Cheek and Chin Implants to Enhance Facelift Results

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Abstract

The traditional rhytidectomy addresses facial and neck aging as it relates to soft tissue laxity. The modern volumetric facelift provides optimal results by addressing not only skin laxity but also the loss of volume secondary to tissue atrophy and bony resorption. While multiple techniques including fat grafting, dermal fillers, and tissue resuspension are used to correct the tissue loss, alloplastic midface augmentation remains the most permanent method. In our practice we often address midface cheek hollowness or atrophy with the placement of submalar implants at the time of rhytidectomy. In addition to midface volumetric rejuvenation, alloplastic chin implantation can help strengthen and further define a retrusive chin and weak jawline. In this article we discuss technique, indications, and benefits of performing alloplastic augmentation as an adjunct to rhytidectomy.

Keywords
- facelift
- rhytidectomy
- implants
- chin
- cheek
- malar
- augmentation

Traditional concepts of the aging face have focused on soft tissue ptosis as the major contributor to the senescent process. As the historical development of rhytidectomy demonstrates, advances in technique and results have progressed from superficial to deep. The first rhytidectomies utilized a simple excision of skin and subcutaneous tissue to achieve a transient improvement in dermal tightness. In 1974, Skoog published his textbook describing an elevation of the platysma in conjunction with the skin and began an era of the superficial muscular aponeurotic system (SMAS) lift.[1] In the 1980s, Tessier described the deep plane rhytidectomy.[2,3] Though different from the concept used in today's deep plane rhytidectomy, the concept of elevating deeper to suspend soft tissue and provide longer-lasting results was developed. Today both deep plane and SMAS lifts are the predominant surgical choices. Modern treatments also encompass an emphasis on the camouflage of scars, lasting results, and restoration of diminished facial volume.

The contemporary facelift has been termed a volumetric facelift or a three-dimensional (3D) facelift. Conceptually, the modern facelift specifically addresses not only the soft tissue laxity but also the underlying resorption or remodeling of the subcutaneous tissue, fat, muscle, and bone that accompanies the aging process. Interventions including soft tissue repositioning, autologous fat grafting, bioengineered fillers, and alloplastic implants are combined with a standard rhytidectomy to create a more youthful and natural aesthetic result. The emergence of injectable synthetic fillers has particularly promoted attention toward volume rejuvenation alone or in combination with a facelift. Though fillers and fat grafting can provide excellent results, their use is restricted by a limited duration of effect. In this article, we specifically discuss the use of alloplastic implants as permanent adjuncts to rhytidectomy.

Though alloplastic implants have their own inherent limitations, implant technology has been moving closer toward the ideal implant first described by Scales and Winters: biocompatible, chemically inert, no foreign-body reaction, noncarcinogenic, and easily shaped.[4] Alloplastic augmentation can be utilized to enhance an aesthetically pleasing jawline and a revitalize the midface. While both implants have a similar risk profile, each of the implants presents a particular indication and challenge. Although many patients undergoing a rhytidectomy can benefit from a rejuvenation of facial volume, patient selection can help identify those in whom volume correction is paramount to obtaining satisfactory results. The surgeon and patient must weigh the benefits of implantation with the additional operative time, surgical risks, and cost.

Issue Theme Beyond the Facelift: Procedures to Enhance Rhytidectomy; Guest Editor, Devinder S. Mangat, MD

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Midface Augmentation

Alloplastic malar augmentation was first described by González-Ulloa in 1974[5] as a treatment for bony deficiency of the lateral cheek. Terino[6] and Binder later expanded the options by designing a variety implants to address not only bony deficiency but also soft tissue hollowing of the midface. Binder[7] then described a detailed systematic classification for selection and placement of various implants. Historically, the area of the midface has been difficult to treat with many methods used to address deepening of the nasolabial folds, malar fat pad descent, and midface and cheek volume loss. One of these techniques is the deep plane rhytidectomy technique, described by Hamra[8] in 1990 when he demonstrated a significant early improvement in malar fat pad position. The long-term follow-up of the same cohort of patients, however, manifested a failure in retention of midface volume while the SMAS repositioning retained longer-lasting results.[9] Other techniques such as Keller's percutaneous cheek lift and several subperiosteal approaches have also been described as modifications or adjuncts of the traditional facelift but have not definitively demonstrated longer-lasting results.[10–12]

