• Introduction and History
• Preop evaluation and facial analysis
• Implant materials and sizing
• Implantation technique (chin and malar)
• Complications and pitfalls
Introduction

- Multiple factors contribute to the aesthetically pleasing face
  - Skin
    - Texture
    - Color
    - Thickness
  - Soft tissue
    - Composition, location
  - Bony contours
    - Size, shape, location, and symmetry
  - Cultural norms
Introduction

• Surgery for facial contouring
  • Rhinoplasty
  • Facial implantation
    • Chin
    • Malar and submalar
    • Mandible
    • Orbit
    • Maxilla/pyriform
  • Multiple implant material
Chin Augmentation

- Often an adjunct to rhinoplasty
- Particularly important in creating an aesthetic profile
- Malar – Latin for cheek bone
- Malar eminence dominate the lateral midface
- Particularly important in the “social profile” (i.e. oblique view)
  - High, full cheek bones provide soft and youthful appearance
• Malar Augmentation
  • More youthful appearance
  • Softens angles
  • Improves the harsh or drawn appearing face
- Malar flattening
  - Exacerbated with age
    - Fat atrophy
    - Soft tissue decent
History – chin implantation

First chin implants used autogenous material
  - Hump from rhinoplasty
  - Calvarial bone grafts

Rubin (1948) – first to use alloplastic chin implant

1950s – began advancement of alloplastic materials

Terino pioneered the more natural anatomic shape of today’s implants
History – Malar implantation

- **Tessier – 1971**
  - First to describe malar augmentation
  - Used split calvarial bone, rib, and iliac crest
  - Craniofacial reconstruction

- **Gonzalez-Ulloa - 1974**
  - Described malar augmentation w/ alloplastic materials

- **Hinderer – pioneered aesthetic malar augmentation**

- **Binder and Terino – 1994**
  - Further published on midfacial anatomy, deficiencies, and augmentation
Anatomy

- Nasion
- Subnasale
- Pogonion
- Menton
- Tragion
Cautions and Contraindications

- **Chin augmentation**
  - Patients with severe micrognathia/retrognathia (3rd degree retraction)
  - Significant malocclusion
    - Mild overbite or underbite may be okay
    - Craniofacial abnormalities

- **Malar augmentation**
  - Caution in certain patients
    - Thin skin
    - Significant facial asymmetry
    - Extremely prominent bone structure
    - Deep set orbits
    - H/o irradiation
    - H/o trauma with exposed mucosa
Preoperative Counseling

- Ascertain patient desires
  - Often, chin implantation is suggested by the surgeon
- Medical history
- Patient education
  - Facial anatomy and proportions
  - Pre and post op photos of other patients
- Photo documentation
- Stop ASA, Vit. E, Ginko Biloba, etc.
- Chin augmentation
  - Does not affect mandibular width or height significantly
    - Sliding genioplasty
Facial analysis – Methods for evaluation of chin projection
- Rish technique
- Legan’s angle
- Merrifield Z-angle
- Zero meridian of Gonzales-Ulloa
- Goode’s method
- Lower facial triangle (Calhoun)
- Peck and Peck
- Holdaway
- Powell and Humphreys
- Stambaugh
Legan’s angle

Facial convexity = 8–16°
A – **Goode’s method** – Perpendicular line from the horizontal line (FHL) through the alar-facial crease marks the ideal chin projection.

B – **Merrifield’s Z-angle** – Angle created by intersection of the FHL and a line from the pogonion to upper lip vermilion border.
- **Zero meridian of Gonzales-Ulloa**
  - Line drawn perpendicular to the FHL through the nasion to the chin
    - Pogonion should be within 5mm
    - 1\textsuperscript{st} degree retraction – 1cm
    - 2\textsuperscript{nd} degree retraction – 1-2cm
    - 3\textsuperscript{rd} degree retraction - >2cm
    - Poor candidate
- Effect of subnasale contour on apparent chin projection
- Effect of lower-third height on apparent chin projection
- Effect of facial depth on apparent chin projection
- **Lower facial triangle (Calhoun)**
  - T = tragion, S = subnasale, C = chin defining point
  - TC/TS ratio – 1.15 to 1.19
  - S angle – 88° to 93°
Most plastic surgeons determine the need for chin implantation on:
- Physical Exam
- Photographic evaluation
- Artistic impression
• Pre-operative considerations for chin augmentation
  • Tide (1999) – Quick Analysis of the Chin (QUAC)
    • Lip eversion
    • Anterior teeth
    • Chin pad thickness
    • Labiomialental fold depth and height
    • Dynamic chin pad motion with smile
• **Cause of lip eversion**
  - Deep skeletal jet with overbite
  - Vascular enlargement

• **Augmentation may**
  - Deepen the labiomental angle
  - Disturb the lower lip pogonial relationship
• Patient with retrognathia

• Voluntary protrusion of jaw
  • Better candidate for mandibular advancement

• Patient with retrognathia and chin implant
  • Note deepened labiomental fold
- Position of the labiomental fold determines the chin pad percentage of the lower facial height

