness to the midthird of the face. It establishes the foundation for an enhanced and longer lasting result from rhytidectomy, reducing the need for extended or multiple face-lift procedures, and avoids a stretched or mask-like appearance.

Considerations

Understanding the dynamics of the aging process is a prerequisite for obtaining successful results in facial rejuvenation surgery.

The subcutaneous tissue of an infant contains the greatest amount of adipose tissue, forming "baby cheeks" that maintain the skin at maximum distention [23]. In an adult, progressive atrophy of the quantity and character of this intervening buffer of subcutaneous fat, combined with a decrease in thickness and loss of elasticity in the skin, facilitates the wrinkling process [14]. The inferior migration and redistribution of cheek fat form jowls and depressions, contributing to typical midfacial signs of aging [12]. Atrophy of the buccal fat pad and relaxation of the skin also deepen nasolabial folds and thin the vermilion border of the lip.

Progressive loss of volume of facial skeletal structure combines with degenerative soft tissue changes in the aged so that the skin, lacking subcutaneous tissue, comes into contact with the deep structures of the face. This results in a gaunt appearance with marked hollows and depressions. Similar changes can be seen in patients with sudden weight loss or in premature lipodystrophy [9].

Developmental alterations in facial skeletal structure range from minor imperfections to severe deformity. The importance of using onlay grafts or implants to augment midfacial skeletal deficiencies for improved facial aesthetics has been well documented [3, 4]. In selected cases, alloplastic augmentation has been used alone in an attempt to eliminate more extensive maxillofacial procedures [2, 6].

Since the soft tissues of the cheek may camouflage midfacial skeletal deficiencies throughout the first four decades of life, many patients who are contemplating cosmetic surgery may not be aware of the presence or significance of these abnormalities.

Preoperative Evaluation

The aesthetic correction of contour deficiencies, particularly in relation to overlying soft tissue, requires precise evaluation and careful patient selection. Meticulous analysis of the size and shape of the patient's face and proper placement of the appropriate implant is extremely important for a successful result.

Neger [20] pointed out the importance of evaluating soft tissue structure while measuring the facial skeleton. It was shown anthropologically that soft tissue does not always distribute itself in a uniform manner [15]. As the aging process continues, this asymmetric distribution will adversely affect facial harmony, which is an important factor in determining acceptable facial form.

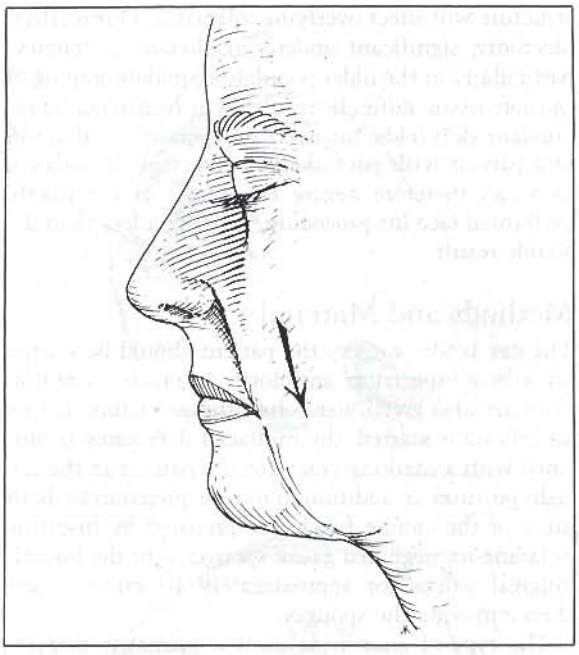


Fig 1. The aging process causes the soft tissues of the face to atrophy, losing inherent structural integrity, and then migrate inferiorly. Only prominent underlying bone structure can slow this process.

Many patients seeking facial rejuvenation surgery have commented on their apparent loss of high cheekbones. Comprehensive preoperative evaluation of these patients reveals that actual skeletal structure has not changed significantly. Instead, the overlying soft tissue pad that formerly was prominent over the malar eminence has both atrophied and migrated inferiorly. Prominent underlying bone structure then becomes most important in slowing down this process (Fig 1).

It has been further emphasized that smoothing out sharp angles or depressions can restore symmetry, render a softer appearance, as well as enhance the aesthetic quality of the face [1, 8]. For example, deep-set eyes, prominent malar-zygomatic arches or nose can produce a shallow look in the medial midfacial region. Alternatively, enhancing the fullness and curvature in the area of the canine fossae can effect a relatively decreased anterior-posterior projection to the nose and provide a softer appearance to the face [2].