Aging and the Midface

The midface is particularly prone to the effects of aging; therefore, focused treatment can produce dramatic results. The midface begins to descend in the third to fourth decade of life. As the aging process progresses, the descent is accompanied by soft tissue atrophy in multiple planes. Along with progressive skin laxity and collagen remodeling, fat atrophy and descent creates the primary visual changes in the early aging process. As the loss of fat and soft tissue extends deep to the subcutaneous tissue, it eventually manifests in the malar, buccal, temporal, and infraorbital regions. As the malar fat pad, suborbicularis oculi fat (SOOF), and orbicularis muscle plunge, the prominence of the nasolabial folds and infraorbital rim become evident. The tear trough becomes evident and a depression extending laterally and obliquely begins to form. Cumulatively, these soft tissue changes are located within the recess that Dr. William Binder described as the "submalar triangle."[13] Binder[14] brilliantly provided the initial nomenclature and description for this region as an inverted triangular midfacial depression bounded superiorly by the prominence of the zygoma, medially by the nasolabial fold, and laterally by the body of the masseter. The process of aging that occurs in the submalar triangle produces "hollow cheeks," a diagnostic finding that is of critical importance to address during a facelift.

Preoperative Analysis: Patient Selection and Procedure

While photographic preoperative analysis of the midface should be documented, the midface is a 3D structure with the zygomaticomaxillary complex having varying contours in all planes. Given the difficulty of defining the ideal position in a two-dimensional approach, the artistic vision of the surgeon must be taken into account for selecting the type and size of the implant and such analysis must be performed in the anteroposterior (AP), lateral, oblique, submental, and sky views.

For the purposes of augmenting a facelift in a patient with significant cheek hollowing, the submalar implant serves as the workhorse. In contrast, malar implants are used for congenital malar bone hypoplasia, and while aging does induce bony resorption, malar augmentation is reserved for those patient who likely have had deficient cheek bones their entire lives. The submalar implant addresses the changes associated with aging, or "hollow cheeks," which reflects a deficiency or loss of tissue in the submalar triangle that is best addressed with augmentation in a lower more medial position. It is important to note that while hollowing of the cheeks is a process associated with aging, it does not easily manifest on patients with high body fat percentages and, in contrast, can be profoundly evident on runners, personal trainers, and those with conditions that predispose to lipodystrophy. The effects of cheek hollowing are caricaturized and evident images of President Abraham Lincoln (►**Fig. 1**). Finally, alloplastic augmentation is a particularly useful alternative in patients who lack a sufficient amount of donor fat for autologous transfer.

Placement of the submalar implant can be performed under IV sedation with local infiltration or general anesthesia. Preoperatively, the patient is placed in the upright position to demonstrate the effects of gravity. The skin is first retracted in the direction of the planned redistribution which would occur with the rhytidectomy. A variety of sizers are placed on the skin to approximate the position of the implant and