- High labiomental fold
  - Poor candidate
  - Augmentation will enlarge the entire lower face

- Low labiomental fold
  - Good candidate
  - Augmentation with accentuate only the chin
Patient with high labiomental fold after augmentation

- Appearance of overpowering chin
- Patient with low labiomentonal fold
- Same patient after augmentation
Evaluation of Chin pad

- Ideal – 8-11mm thick
- Palpate
  - Thinnest in center
  - Determine thickness off midline
  - Midline dehiscence/cleft chin
    - $2^\circ$ to mentalis m. dehiscence or failed fusion
- Cephalogram demonstrating a very thick chin pad
  - Ideal – 8-11 mm

- Same patient

- Patient with thin chin pad but prominent bony chin
  - May benefit from deprojection by removal of bone
Dynamic Chin Pad Motion

- Malpositioned implant
- Ptosis of chin pad w/ smiling
Facial analysis – methods for analysis of malar projection

- Difficult to analyze secondary to 3 dimensional structure
  - Classic facial analysis rely usually on 2-D projection

- Hinderer
- Powell et al.
- Silver and Guilen
- Schoenrock
• **Hinderer’s** method for malar analysis

Malar eminence is most prominent
- Silver’s malar prominence triangle
- Place implant several mm infra to the FHL
Implant Selection

- Multiple materials
- Advantages and disadvantages to all
  - No ideal implant
- Know available options
- Key factor
  - Tissue/implant interface
Implant Selection

- Ideal implant
  - Should not be modified by host tissue
  - No foreign body reaction
  - Non-allergenic
  - Non-reactive chemically
  - Non-carcinogenic
  - Should resist deformation to strain (i.e. elastic not plastic)
  - Sterilizable
  - Should integrate into host tissue
  - Easily removed
- Autologous
  - Calvarial bone
- Metals
  - Corrosive
  - High rate of bone erosion
- Polymers – most commonly used
- Polymers – carbon chain based molecules with crosslinking
  - Dimethysiloxanes
    - Silicone based
    - Silastic
  - Polyamide
    - Supramid
  - Polyethylene (polyester fiber)
    - Mersilene (Polyethylene terephthalate)
    - Dacron
    - Medpor (porous polyethylene)
  - Expanded polytetrafluoroethylene (PTFE)
    - Gore-Tex
    - Avanta
  - PTFE
    - Teflon
    - Proplast I and II
  - Polymethylmethacrylate (PMMA)

Silicone chin implants
Composite polymer implants

- Hard Tissue Replacement (HTR)
  - PMMA + polyhydroxyethylmethacrylate and calcium hydroxide
    - Hydrophilic outer layer for osseointegration
- Silastic implant with Dacron backing
  - Increase interface soft tissue ingrowth
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<th>Implant Characteristic</th>
<th>Acrylic</th>
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*Proplast was withdrawn from the market in 1992 by the Food and Drug Administration. Ellipses indicate not applicable. See the introductory textual material for the nonproprietary names and the manufactures’ names and locations for the implant materials.*
<table>
<thead>
<tr>
<th>Material</th>
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<td>Methylmethacrylate</td>
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<td>Polyester fiber mesh</td>
<td>Mersilene</td>
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<td>Porous polyethylene</td>
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<td>Polyamide mesh (nylon)</td>
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*See the introductory textual material for the manufacturers’ names and locations for the implant materials.*
Implant Sizing

- Kent
  - 1.0:0.7 effect on soft tissue after bony re-contouring
    - i.e. 1cm implant will increase soft tissue projection .7 cm
    - Occurs from bone resorption, soft tissue thinning

- Size based on preoperative facial analysis

- Malar implant sizing is more subjective than chin implant sizing
  - Morphing programs
Implant Sizing

- In general, err on the side of lesser projection in women
- Outpatient surgery
- Easy to perform
- Minimal operative equipment needed
- Minimal recovery time
Chin Implant

- Technique
  - Intraoral
    - ? Increase infection
    - Detachment of mentalis m.
  - External submental
Detachment of mental m. in intraoral approach
Malar Implant

Technique
Advanced sliding genioplasty

- Alternative method for chin augmentation
- Uses patients own tissue
- Can decrease height of the mandible
- Better for more severe microgenia
- Failed alloplastic chin implant
Complications – Chin implants

- **Immediate**
  - Bleeding/hematoma
  - Nerve injury
  - Infection
  - Malposition

- **Delayed**
  - Implant migration (scarring)
  - Infection/extrusion
  - Bone resorption
  - Post infection deformity
  - Implant mobility
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*Unless otherwise indicated data are percentages. Ellipses indicate not applicable.
†Prior to soaking of implant in an antibiotic.
Lower lip numbness
Removed chin implants
Bony resorption and detachment of mentalis m.
Removed chin implant

- Incisor show secondary to poor lower lip support
- Aberrant chin pad with animation
Malpositioned Implant
Chin and Malar Augmentation

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