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Chin and Malar Augmentation  
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### Introduction:

Genioplasty or chin augmentation and malar augmentation are commonly performed surgical procedures intended to give patients a more youthful, refreshed appearance. Chin augmentation has come further along than malar or submalar augmentation but both procedures are becoming increasingly popular with plastic surgeons either separately or as an adjunct to other plastic procedures.

### Chin Augmentation:

Chin projection can be determined by several methods. One method employs a line perpendicular to the Frankfort horizontal line intersecting the vermilion border of the lower lip. The chin should approach this line. There are other methods for determining appropriate chin projection. The Legan angle involves connecting a line from the glabella to the subnasale and the subnasale to the soft-tissue pogonion. This should approximate 12 degrees plus or minus 4. The Merrifield Z angle is created by the Frankfort horizontal line and a line connecting the soft-tissue pogonion and the most anterior part of the lip. The Z angle should be between 80 plus or minus 5 degrees. The Gonzales-Ulloa determines chin projection based on a line perpendicular to the Frankfort horizontal line that intersects the nasion. The chin should generally approximate this line. It is important to note the balance between the nose and chin. A large nose will make the chin look smaller and vice versa.

Rather than remembering many of these angles, one needs to use their own art and gestalt to consciously analyze this balance. Any augmentation that disrupts the chin-nose relationship by creating an excessively large chin will rarely be acceptable especially to women. A simple useful tool to measure appropriate anterior projection of the chin is to hold a ruler against the anteriormost portion of the upper and lower lips and comparing this to the anteriormost projection of the soft tissues of the chin. For males, the chin should meet this line and for females, it should be 2 to 3 mm behind this line.

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Additionally, it is necessary to determine whether the patient has microgenia, micrognathia or retrognathia. Microgenia simply means that the patient has a small mandible and retains normal dental occlusion (class I). Micrognathia means that the patient has an underdeveloped mandible and that the patient has an overbite (class II occlusion). Retrognathia means that the mandible is normal in size but is retruded leading to a class II occlusion. Micrognathia and Retrognathia are both functional problems that require orthognathic correction before correcting for chin augmentation. Otherwise clinical occlusal symptoms may develop if these problems are not addressed first.

Generally correction of the deficient chin involves augmentation in the sagittal direction. This also allows the chin to appear longer than initially because the forward migration causes an optical illusion of chin elongation. Correction in the lateral dimension can be attempted with extenders however most augmentation again occurs in the sagittal plane. It is generally wise to undercorrect women.

Lower lip analysis is important in decisions about chin augmentation. One must address the fullness of the lower lip and its position relative to the chin point. On profile, the lower lip should lie slightly posterior to the upper lip and the most anterior lower lip white roll should be in the same anteroposterior plane as the soft tissue chin point – this should be the location for the chin implant. When the chin pad soft-tissue thickness is normal (8 to 11 mm), the anterior surface of the implant should not project beyond the labial surface of normally positioned lower incisors. Lower lip eversion may be due to a skeletal deep bite, lower tooth procumbency, or excess lip weight and bluk as occurs with vascular engorgement. Often the bony chin is retropositioned but the existing lip position results in a white roll in close to proper position. Sagittal augmentation in these cases decreases the labiomenal angle and deepens the labiomenal fold. The role of the labiomenal fold is crucial to determine the appropriate treatment for microgenia/retrogenia. The labiomenal fold is analyzed to determine its height, depth, and distinctiveness. It is important to determine the percentage of lower facial height from lip to labiomenal fold and from the lip to menton. If the labiomenal fold is high, the pad percentage is high. In women with a high pad percentage (high or indistinct labiomenal fold), an alloplastic chin augmentation can be a disaster. The effect of augmentation is overwhelming as the entire lower face is enlarged. In contrast, only the chin pad and not the entire lower face will look larger after chin augmentation in patients with a distinct lower labiomenal fold.

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An analysis of chin pad thickness consists of assessment of the thickness of the chin pad relative to the mandibular borders on lateral cephalogram. Soft-tissue thickness of 8 to 11 mm is normal. In patients with a thick pad, surgeons may be tempted to set back a normally positioned bone. This only increases submental fullness, flattens the pad on profile and can yield a negative aesthetic outcome. After static analysis, it is important to ask the patient to smile. Ptosis of the soft-tissue chin pad can occur with smiling. Any attempt at setback can lead to bony irregularities along the jaw line, soft-tissue pad ptosis and an unsupported chin pad. It is also important to note the emphasis of the lip muscles as they affect the chin appearance. A malpositioned chin implant will be visible during effacement of the soft tissue over the chin prominence with smiling.