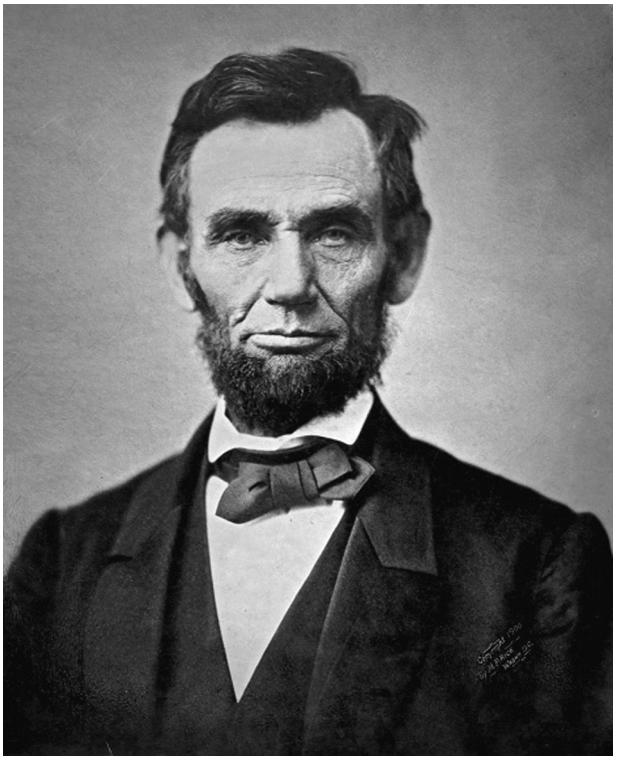

Fig. 1 President Lincoln demonstrating classic submalar hollowing. (Source: *Library of Congress*.)

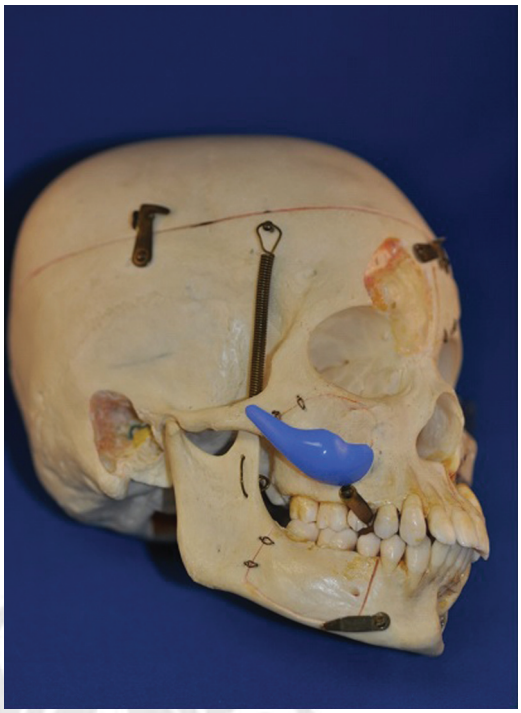

Fig. 2 Right binder submalar implant showing appropriate position (Used with permission from Russell W.H. Kridel, MD).

then the skin is marked. The implant should ideally be placed obliquely with the contour of maximal projection at the center of the submalar triangle (►**Fig. 2**).

An initial incision is placed just medial to the gingivobuccal sulcus over the lateral canine fossa. It is important to leave an adequate cuff of mucosa to facilitate a tension-free closure and prevent lateral migration of the incision to avoid contact between the implant and the incision. A periosteal elevator is used to dissect in the subperiosteal plane in an oblique direction over the maxilla toward the medial zygomatic arch following the preoperative facial marking. Dissection should be carried inferiorly to expand the pocket superficial to the underlying white and glistening tendinous attachment of the masseter. Once a pocket is created, it is important to place multiple sizers to determine the implant size necessary for adequate volume restoration. A transcutaneous suture is used to help secure the submalar implant in place during the initial healing phase. A 3–0 Prolene (Ethicon, Inc.) is placed through the previously marked skin site and into the subcutaneous pocket. The suture is then sequentially passed through the posterior hole and the anterior hole of the implant and finally back through the anteriorly marked skin. As the implant is deployed into position, the suture is tied over a dental roll to protect the underlying facial skin. Antibiotic solution is used to soak the implant and irrigate the cavity before and after implant deployment. The oral cavity incision should be closed in two layers with chromic suture. Also, the implant should be placed prior to the rhytidectomy, as once the overlying tissue has been pulled, dissection and placement of the implant is more difficult. In addition, elevation of the periosteum provides an additive effect toward the results of the facelift, which is a concept discussed later. Along with perioperative antibiotics, a 7-day course of postoperative antibiotics is continued to cover standard oral flora. The bolsters are kept in place for 5 days, and when removed, betadine prep is used on the exposed suture to prevent contaminated suture from running through the sterile subcutaneous pocket. The intraoral chromic sutures are left in place to dissolve on their own over 2 to 3 weeks while chlorhexidine rinses are used to maintain a clean incision line.