It therefore becomes essential for the surgeon to accurately assess how augmenting underlying bone

structure will affect overlying soft tissue. During rhytidectomy, significant underlying skeletal deficiency, particularly in the older population, makes draping of the soft tissue difficult, resulting in recurrence of redundant skin folds. Incorrect preoperative evaluation of a patient with poor skeletal structure or inelastic skin can therefore negate the efforts of a perfectly performed face-lift procedure, yielding a less than desirable result.

Methods and Material

The day before surgery the patient should be started on a broad-spectrum antibiotic. Intravenous antibiotics are also given just before the procedure. Before anesthesia is started, the midfacial deficiency is outlined with a marking pen with the patient in the upright position. In addition to routine preparation, both areas of the canine fossae are prepared by inserting Betadine-impregnated gauze sponges into the buccal-gingival sulcus for approximately 10 minutes and then removing the sponges.

The type of anesthesia used is primarily intravenous sedation accompanied by a wide-field local block. General endotracheal anesthesia can also be used, particularly if required by concurrently performed procedures.

A small incision, approximately 1 to 1.5 cm, is made on the inner surface of the lip at the buccal-gingival sulcus over the canine fossae. The periosteum is incised and elevated superiorly off the anterior surface of the maxilla, and the infraorbital nerve is identified. The incision is made high enough so that it does not interfere with dentures (Fig 2A).

Using both a Joseph's elevator and a spatula-type periosteal elevator, a pocket is created providing total exposure from the anterior surface of the maxilla to the lateral malar-zygomatic areas of the facial skeleton. The area just below the inferior surface of the zygoma, over the tendinous insertions of the masseter muscle, is also exposed (Fig 2B). The periosteum, easily elevated medially, may be more adherent laterally, in which case the dissection may slip into a supraperiosteal plane without having to forcibly elevate the periosteum in this area. Unusually high anterosuperior masseteric tendinous attachments that may limit access inferiorly can be incised. However, if more inferior placement of the implant is desired, the pocket is continued by exposing the anterior surface of the tendinous insertions of the masseter muscle which are usually left intact. The pocket is always made large enough so that there will be no compression of soft tissues on any part of the implant.

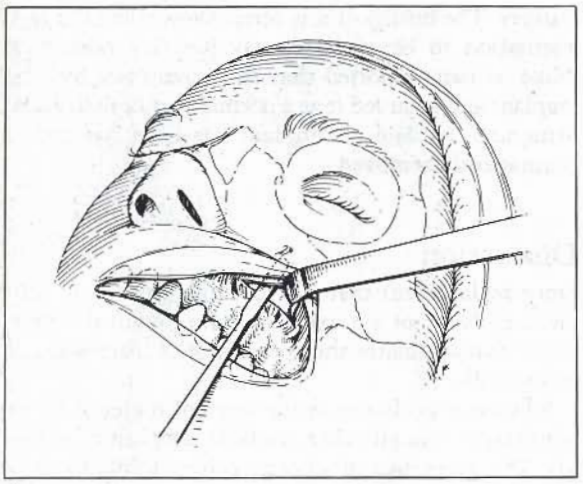
The anatomical configuration is identified by direct vision, and sizers are used to choose the appropriate submalar implant. The submalar implant consists of soft, solid silicone rubber in a three-dimensional anatomical design specifically contoured to accommodate the variation of midfacial bone structure (Fig 2C). The bulk of the implant is placed over the anterior surface of the maxilla, and the tapered, posterior-lateral extension wraps around the zygomatic arch or rests on the superior tendinous attachments of the masseter muscle.

Once the correct implant size is chosen, it is placed on the anterior skin surface and outlined on the skin in the desired position. The position of the two most medial fenestrations of the implant are also marked on the skin (Fig 2D).

The implant is inserted in the pocket over the anterior face of the maxilla, around the zygoma, and is adjusted in position until the desired facial contour is achieved. The implant is lined up so that the two medial fenestrations correspond to the external markings on the skin. Conversely, the external markings can also be altered if the position of the implant is changed.

