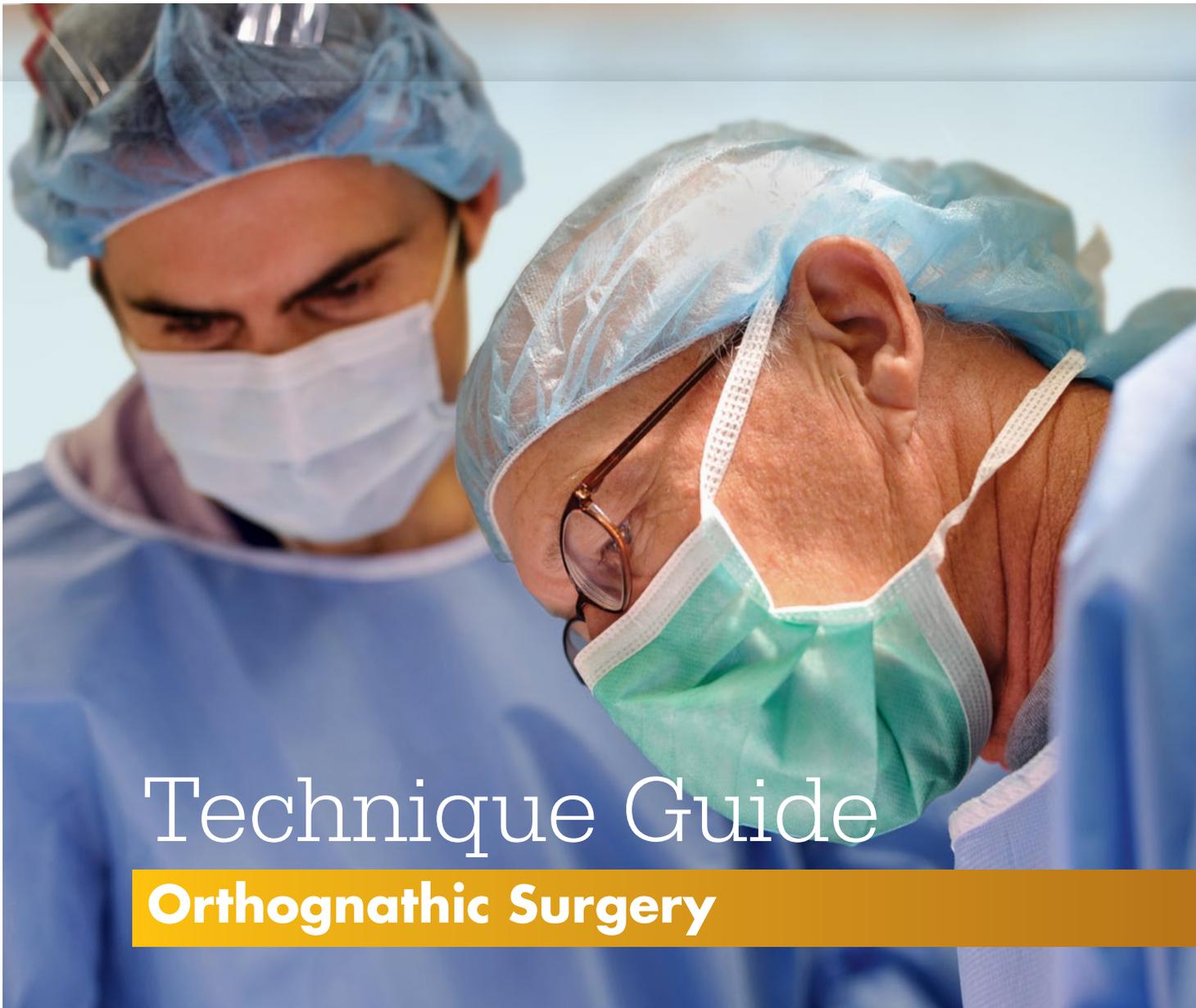


stryker



Technique Guide

Orthognathic Surgery

Editor:

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Table of contents

Section I: Sagittal Ramus Osteotomy (BSSO or BSRO) for Advancement 3-12

Multiple Modifications	3
Incision/Exposure	3
Superior/Medial, Osteotomy Cuts & Lateral/Vertical	4-5
Thin Ramus	5
Fixation	7-9
Technical Modifications for BSSO for Mandibular Setback	10-12

Section II: Transoral Vertical Ramus Osteotomy 13-15

Advantages/Considerations	13
Incision/Exposure	13-14
Osteotomies	14
Fixation	15
Recontouring proximal segment	15

Section III: Genioplasty 16-18

General Considerations	16
Incision/Exposure	16
Osteotomy	17
Fixation	18
Closure	18

Section IV: LeFort I Maxillary Osteotomy 19-27

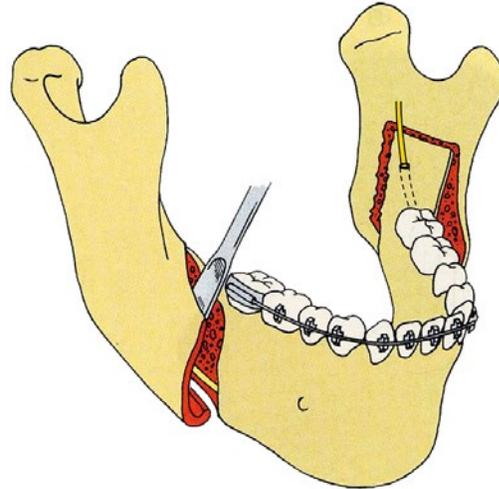
Incision/Exposure	19
Osteotomies	19-24
Recontouring	22
Grafting	24
Fixation	25-26
Closure	27

Section I:

Sagittal Ramus Osteotomy

Sagittal Ramus Osteotomy (BSSO or BSRO) for Advancement

- **Multiple modifications**
 - (Dalpont-Hunsuck most popular and most widely used)
 - Dalpont modification with lateral cut vertically near first molar
 - Hunsuck modification with posterior medial cut extending only to retrolingular depression
- Can be used for correction of a wide variety of mandibular deformities



Incision design

- Mucosal incision made 2 to 3 cm lateral to external oblique ridge
 - Through mucosa only
- Pull medial edge of mucosa over external oblique ridge
- Incise periosteum directly over external oblique ridge



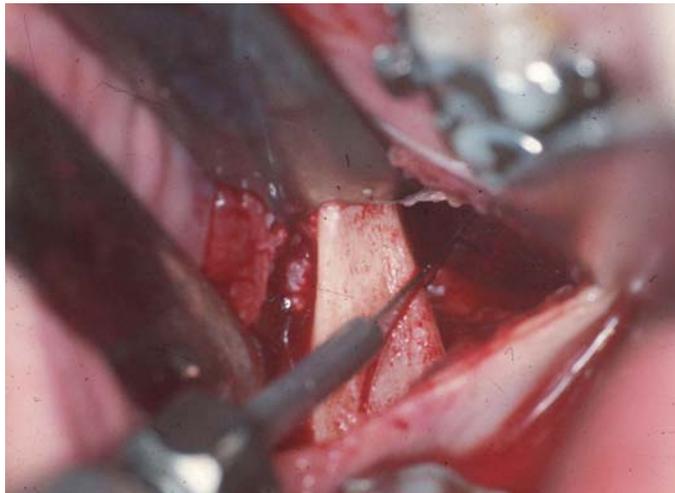
Exposure of Anterior Ramus

- Expose medial ridge of posterior body/anterior ramus area
- Use notched ramus retractor to elevate temporalis muscle and periosteum from anterior ramus
- Create medial pocket above the inferior alveolar nerve using periosteal elevator
- Protect IAN with retractor