Regarding implant selection, there are three categories of implants that can be used to augment the midface: malar, submalar, and combined malar/submalar implants. The malar implants are placed laterally over the zygomatic arch and can correct malar hypoplasia. The Binder submalar implant is used for those patients who have adequate cheek projection over the zygoma but hollow cheeks below. Finally the larger combined submalar shell and Conform (Implantech) midfacial implants address both areas. The Conform design provides a "gridded" backing that ideally allows the implant to sit more closely and cinch down tighter to the underlying bone.

Chin Augmentation

In 2015, the American Society of Aesthetic Plastic Surgeons estimated that 17,451 chin implants were performed.[15] The chin, along with the lips, form the primary aesthetic focus of the lower third of the face. A retrusive or weak chin is a detriment to the desire of a proportionally aesthetic and strong profile. Overall, while most chin implants are placed in conjunction with a rhinoplasty secondary to the visual relationship between chin position and nasal projection, augmenting the chin can also create a visually stunning neckline.

Aging and the Chin

Although congenital elements contribute more to chin aesthetics, aging also produces a laxity and droop in the area of the chin. The profile of the lower face and neck after a facelift are particularly dependent on the chin projection and contour and hyoid position.

In addition to the overlying skin changes that affect the entire face, the chin and mandible are vulnerable to bony resorption. As mandibular contours are whittled, surrounding grooves and sulci tend to become more prominent. The mentalis contracts under the ptotic soft tissue resulting in a deeper labiomental fold.[16] Also, lateral bony mandibular resorption between the area of the jowls and central chin forms the pre-jowl sulcus. As aging progresses, this sulcus deepens and becomes part of the commissure-mandibular groove or "Marionette line."[17]

The position of the hyoid also bounds the limits of the resultant neck silhouette that can be obtained following a rhytidectomy. A high and posteriorly positioned hyoid can produce a tight and defined neckline, whereas a lower and more anteriorly positioned hyoid, even after a well performed facelift, will result in a neck with a blunt and obtuse angle. Such physical findings need to be analyzed then discussed

with the patient preoperatively as they can limit the final neck silhouette.

Preoperative Analysis: Patient Selection and Procedure

Preoperative assessment should include an evaluation of the patients' chin shape and projection, the overlying chin pad thickness, the mentolabial sulcus depth and height, and dental occlusion. The degree of jowling and the transition between the prominence of the central chin and the lateral jowls should also be assessed. Dental occlusion is critical as retroagnathia should not be addressed with a chin implant but rather with oral surgery consultation for possible orthognathic surgery.

Chin implants can be placed either via a submental incision or intra-orally. The intraoral approach presents less risk of inferior implant migration whereas the submental approach reduces the risk of superior migration. For the intraoral approach, a curved horseshoe-like incision is made into the lip just anterior to the gingivolabial sulcus. Blunt-tipped scissors are used in the midline to dissect to the mentalis muscle, and then without incising the muscle, it is gently elevated laterally off the periosteum until the inferior border of the mandible is identified. Bilateral vertical incisions are made into the periosteum approximately 1 cm lateral from the midline, which preserves 1 to 2 cm of midline periosteum. Once atop the bone, curved periosteal elevators are used to hug the bone and create precise pockets laterally. Care is taken to avoid injury to the mental nerve. It is reliably found 1 to 1.5 cm above the inferior border of the mandible and 2.6 to 2.8 cm lateral to the midline.[18] Sizers are then placed into the lateral pockets to select the appropriate size of implant. The periosteum is then further elevated laterally to ensure that the implant edges do not buckle secondary to compression from placement in an undersized pocket or from the postoperative contraction of the pocket. The implant is soaked in, and the cavity is irrigated with antibiotic solution. The ends of the implant are laterally tucked into the subperiosteal pockets and the central portion is laid flat on the preserved periosteum. The incision is closed in two layers with chromic suture. Postoperative management includes a 7-day course of oral antibiotics to supplement the perioperative dose, a 3- to 5-day compression dressing, and chlorhexidine rinses for the intraoral approach. The intraoral chromic sutures are left to dissolve on their own.