The implant is then removed, and a 00 or 000 silk suture on tapered needles is looped around the undersurface and through the fenestrations of the implant. The needles are advanced through the pocket and then passed perpendicularly through the skin, exiting at the external markings (Fig 2E). The implant, fol-

Fig 2. (A) The infraorbital nerve is identified through the intraoral approach. (B) Dissection continues laterally around the zygoma and inferiorly over the superior tendinous insertions of the masseter muscle. The pocket is made large enough so that there is no encroachment of soft tissue on any part of the implant. (C) The submalar implant is specifically designed to deal with the three-dimensional problems encountered in midfacial structure. (D) The submalar implant is adjusted in the desired position so that the two most medial fenestrations of the implant correspond to the markings placed on the external skin surface. (E) A double-armed 2–0 silk suture is passed around the posterior surface and through the fenestrations of the implant. From inside the pocket, the needles are passed directly perpendicular to the skin, exiting at the external markings, corresponding in position to the implant fenestrations. (F) The implant is stabilized by tying the suture directly over an external bolster.



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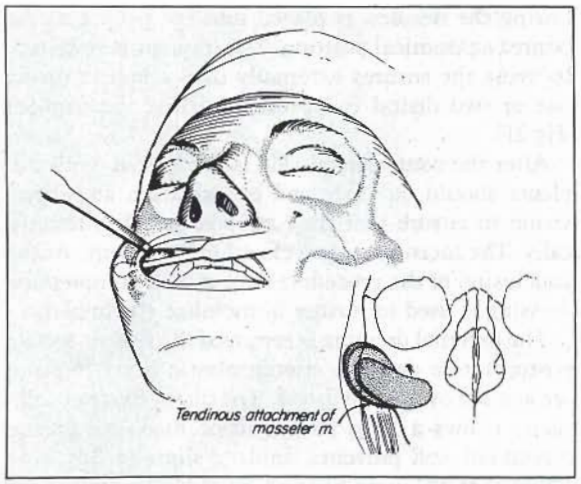

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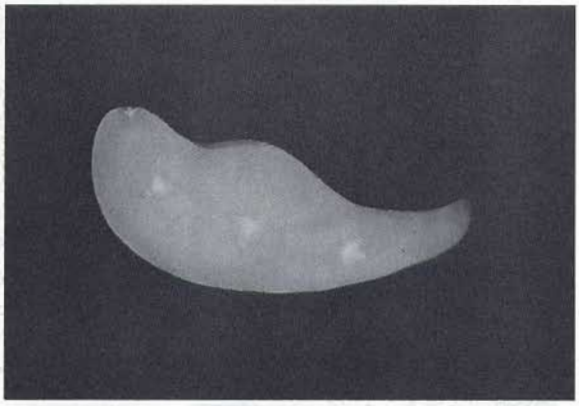

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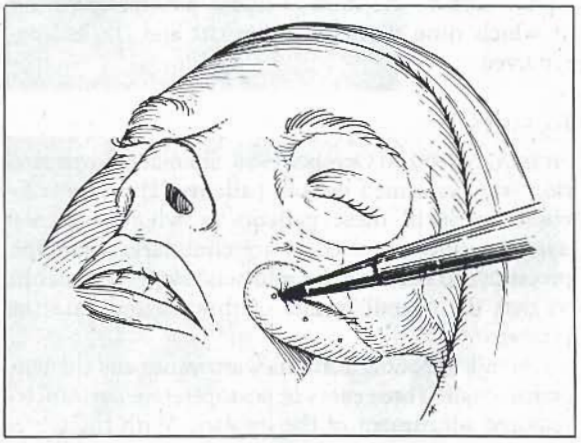

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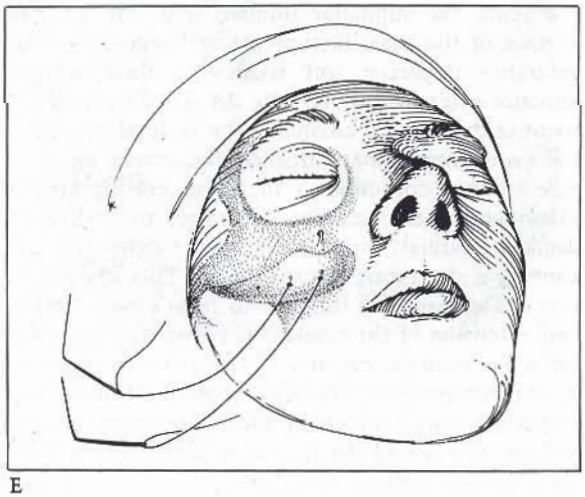