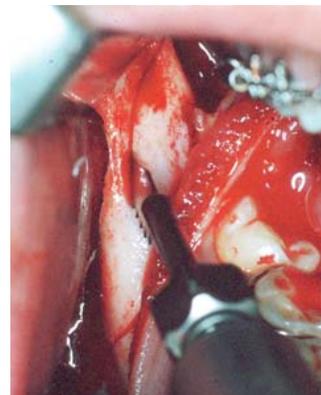
Superior/medial cut

- Protect medial tissue and IAN with retractor
- Begin cut at 45 degree angle to medial cortex (more angle if ramus is extremely thin)



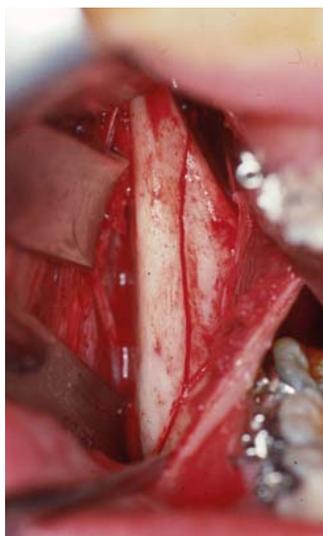
Superior/medial cut

- Should extend into retrolingular depression
- After initially outlining saw cut, place saw to full depth of blade to cut into depression on medial aspect of posterior ramus area
- Visualize and protect IAN
- Extend cut to lateral cortex and inferiorly, at full depth, about 1.5 cm



Osteotomy cuts

- Should incorporate gentle curves rather than sharp angles



Thin ramus

- If ramus is extremely thin the medial and anterior cuts should essentially be a continuous straight cut



Lateral/vertical cut

- Expose the lateral mandible anteriorly to the antegonial notch area
- Place channel retractor at inferior border of mandible
- Use of smaller bite block or removal of bite block may improve access
- Cut must extend slightly to medial aspect of inferior border
- Cut through cortex only to avoid injury to IAN



Osteotomy separation

- Gentle osteotomy separation at superior portion of osteotomy-obtain minimal mobility
- Use osteotome, wedge or spreader to obtain separation at the anterior cut
- **Most important aspect of Osteotomy is to insure Proper inferior border Separation**



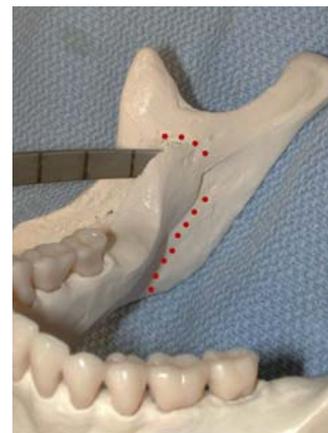
Separation of posterior aspect

- In some cases, particularly young patients, the mandible will often "green stick," making complete separation difficult.
- The inferior alveolar nerve must be identified. A curved osteotome is used to direct the posterior aspect of the osteotomy toward the medial aspect of the mandible



Illustration of posterior cut

- Osteotome is used to redirect direction of osteotomy separation toward the retrolingular depression



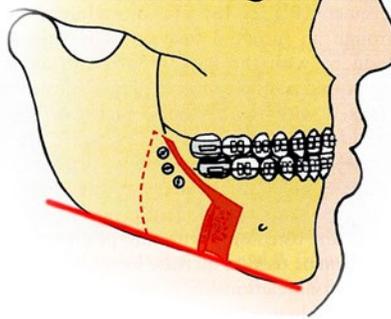
Releasing muscular, periosteal And tendonous attachment

- The J stripper is an effective instrument to release muscular attachments from the medial aspect of the proximal segment
- Retract the proximal segment and insert the J stripper at the antegonial notch area
- Push stripper posteriorly, along the inferior border, around the angle and up the posterior aspect of the distal segment



Fixation

- Once maxillomandibular fixation has been applied, position the proximal fragment into the appropriate position.
 - Condyle seated
 - Inferior border alignment
- Pass local anesthetic needle through skin to verify proper location for fixation through the percutaneous trocar



Drilling through trocar

- Access can be easily obtained to apply fixation through the proximal segment



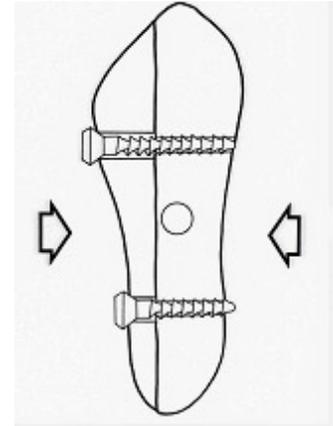
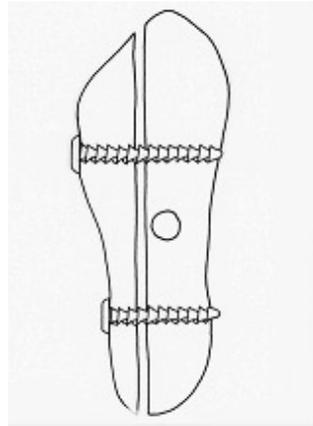
In some cases use of a plate may involve combination of methods for access

- Posterior aspect through the trocar
- Access to the anterior area can be obtained transorally.
 - Minimize retraction to expose only the anterior area of the plate

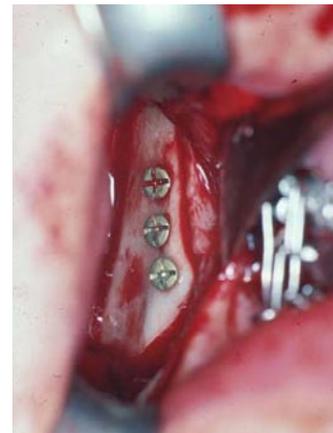
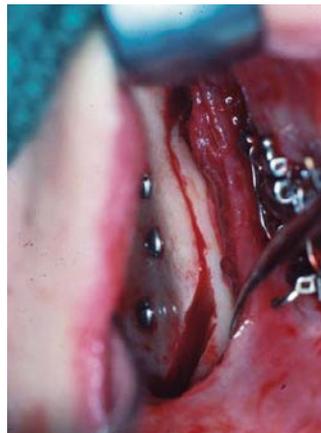


Fixation options

- Lag Screw
 - Good bone approximation
 - Tactile sense of screw tightening
 - Possible condyle torquing or compression of IAN
- Position/bicortical screw
 - Less compression and possible less torquing
 - Inability to verify screw interface on distal segment



- Screws placed in line or inverted L pattern
- Plates
 - Long advancements
 - When third molars removed during osteotomy
- Combination