The submental approach is performed in a similar manner. Once an incision is made into the submental crease, a stair-step dissection technique is used to keep the deeper plane away from the skin incision. The dissection planes are elevated in a comparable manner and a midline cuff of periosteum is similarly preserved. In both approaches the periosteum helps deter midline bony resorption that can otherwise occur and be severe enough to cause a "bathtub deformity" to the chin.

Several different companies manufacture various implant sizes and shapes that are not interchangeable due to size and shape differences. The choice is dependent on the deficiency in the patient's particular anatomy. Implant selection is determined by palpation and visualization of the chin region where deficiency in the midline chin and/or lateral pre-jowl areas is discerned. An extended anatomical chin implant is used for most patients with microgenia. These patients lack chin projection as determined from profile imaging. By diagnostic definition, they must also have Angle's class I dental occlusion or have declined orthognathic intervention. These patients may benefit from an implant that augments central chin projection and contours laterally. Historically, button-like implants that augmented only the central chin projection were used; however, they fell out of favor for implants that gently taper to the lateral mandible and avoid an abnormal concentrated look (►**Fig. 3**). For patients in whom chin projection is adequate but who have deep lateral grooves, an augmentation of only the pre-jowl sulci can performed to fill the geniomandibular groove depression and soften the Marionette lines. Likewise, this implant is also useful for patients with a pointed chin in whom lateral augmentation can camouflage a sharp mentum. A Mittelman anterior mandibular groove jowl (Spectrum Designs Medical) or a Mittelman pre-jowl (Implantech) implant can be utilized. Finally for patients who need chin projection and desire a repletion of the pre-jowl sulcus, a Mittelman Anterior Mandibular Groove Extended Chin (Spectrum Designs Medical) or a Mittelman Pre-Jowl Chin (Implantech) can be used. Preoperative assessment can help determine the appropriate category of chin implants that can be utilized to best form a sharp jawline that can highlight a high-quality facelift.

Fig. 3 Anatomical chin implant showing lateral extension and placement avoiding mental nerve (Used with permission from Russell W.H. Kridel, MD).

Discussion

A wide variety of factors must be accounted for when selecting patients who would significantly benefit from submalar and chin augmentation as an adjunct to rhytidectomy. Cost, risk factors associated with the extra procedures, the additive effects of the procedures on the results of the facelift, and anatomical considerations are important factors to assess.

When midface implants are placed as an adjunct to a facelift, they provide a permanent solution to the loss of midface volume. They present an additional benefit in that they work in conjunction with the rhytidectomy to improve its results. The subperiosteal dissection performed when placing cheek implants releases a composite of periosteum, muscle, and subcutaneous tissue that is then re-draped and attached at a higher level with the superolateral advancement of the skin flap for the facelift. The additive effects of the periosteal release can be juxtaposed with the concept applied to an endoscopic browlift where release of the arcus marginalis allows for a greater pull and suspension of the brow. Though volume replacement is the primary goal of a submalar implant, the subperiosteal release provides the synergistic benefit of promoting improved midface repositioning.

When discussing the cheek and chin augmentation procedures with patients, it is important to review specific risk factors associated with each. Hopping et al[19] published a retrospective review of 100 patients who underwent concurrent malar and/or chin augmentation and rhytidectomy and compared the complication rates with those of patients undergoing rhytidectomy alone during the same time period. Looking at common and severe complications of implants placed during simultaneous facelifts, they found no significant increase in complication rates.