### Augmentation Mentoplasty

Materials used in augmentation mentoplasty have included bone, cartilage and synthetic materials. Synthetics have opened many options to the facial plastic surgeon. Materials implanted have included silicone implants, supramid, proplast, and acrylics. The earliest synthetic material used in facial plastic surgery was silicone fluid. It was injected however reports of adverse effects on tissues have led to its discontinuation. Solid silicone was developed in the 1950's and has become the implant standard of choice for implantation. By increasing the polymer length on the side chains, one can make the implant firmer. It can be carved and elicits a fibrous capsule formation which fixes it to the pogonion. Minimal to no bone erosion has been noted with silicone implants. Supramid has been used for over 35 years. This material is related to nylon and tends to elicit a moderate tissue foreign body reaction unlike silastic. Because of this reaction, the implant is extremely difficult to remove once it has fixed itself into the implanted site. It is generally considered nonabsorbable but like silk it is somewhat absorbed after many years. Proplast is a teflon and carbon mixture that is marketed in a firm to hard, tightly packed porous material. This porosity allows tissue ingrowth into the implant thus stabilizing it. Proplast I is black which can show through the skin of fair, thin-skinned patients. Proplast II has a white teflon coating but is more difficult to carve. Proplast in general is harder to carve than other synthetics. Because of its hardness too, it may not be as trauma resistant as the softer implant materials. The newest implant material has been ePTFE (reinforced polytetrafluorethylene). It can be easily inserted, is well tolerated by the tissues, and may demonstrate less underlying bone resorption over the years. If a porous implant is chosen, the

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interstices of the implant should be pressure loaded with antibiotic solution. Clindamycin may be used because of the extremely low sensitivity or allergic reaction.

### Surgical Techniques:

Either intraoral or extraoral techniques can be used for chin implants. Intraoral insertion has the advantage over extraoral insertion in that there are no external scars but disadvantages include intraoral contamination, suture line irritation, a larger incision line, and inability to stabilize the implant internally. The extraoral incision can be made through a very small submental crease incision and the implant can be stabilized to the periosteum. The extraoral technique involves flexing the neck identifying the submental crease. Local anesthetic with bupivacaine is infiltrated into the surrounding tissues which allows chin augmentation to be performed in conjunction with a rhinoplasty and with the chin surgery being performed first, there is minimal to no feeling of the chin area during the rhinoplasty. A skin incision 10 to 15 mm long is made down to and through the periosteum. The periosteum is incised for 2.5 cm and elevated with a periosteal elevator to the midportion of the mandible. If the elevation is carried to far superiorly, the implant could rise and shallow out and obliterate the labiomental sulcus and interfere with the natural smile. Elevate the subperiosteal envelope laterally and inferiorly. The implant has a central groove and vertical line so that the implant can be centered. The implant is inserted into the subperiosteal pocket and moved back and forth until the deep central groove is centered into the midline. The skin is then closed in layers followed by a compression dressing. If the intraoral incision is used, a vertical incision is made through the anterior gingival-buccal frenulum. A longer horizontal incision is necessary with the intraoral approach but the implant is placed into a similar subperiosteal pocket as for the external approach.

### Complications:

Despite the relative technical ease of alloplastic chin augmentation, surgeons may be faced with a number of common postoperative problems. Chin augmentation in women should be conservative. If the implant is too large and it is removed, a few problems can arise. The implant capsule contracts drawing with it the overlying soft tissues resulting in a "ball" or fasciculations or excess tissue can result in chin pad droop. To prevent this,

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a smaller implant should be placed after removing the larger implant or the muscles should be redraped over the chin. Proper positioning of the implant ensures that it rests on the pogonion. This produces the most aesthetically pleasing result and reduces erosion into bone. Some implants may ride superiorly especially after intraoral placement and this is usually due to technical error – securing the implant to periosteum or soft tissues will prevent this from happening. Lip numbness should resolve by 2 to 3 weeks postoperatively; if not, the implant should be removed and trimmed superiorly or the wings lowered. Adjust these implants early within 4 weeks of surgery to prevent permanent loss of sensation.