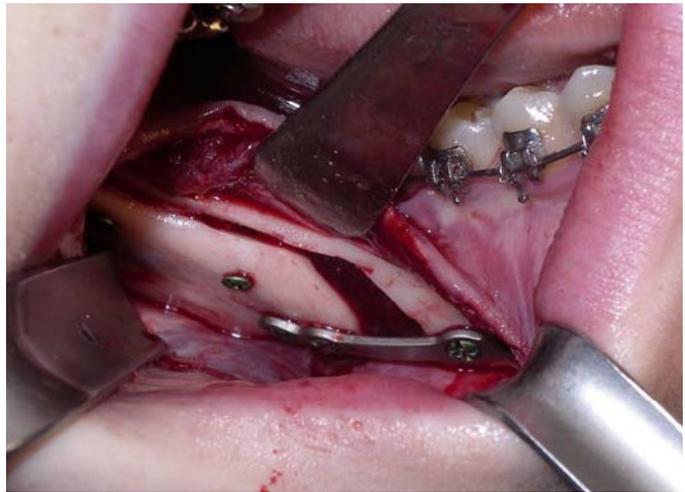


- Screws placed in line or inverted L pattern
- Plates
 - Long advancements
 - When third molars removed during osteotomy
- Combination



Fixation options

- Screws placed in line or inverted L pattern
- Plates
 - Long advancements
 - When third molars removed during osteotomy
- **Combination**



Wound closure

- Proper lateral placement of mucosal incision provides easy access during closure.



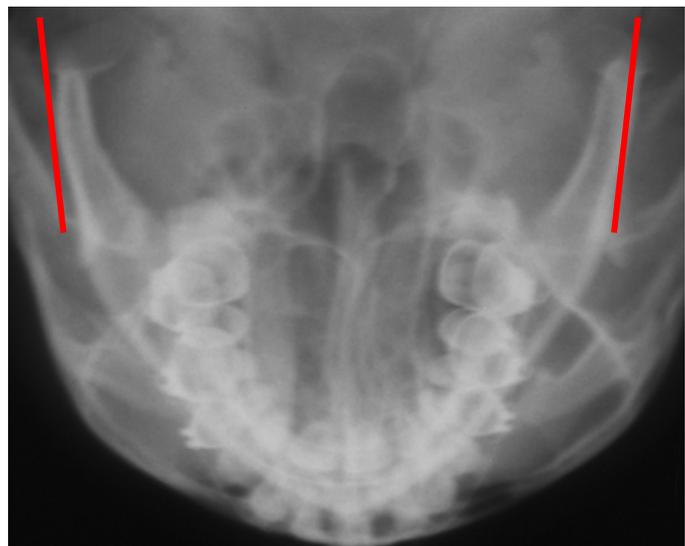
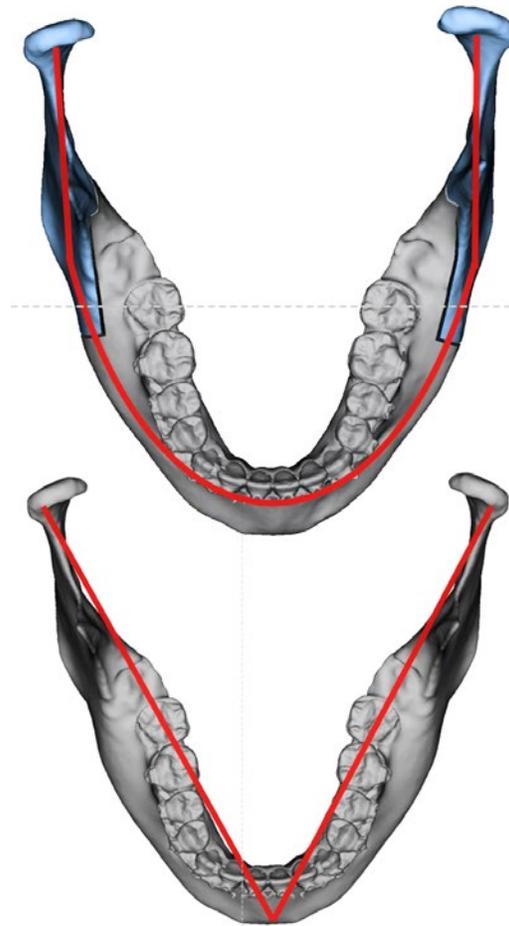
Technical modifications for BSSO for mandibular setback

Anatomic considerations for Mandibular Setback I

- Determine pattern of ramus divergence
 - U shape shown to right
- U shaped mandible best suited for SSRO

- Determine pattern of ramus divergence
 - V shape shown to right
- V shaped mandibles best for TOVRO

- Determine pattern of ramus divergence
 - V vs U
- U shaped mandible best suited for SSRO- shown to right
- V shaped mandibles best for TOVRO
- **Best determined with submental vertex radiograph**



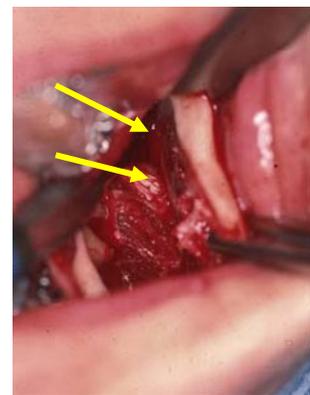
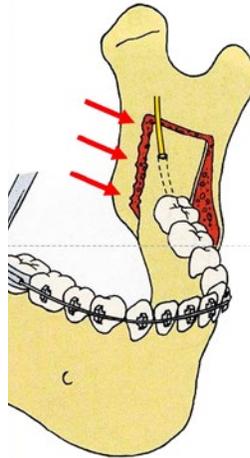
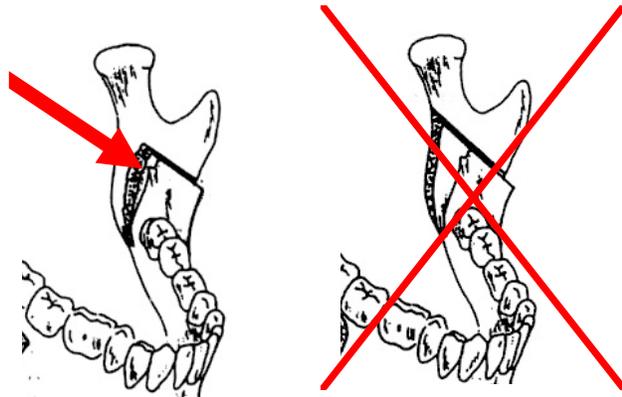
Anatomic considerations for Mandibular Setback I

- V shaped mandibles best for TOVRO
 - Shown to right
- Best determined with submental vertex radiograph
- Angle of ramus divergence most important



Osteotomy design

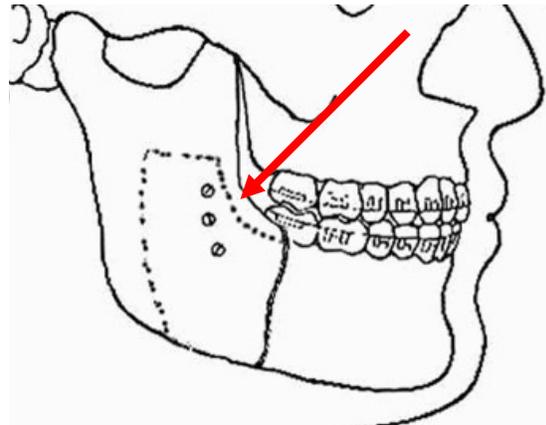
- Design of osteotomy identical to advancement
 - Very important to incorporate Hunsuck modification
 - This allows distal segment to move posteriorly without tissue impingement
 - ARROW
-
- Periosteal and muscle attachments must be stripped from the medial aspect of the proximal segment to allow posterior movement of the distal segment without tissue impingements