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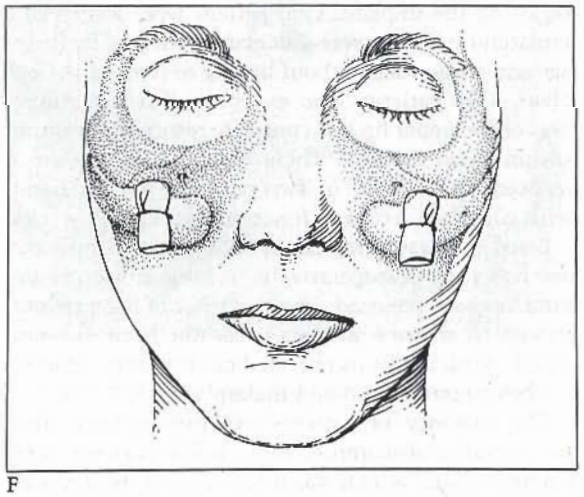


F

lowing the needles, is placed into the pocket in the desired anatomical position. The implant is stabilized by tying the sutures externally over a bolster (using one or two dental rolls), immobilizing the implant (Fig 2F).

After the contralateral side is completed, both implants should be examined by palpation and direct vision to ensure that they are positioned symmetrically. The incision is then closed in two layers. At the conclusion of the procedure, an external compression dressing is used to further immobilize the implants.

The external dressing is removed the first or second postoperative day and stretch plastic bandage strips are applied over the bolsters. The direct fixation technique allows a large pocket to be made for precise placement and prevents implant slippage. We have found that adequate fixation by the surrounding tissues occurs by the third or fourth postoperative day, at which time the sutures are cut and the bolsters removed.

Results

From May 1982 to October 1988, submalar augmentation was performed on 140 patients. This report focuses on 56 of these patients in whom submalar augmentation was used as a preliminary, adjunctive procedure to enhance the midfacial skeletal structure so that the overall results of rhytidectomy are improved.

Overall, the complications were minor and the incidence small. Three cases of postoperative asymmetry required adjustment of the implant. With the use of silicone, there was no difficulty in repositioning or replacing the implant. One patient who developed a unilateral infection was successfully treated by drainage and antibiotics without having to remove the implant. Two patients who experienced partial numbness of the upper lip had complete return of sensation within three months. There was a slight degree of reduced lip mobility in two patients, all unilateral, with complete return of function within four weeks.

Based on x-ray films taken on 2 patients three and one-half years postoperatively, no bone erosion of any kind has been reported. The incidence of bone erosion related to silicone implants has not been substantiated, particularly in the medical literature relating to chin augmentation and malarplasty [5, 7, 13].

The majority of patients experienced very little postoperative discomfort. Only a few patients complained of pain, which was totally absent the day after surgery. The results of this series show submalar augmentation to be an extremely low-risk procedure. Most patients reported that they could not feel the implant and regarded it as a normal part of their facial structure. To date no implant has been rejected or permanently removed.

Discussion

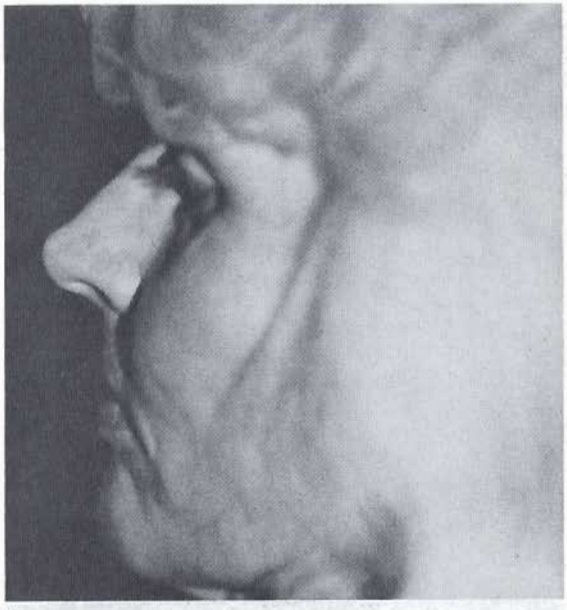
Since replacement material for large, soft tissue deficiencies does not yet exist, we have provided a technique that simulates the appearance of increased soft tissue bulk.