## MALAR AUGMENTATION

The malar region can add to or detract from the overall aesthetic appearance of the face. Fullness of the malar region gives a youthful appearance to an older face and provides a happier decisive look to the face. Some general indications for malar augmentation include lack of a malar prominence, to lessen deep melolabial folds, accentuate the malar prominence, and provide symmetry to the malar prominence. Adding bulk to the malar area is more a sense of aesthetic appreciation rather than actual measurements. Proper placement of the implants lies in a thorough understanding of the aesthetics of the malar mound. Augmentation has been advocated to change the shape of the face to a more oval configuration, to elevate the cheekbones to give a more youthful appearance, and to de-emphasize prominent nasal or chin projection. In patients with round, full faces, malar implants can provide anterior augmentation providing more definition and contour. It can also be used for bilateral malar hypoplasia, post-traumatic malar deformity, defects from tumor resections and for hemifacial microsomia. Generally, when the malar prominence falls 5 mm posterior to the nasolabial groove on a true lateral projection, there exists a deficiency of this area. Also placement of the malar implant can be determined from the following triangle. Drop a vertical line from the lateral canthus and draw a horizontal line bisecting the upper lip. The intersection of these two points is drawn towards the medial canthus. From that same intersection, reflect a line laterally with the same angle as above. Draw a frankfurt horizontal and this area in between is the malar prominence triangle which is the area to be augmented. There are many methods to determine implant location. Hinderer drew a line from the lateral canthus to the commissure of the ipsilateral lip and the other line was drawn from the nasal ala to the tragus. The implant was placed into the upper outer

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quadrant. Powell showed that the precise areas for augmentation were not universally agreed upon. They found that the height of the contour vertically was just at or below the Frankfurt horizontal plane. They also made a practical division of the malar anatomy by arbitrarily dividing the prominence into anteromedial and posterolateral segments. This division was created by dropping a vertical line from the lateral canthus. This classification is significant because it defines the type of malar deficiency as anteromedial, posterolateral or a combination. Prendergast defined the malar eminence as the point below the lateral canthus that gives the impression of being the most prominent point of the malar mound in any view. They believe the oblique view was the most valuable in the assessment of the projection of the malar eminence. Looking at the face obliquely, they drew a line from the lateral canthus to the ipsilateral commissure. A line perpendicular to this at two thirds of the distance went through the most prominent point of the malar complex. The type of defect varies from patient to patient and can vary from one side to side so no single method can identify the malar eminence or localize the appropriate placement for a cheek implant.

Implants currently in use include the silastic McGhan implant, the Binder submalar implant and others. Similar advantages to silastic chin augmentation exist with malar augmentation (a smaller pocket can be used, sinus infection is less a concern). Reinforced PTFE forms no capsule and has good tissue fixation secondary to its porosity. If an infection does develop with PTFE, the implant must be removed as opposed to silastic. Porous polyethylene has an average pore size from 100 to 250 um. This allows for excellent tissue ingrowth. Bony resorption has been less with this implant but this implant is not as flexible as the silastic or PTFE.

#### Operative Technique:

An intraoral incision is placed just inferior and slightly anterior to the parotid duct about 3 cm long. The incision is carried through mucosa and muscle with a no. 15 blade or needle-point cautery down to the periosteum. The periosteum is elevated with a Joseph's elevator. Elevation is continued superiorly and laterally over the malar eminence and zygoma. Make the pocket big enough for implant placement. The most important consideration in pocket creation is precision. A pocket too large lends itself to implant migration and one too small leads to implant distortion. Porous implants should be loaded with clindamycin and saline. Then the implant should be properly sized and placed into position at the malar eminence. Fixation sutures are not necessary to secure the implant. The incision is closed in two

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layers. If a silastic implant is used, a silk suture is applied to the lateral portion of the implant and passed through a long needle or wire passer which is passed into the most superior-lateral part of the pocket and then passed into the hairline. The implant is maneuvered into the correct position and the suture tied over a bolster and left in place for 3 days to stabilize the implant. Again this is not absolutely necessary.

### Complications:

Complications can include a malpositioned implant, an implant too large or small, infection from the sinuses or teeth, asymmetric implants, capsule formation and implant exposure. The most common complication seems to be insertion of an implant that is too big or too small. Malpositioned implants must be removed and replaced. Larger implants should be replaced with smaller ones - again after all the swelling has gone down. If additional augmentation is needed, a small amount of PTFE can be added to the implant after healing has occurred. If an infection develops around a porous implant, the implant must be removed and a new implant should not be inserted for 6 to 8 weeks. If the maxillary sinus has been fractured, only a silastic implant should be used as a replacement.

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