Fixation

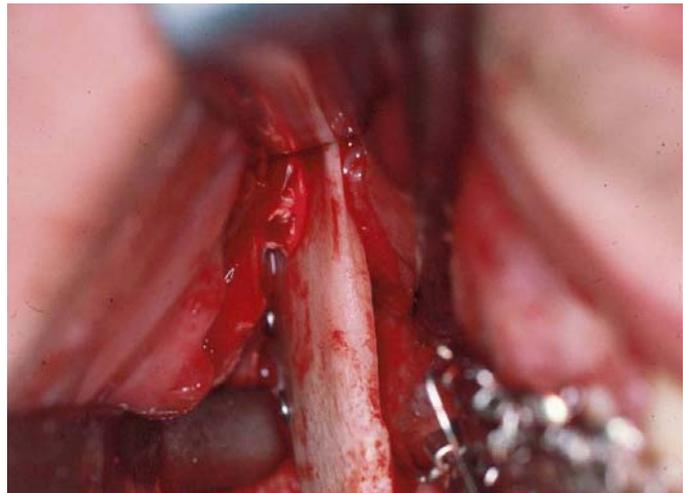
- Once maxillomandibular fixation has been applied, position the proximal fragment into the appropriate position.
 - Condyle seated
 - Inferior border alignment

Initially there will be a significant superior border discrepancy with the proximal segment well above and anterior to the ramus portion of the distal segment (arrow)



This proximal segment position creates several problems

- Visibility-difficult to see proximal distal segment for fixation
- Positioning of proximal segment often over rotated posteriorly
- elongated muscular sling
- Soft tissue attachment lateral to second molar often elevated creating tissue irritation



Management of proximal segment relationship

- Remove anterior portion of proximal segment to allow setback
- Remove superior portion of proximal segment (external oblique ridge area to
 - Improve visibility
 - Prevent over rotation of proximal segment
 - Improve soft tissue position



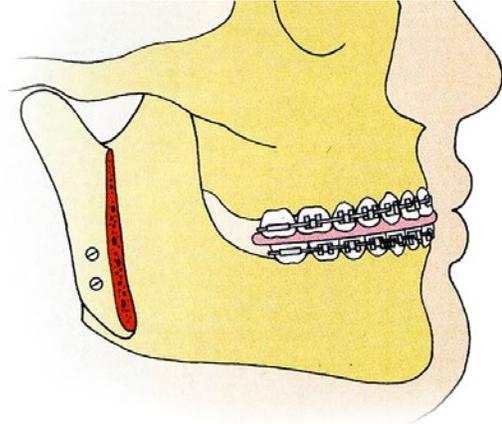
Section II:

Transoral Vertical Ramus Osteotomy

Transoral vertical ramus as alternative technique for mandibular setback

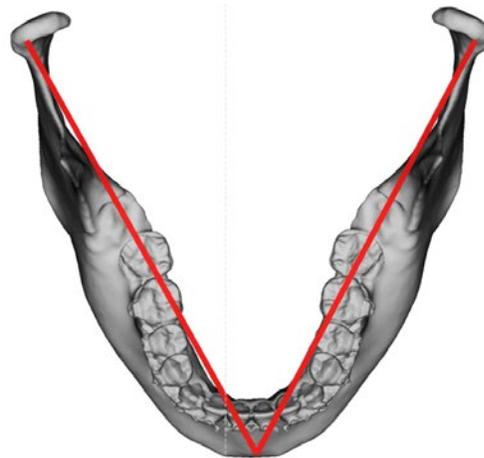
TOVRO-Advantages I

- Effective method for treating mandibular excess
- Minimal neurosensory risk
- Long term stability



Anatomic considerations for mandibular setback I

- Determine pattern of ramus divergence
 - V shown
- V shaped mandibles better/ideal for TOVRO



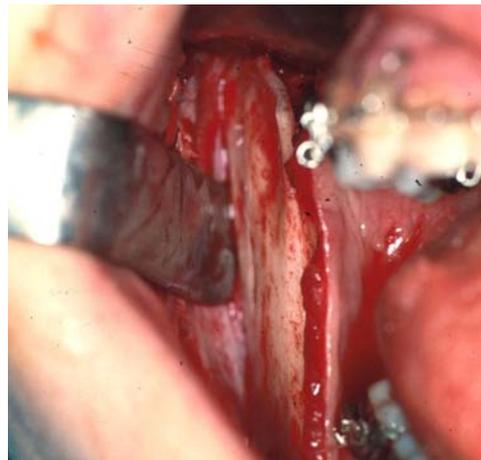
Incision/Exposure

- Initial incision identical to BSSO expose anterior aspect of ramus with notched ramus retractor
- Place channel retractor in sigmoid notch
- Use reciprocating saw to create and osteotomy to separate coronoid process
 - Provides better visibility
 - Removes pull of temporalis muscle



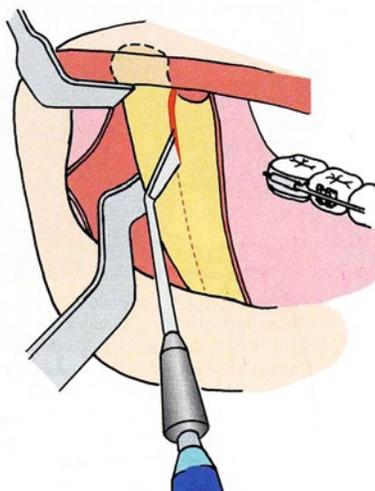
Exposure of lateral ramus

- Remove bite block, allow mouth to close
- Place on Bauer retractor in the sigmoid notch
- Place a second Bauer retractor at the inferior border near the angle
- Surgeon retracts tissue with large toe out retractor



Osteotomy cut

- Oscillating saw (105 degree) used to create osteotomy from sigmoid notch to the inferior border, slightly anterior to angle area.
 - Behind IAN/Lingula

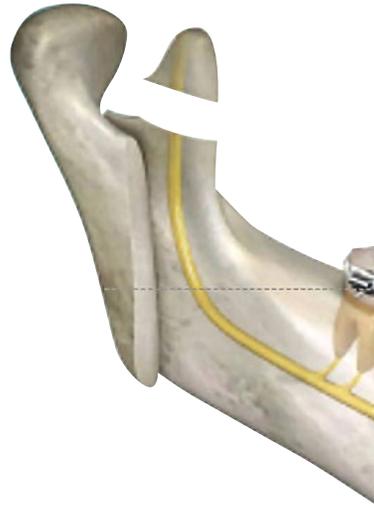


- Cut vertically from midportion of ramus to inferior border
- Return saw to mid portion of ramus and cut superiorly to sigmoid notch