Silicone was chosen as the implant material for its advantages over all other available alloplastic materials. The properties of silicone rubber fulfill more of the requirements of an ideal synthetic implant than any other currently used alloplastic material, with very little tissue reaction [15, 26]. It has mechanical and thermal stability, is not absorbed, and does not warp or disintegrate.

Proplast has been used in the midfacial area primarily because it can be immobilized and readily fixed to surrounding structures [17, 29]. However, difficulty has been encountered with implant shrinkage and migration, and Proplast fragments easily, making secondary repositioning extremely difficult [4, 25]. The rapid ingrowth of granulation tissue with Proplast can entrap bacteria, causing a relatively high infection rate. Once an infection is diagnosed, the Proplast implant must be removed and discarded. However, since silicone is nonporous, it is resistant to infection and can be resterilized.

Placing the submalar implant over the anterior surface of the maxilla supports and repositions the inferiorly displaced soft tissues to their original superior-anterior location (Fig 3A–D). Proper placement of the implant augments the skeletal structure, following normal anatomical configurations that provide natural contours to the face (Fig 4). Medial placement of the implant also raises the inferiorly displaced lateral commissure, while externally advancing and rotating the vermilion. This has the effect of increasing lip fullness. In most cases, the lateral extension of the implant is positioned along the inferior edge of the zygoma, further reducing the risks of implant exposure. Since the major part of the implants are placed under the more protective, thicker soft tissue mass of the medial midthird of the face, they are very difficult to palpate.

A



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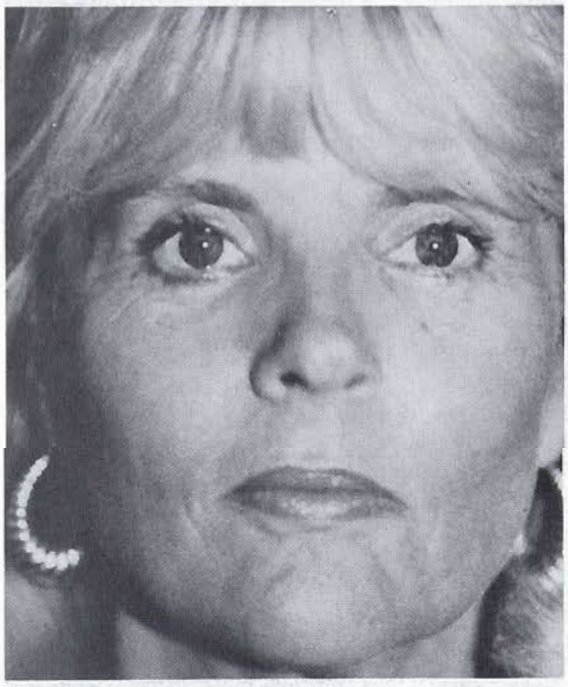

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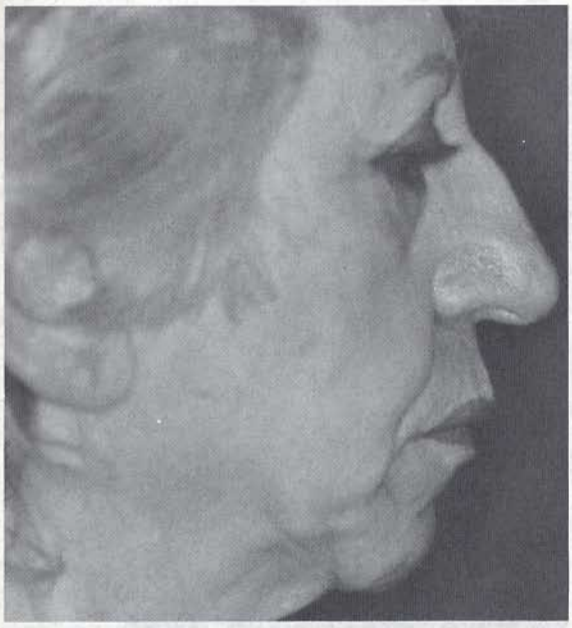
Fig 3. (A, C) Preoperative views. (B, D) Postoperative results six months following blepharoplasty and submalar augmentation without rhytidectomy. The submalar implant augments skeletal structure while supporting the ptotic overlying soft tissues. This has the effect of repositioning the relaxed midfacial soft tissues to a more anterior-superior location.