We always address with our patients the permanent nature of the results obtained as it bears particular significance when considering cost. While there is an increased initial cost of alloplastic implants because of anesthesia time, surgeons' fees, and cost of the implant, over the long term, the cost of implant offsets that of repetitive volume enhancement using autologous fat or fillers. Today, fillers are the most popular tool for midface volume rejuvenation. We performed a nonscientific survey of four local facial plastic surgeons and compared the cost of treatment with Juvederm Voluma (2 cc) (Allergan) versus bilateral cheek augmentation, including the costs of materials, operating room, and surgeons' fees. With optimal results, Voluma can last up to 2 years in the cheek area.[20] Based on our survey, after repeating the injections just three times, the purchaser would have broken even if he or she had undergone midface augmentation. Any time period beyond the duration of those three injections would deem midface augmentation as more economical.

Finally, we analyzed three specific complications of implant placement: infection, implant migration, and nerve injury. Infection generally occurs secondary to transference of intraoral flora during either midface or transoral chin augmentation. While use of antibiotic solution can help minimize the risk, elimination of oral flora is not plausible. When signs of infection including drainage, pain, and overlying skin erythema are noted, aggressive management is warranted. Though early explantation is recommended, irrigation of the cavity with antibiotic solution in combination with an oral antibiotic regimen can salvage the implant. Infections are certainly more common when the alloplastic implant is not well fixated.[21] It is important for the surgeon to either create precise pockets or secure the implant when it is noted to have mobility.

Implant migration often occurs when dissection of the implant pocket occurs in the incorrect plane or the need for intraoperative fixation is not identified and performed. If the periosteum is not overlying the implant, chin and cheek implants can postoperatively be found to be mobile upon external palpation. Even when within a subperiosteal pocket, migration can also inherently occur. It is important for a surgeon to fixate all cheek implants with transcutaneous technique previously described and intraoperatively identify chin implants with slight mobility. For chin implants, while lateral pockets hold the implant taut, if the implant is still loose, a Prolene suture securing the midportion of the implant and to underlying periosteum should be used.

Finally nerve injury can occur in both midface and submalar augmentation. Infraorbital nerve injury to the midface and mental nerve injury in the chin are intraoperative complications that can be avoided with sound surgical technique. Knowledge of their location and dissection in the correct planes will avoid this perilous intraoperative complication.

In summary, to address both soft tissue laxity and atrophy, a comprehensive facelift must address volume augmentation to achieve an optimal facial rejuvenation. Submalar hollowing, an intrinsic byproduct of aging, can be addressed at the same surgical setting using submalar implants, which can produce durable and additive results to the face lifting (►**Fig. 4**). Either individually or in combination, congenital microgenia and the pre-jowl chin hollows can be addressed with various types of chin augmentation. These implants can help improve the neckline in patients who otherwise would be limited in the quality of their facelift results (►**Figs. 5** and **6**). While rhytidectomy techniques have developed over time, the modern aesthetic

Fig. 4 A 55-year-old woman before (left) and 3 months post-op (right) after a rhytidectomy, browlift, CO_2 resurfacing, and Binder submalar implants (Copyright Russell Kridel, MD, and Zahi Abou Chacra, MD. The Aging Face. In: Jonas T. Johnson, MD, and Clark A. Rosen, MD [eds.], Bailey's Head and Neck Surgery – Otolaryngology, 5th Edition. Lippincott Williams and Wilkins, 2013. Used with permission.).

Fig. 5 51-year-old woman before (left) and 6 weeks after (right) rhytidectomy and combined chin/jowl implant (Used with permission from Russell W.H. Kridel, MD).

Fig. 6 A 51-year-old woman before (left) and 6 weeks after (right) rhytidectomy and combined chin/jowl implant (Used with permission from Russell W.H. Kridel, MD).

surgeon must consider volume replacement and utilize an armamentarium of tools to augment the results of a high-quality facelift.

Disclosures
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