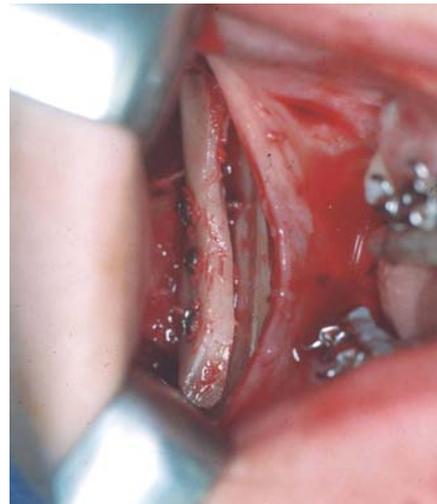
After completion of osteotomy

- Strip muscular and periosteal attachment from inferior portion of medial aspect of proximal segment
- Apply maxillomandibular fixation and evaluate proximal segment relationship
- Remove bony interference (usually at the sigmoid notch area) to achieve passive overlap



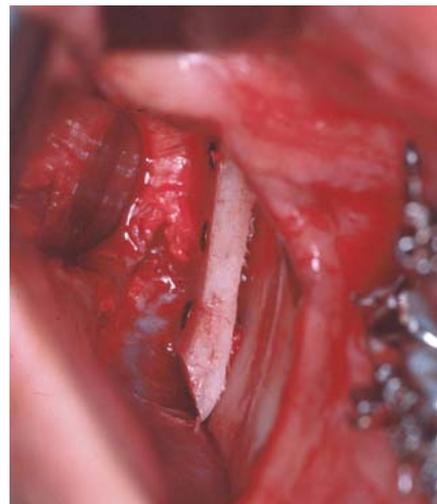
Fixation

- After recontouring/interference removal in lateral ramus area, passively position condylar segment, condyle seated
- Insert percutaneous trocar
- Fixate with three lag or bicortical screws



Recontouring proximal segment

- If the anatomy of the proximal segment produces excessive lateral projection at the angle, the inferior portion of the proximal segment should be recontoured
- Wound closer is identical to sagittal osteotomy

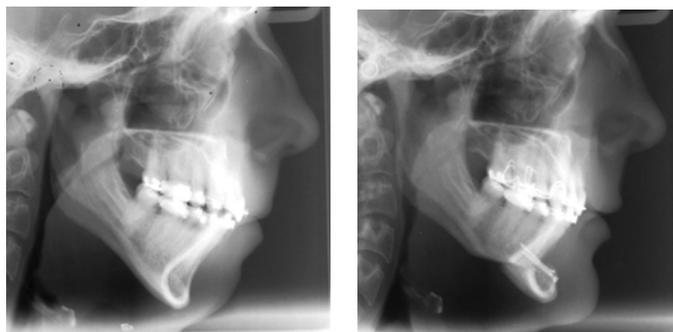


Section III:

Genioplasty

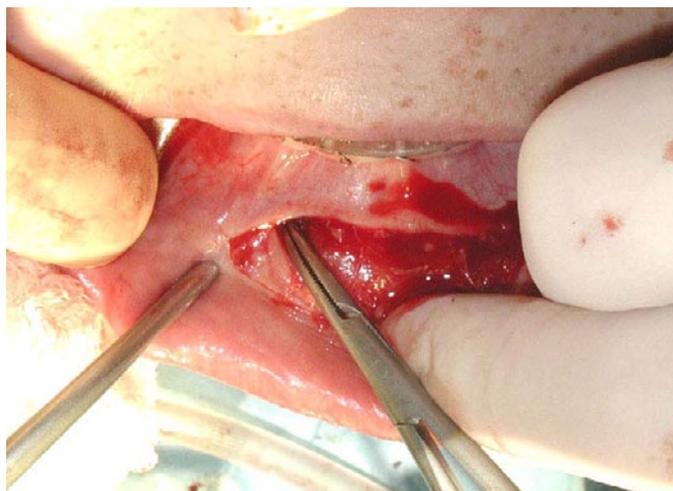
General considerations

- Dramatic facial changes can be made with relatively minor surgery
- Morphology of bony chin and overlying soft tissue must be considered
 - Relatively flat anatomy to anterior mandible usually produces most aesthetic results



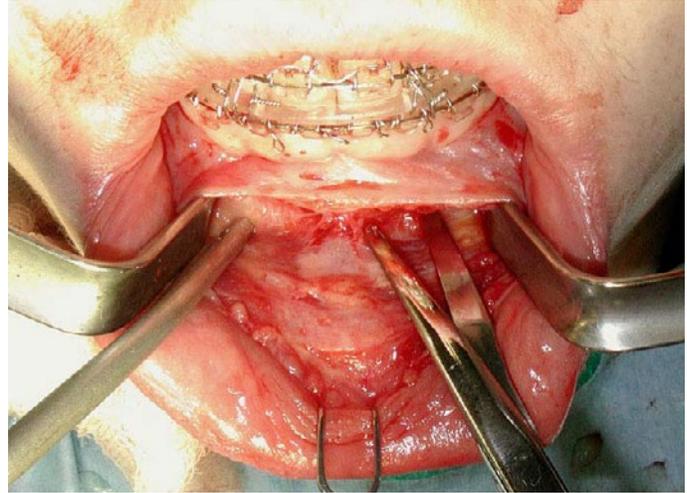
Surgical exposure

- Mucosal incision should be made at least 1 cm facial to the depth of anterior mucosal vestibule
- Blunt dissection to identify, retract and protect the mental nerves

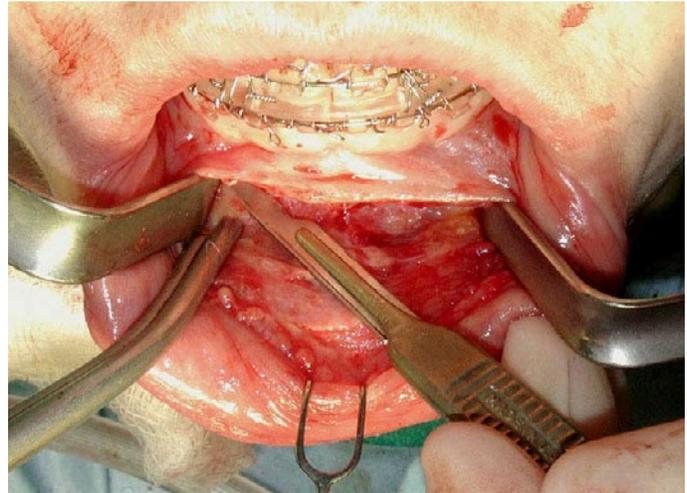


Surgical exposure (cont.)