A B C D

Fig 4. (A, C) Preoperative views. (B, D) Ten months after submalar augmentation. In this patient medical problems precluded rhytidectomy. However, submalar augmentation, a less lengthy procedure, was allowed to effectively restore the appearance of midfacial soft tissue.



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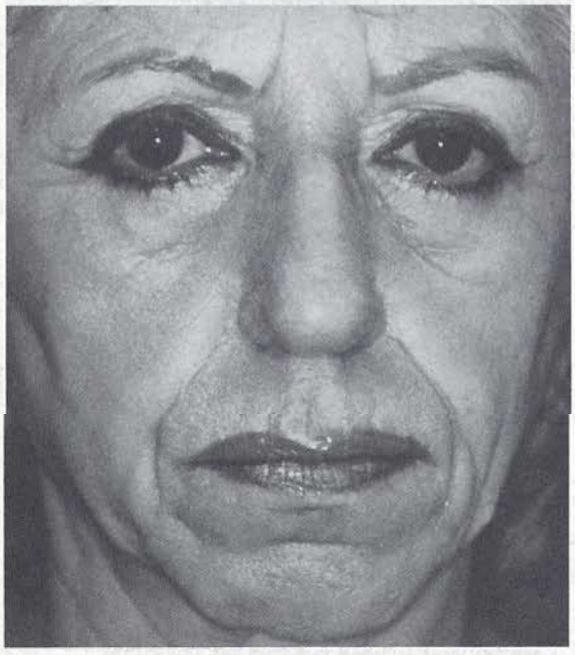

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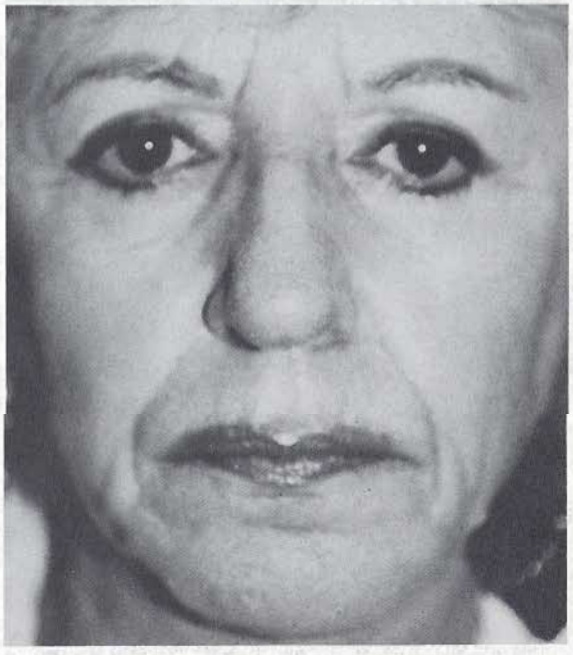

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Fig 5. (A, C) Preoperative views showing insufficient facial skeletal structure unable to support collapse of degenerative soft tissue and aging skin. The underlying bone structure must first be enhanced for even extensive face-lift surgery to provide a satisfactory, long-lasting result. (B, D) Views two years postoperatively showing the results of submalar augmentation and chin augmentation before planned face-lift surgery. The enhanced facial structure will now provide the basis for a more successful face-lift surgery.

A

B

Fig 6. (A) Preoperative view. Too much skin tightening from prior face-lift surgeries can produce a stretched, mask-like appearance. (B) View 10 months postoperatively. Instead of removing more skin or soft tissue, submalar augmentation was used to restore lost fullness and vibrancy to the midface, particularly around the perioral area.

Many patients with deficient facial skeletal structure or severe degenerative soft tissue changes, or both, are considered poor candidates for face-lift surgery and are sometimes denied its benefit. By enhancing deficient bone structure and repositioning midfacial soft tissue, submalar augmentation has the unique ability to change the status of a patient from that of a poor candidate to one who can benefit from rhytidectomy (Fig 5).

It has been accepted that gravitational folds located in the medial midfacial area are the most difficult to improve by means of face-lift surgery [10, 18]. Attempts to treat these problems have consistently met with patient dissatisfaction [16, 19, 22]. The persistence of the nasolabial folds after rhytidectomy has prompted development of many primary as well as ancillary surgical procedures. These include direct skin excision, tunneled dermal grafts, imbrication fascial techniques, extended rhytidectomy procedures, injection of silicone or collagen, and the recent use of liposuction [19, 21, 27].