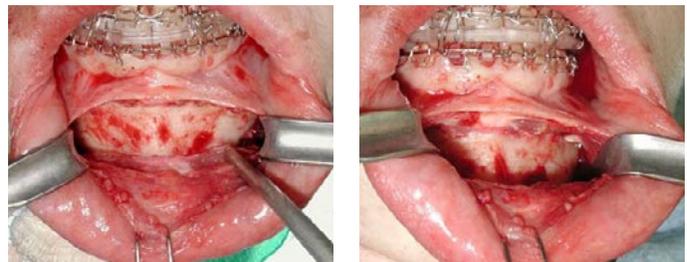
- Scissor dissection through mentalis muscle attachments exposing periosteum
- Periosteum incised with scalpel



- Periosteum incised with scalpel

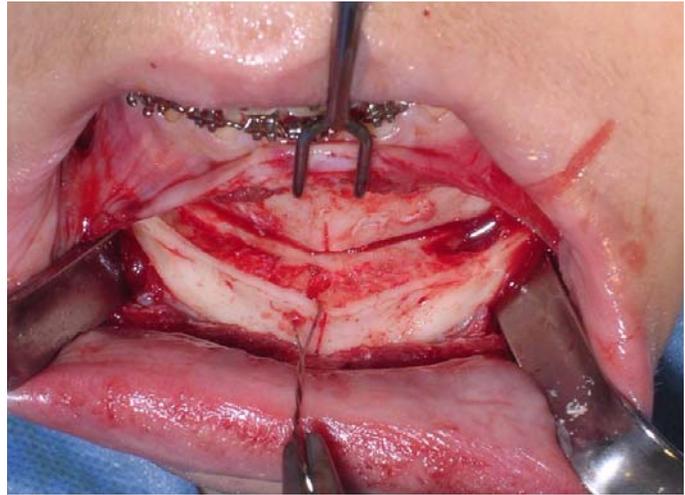


- Anterior mandible exposed
- Mental nerve identified, retracted and protected



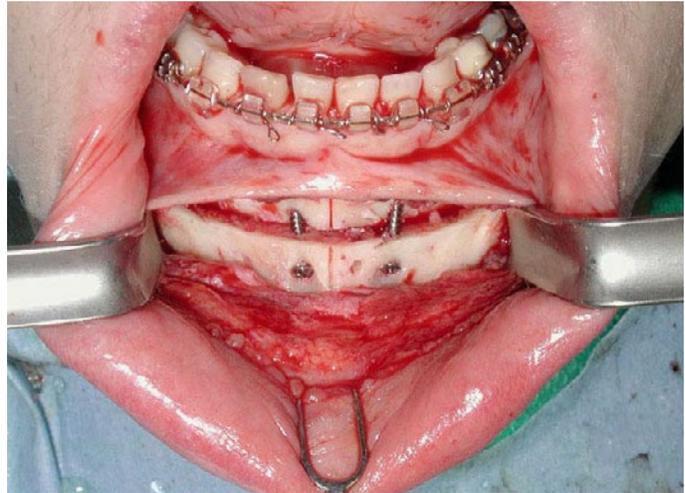
Ostoeotomy

- Mark midline
- Osteotomy extending posteriorly to inferior border
- Adequate room below mental foramen to insure that inferior extent of intrabony canal is not violated
- Drill hole in superior aspect of chin segment, pass wire. This will allow for easy manipulation of segment



Osteotomy fixation

- Countersink bone in area of screw placement
- Advance segment to desired position
- Make sure posterior aspects of inferior segment are symmetrical
- Secure with 2 or 3 bicortical screws
- Plates can also be used.



Closure

- Two or three layer closure
 - Periosteum
 - Muscle
 - Mucosa



Section IV:

LeFort I Maxillary Osteotomy

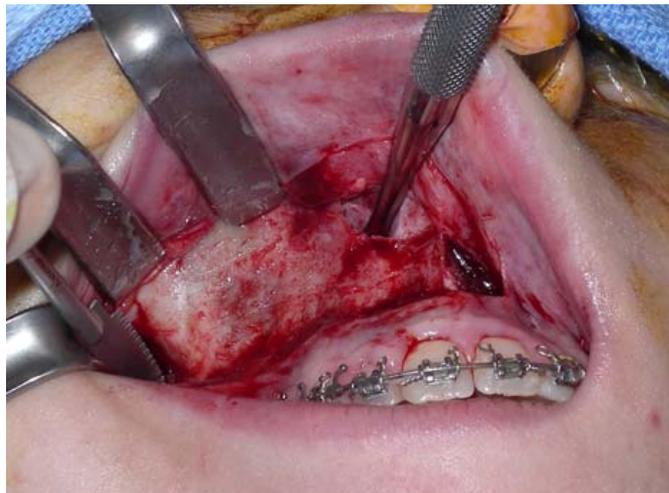
Incision/exposure

- Short incision with wide pedicle base



Exposure

- Generous exposure of anterior maxilla and lateral maxillary wall
 - Pterygoid plate should be visualized
 - Nasal mucosa elevated from piriform rim, lateral nasal wall and nasal floor. Protected with retractor



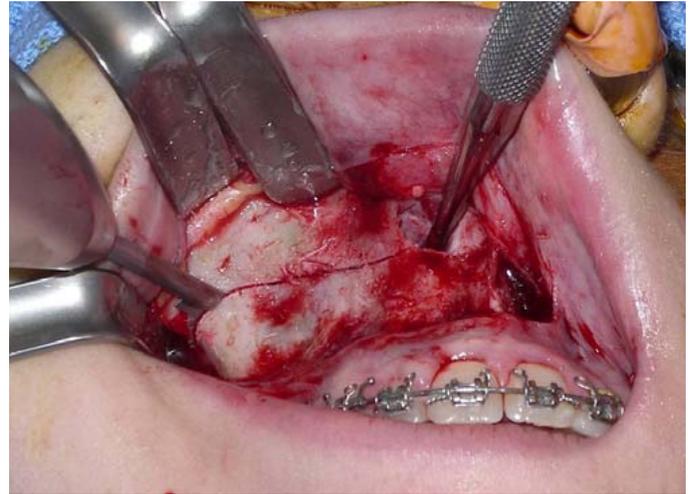
Osteotomies

- Osteotomy cut from buttress to piriform rim cutting from outside in.
 - Posterior cut as low into pterygoid maxillary junction as possible
 - Anterior cut through piriform rim and anterior portion of lateral nasal wall



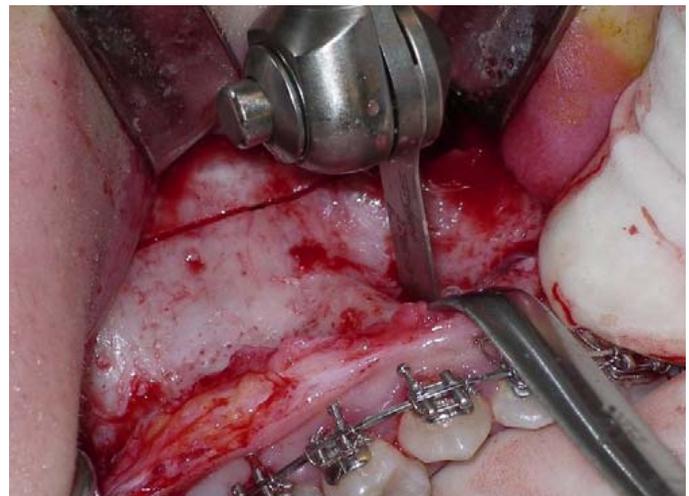
Osteotomies (cont.)

- Complete cut to posterior aspect of maxilla by cutting from inside the sinus outward



Osteotomies - Interdental cuts

- Complete interdental cuts before downfracturing maxilla.
 - This allows cuts to be made on stable maxilla.
- Saw more efficient
- Technically easier



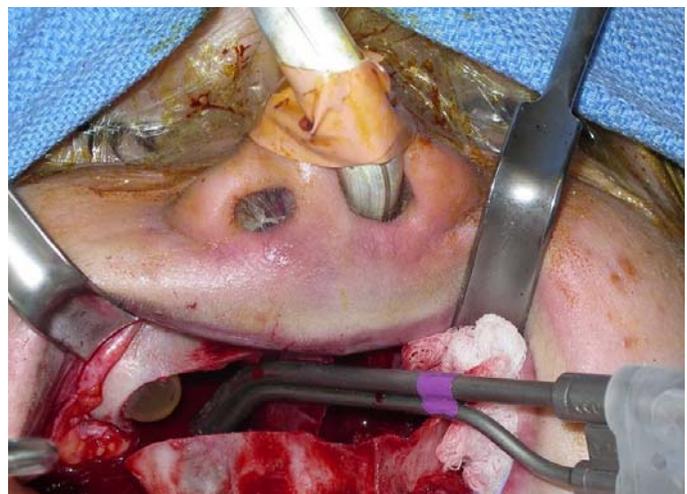
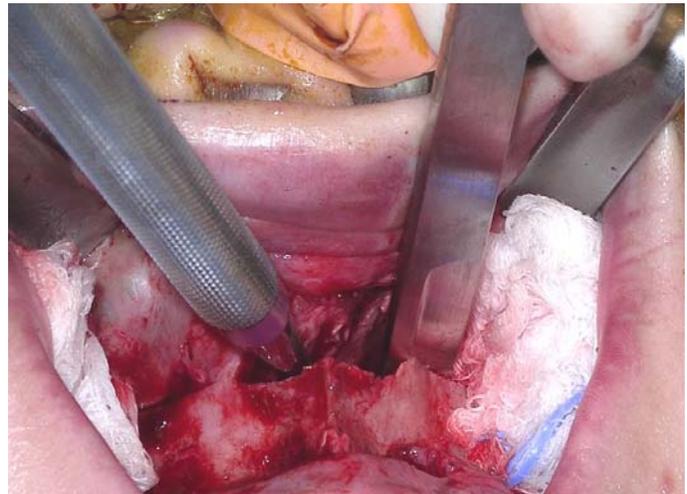
Osteotomies

- Use double guarded osteotome or mayo scissors to divide inferior portion of septum from nasal crest of maxilla



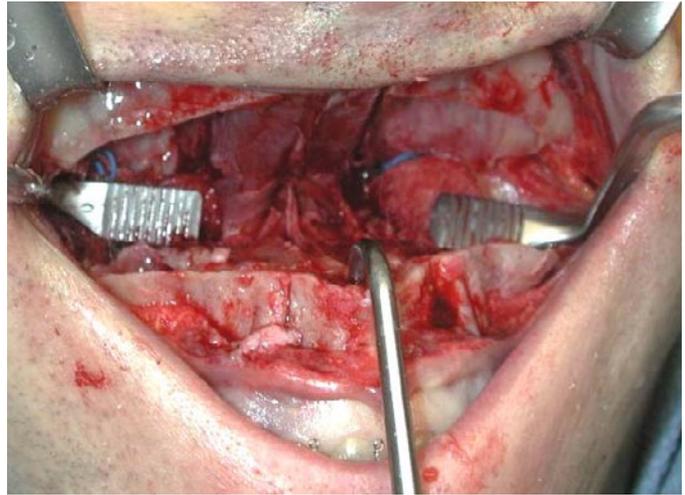
Osteotomies (cont.)

- Curved osteotome used to divide pterygoid-maxillary junction
- Single guarded osteotome used to divide lateral nasal wall.
 - Can extend osteotome completely through posterior aspect of wall
- Transects descending palatine vessel
- Downfracture maxilla. You should be able to do this with digital pressure
- Elevate remaining nasal mucosa from nasal floor and crest of maxilla while downfracturing



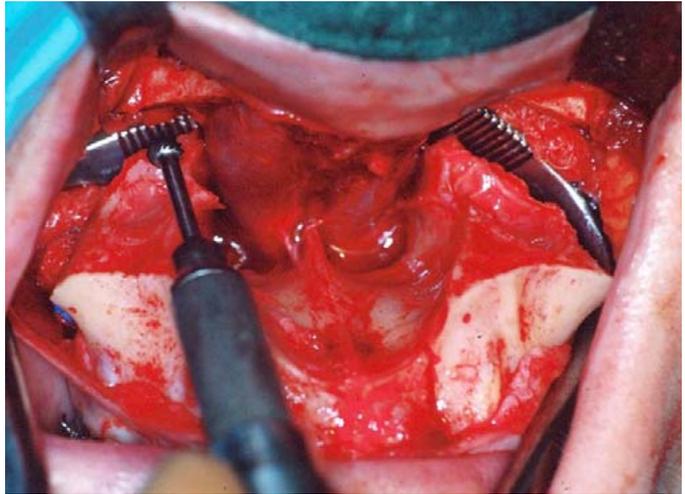
Osteotomies (cont.)

- Place Tessier mobilizers on posterior aspect of maxilla and complete separation from pterygoid plate area. You should be able to move maxilla at least 1.5 cm in any direction
 - Obtain hemostasis with cautery
 - Place entire moist sponge behind each side of maxilla in area of pterygoid-maxillary separation



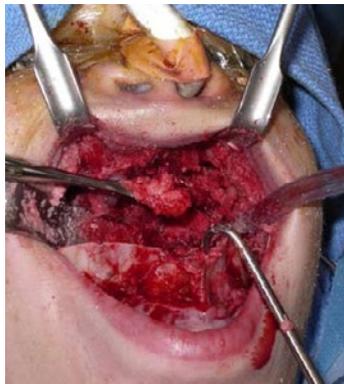
Recontouring

- Recontour, remove interferences from superior aspect of maxilla. Especially important in the following areas
 - Nasal crest of maxilla
 - Lateral nasal wall to include most posterior aspect
 - Posterior, lateral aspect of maxillary sinus



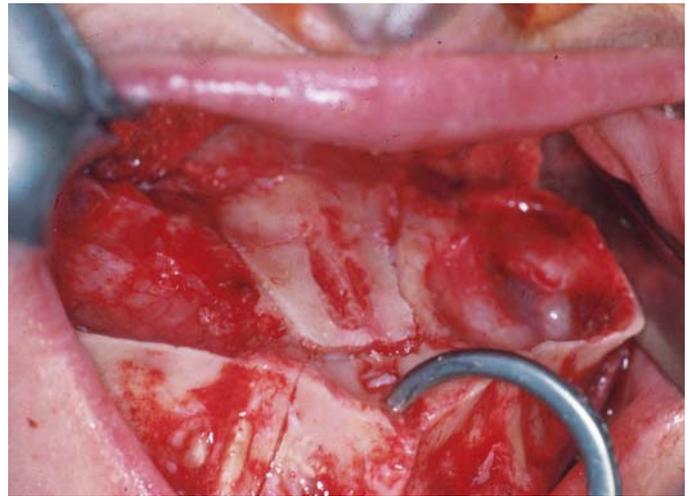
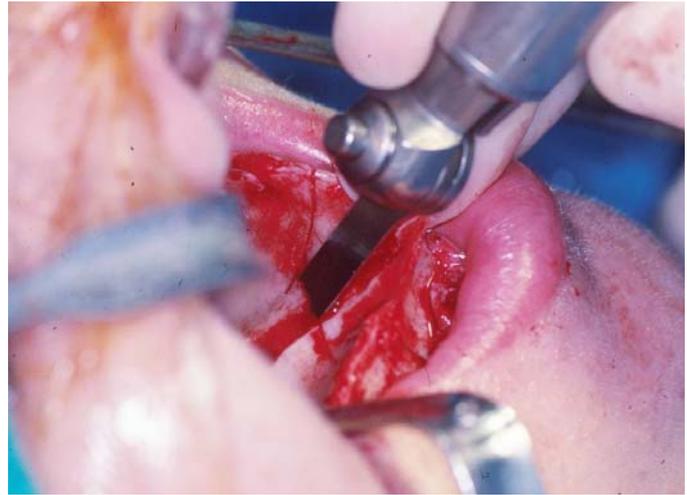
Osteotomies