We have found that liposuction can actually accentuate the problem. Excessive fat extraction, particularly of the buccal fat pad, alone or in conjunction with rhytidectomy, can have the long-term effect of causing loss in elasticity and producing thinner, looser, and more redundant skin. A youthful, vibrant appearance is then lost.

It is generally agreed, however, that a smooth nasolabial fold is part of the youthful facial expression. In an attempt to reduce the nasolabial folds, extended face-lift techniques mobilize and stretch already thin and inelastic skin. This may result in an unnatural, skeletonized, mask-like appearance with general loss of facial expression [14, 24] (Fig 6A,B). Extensive undermining can also cause ischemic changes in the skin and increases the chance of skin slough as well as temporal alopecia.

A

B

C

D

Fig 7. (A, C) Preoperative views. A major part of this patient's problem is associated with the extensive wrinkling and depth of folds around the nasolabial and perioral areas of the face. Face-lift surgery alone would have difficulty in eliminating this problem, potentially producing a stretched appearance around the mouth. (B, D) Views one and one-half years postoperatively. Submalar augmentation was performed first followed by face-lift surgery. The enhanced facial structure provided by submalar augmentation enabled the face-lift operation to smooth out the wrinkles and folds around the mouth without pulling the skin too tight, thus achieving a more natural and longer lasting face-lift result.

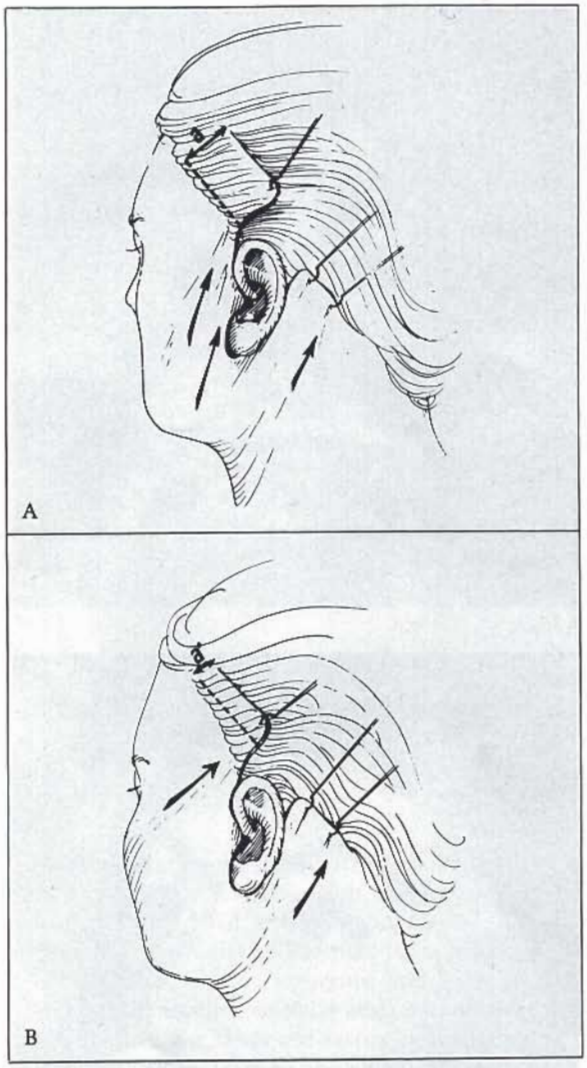

Fig 8. The submalar implant augments the anterior facial strucure so that instead of draping the skin over a smaller concave structure (A), it is draped over a larger convex structure, requiring more surface area of skin to cover it (B). This avoids applying excessive tension on the skin and reduces the amount of temporal hair-bearing skin that must be excised during rhytidectomy.

Fig 9. (A) Preoperatively the loss of midfacial soft tissue is depicted by a flattened appearance to this area. (B) View 12 months after submalar augmentation and rhytidectomy. By enhancing midfacial bone structure, submalar augmentation gives rhytidectomy the capacity to achieve enhanced, longer lasting results.

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Correction

An error was made in not recognizing the contribution of Dr John Christ to the article by Shenaq and Spira entitled "Treatment of Bilateral Axillary Hyperhidrosis by Suction-Assisted Lipolysis Technique" (Ann Plast Surg 19:548, 1987). The initial surgical procedure was performed by Dr Christ, and not including his name in the list of authors was an inadvertent oversight. The authors recognize his contribution and apologize for the error.