- Save bone dust harvested during recontouring
 - Can be used for grafting segmental defects
 - Large quantity of bone can be saved



Complete segmental osteotomies

- Connect anterior interdental cuts by making an osteotomy in a tangential fashion across the palate
- Complete segmental cuts by making parasagittal cuts in palate
 - Should use parasagittal cuts even for 2 piece maxilla
 - Bone thinnest laterally while soft tissue is thickest
- Minimizes risk of perforation
- Tissue more elastic for expansion
- Begin seating individual segments in splint
- Remove small interferences with 701 bur to complete positioning of segments in splint



Complete segmental osteotomies (cont.)

- In cases where there is a significant amount of mucosa in the space to be closed, it may be necessary to incise mucosa along crest of ridge to facilitate close approximation of segments to complete space closure



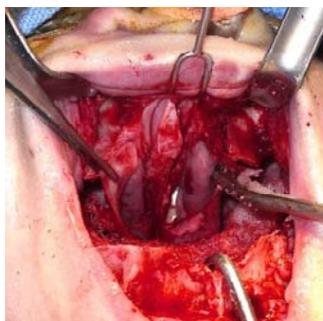
Grafting of segmental sites

- Defects created by segmentalization should be grafted. Sources include:
 - Freeze dried banked bone
 - Bone dust harvested from recontouring after downfracture



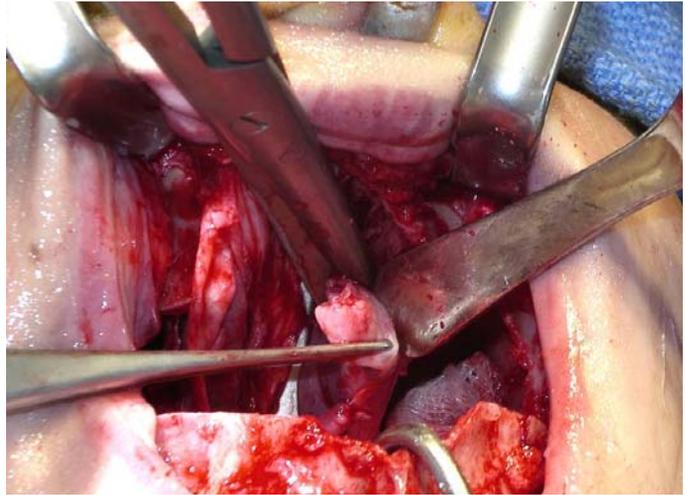
Turbinates and septum

- In cases of significant superior repositioning or when nasal obstruction is apparent, turbinectomy may be required
 - Open nasal mucosa



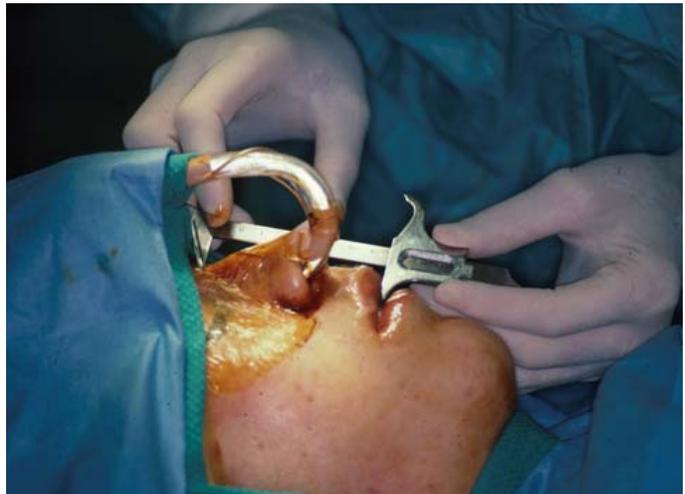
Turbinates and septum (cont.)

- Dissect nasal mucosa from septum
 - Resect as necessary
 - Suture mucosa

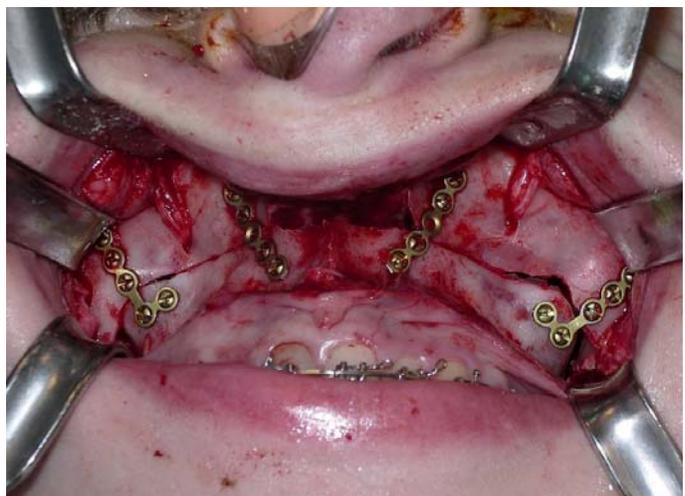


Fixation/Stabalization

- Apply firm maxillomandibular fixation
- Rotate maxillomandibular complex superiorly, seating condyles
- Remove interferences as necessary to achieve appropriate vertical dimension



- PLATES
 - Most common fixation technique
 - Usually use 4 plates

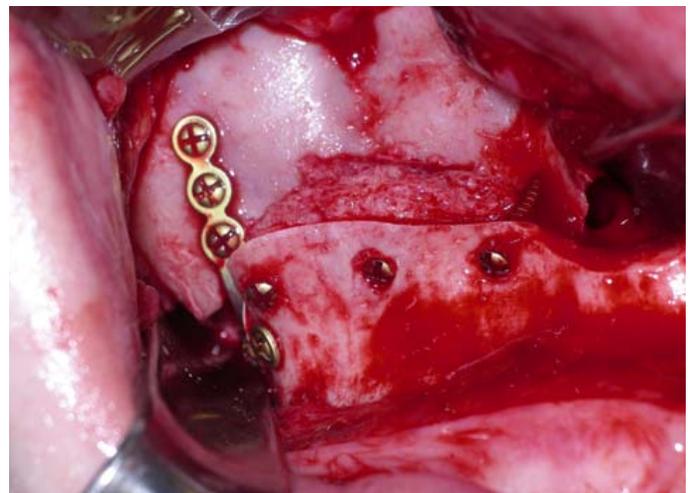
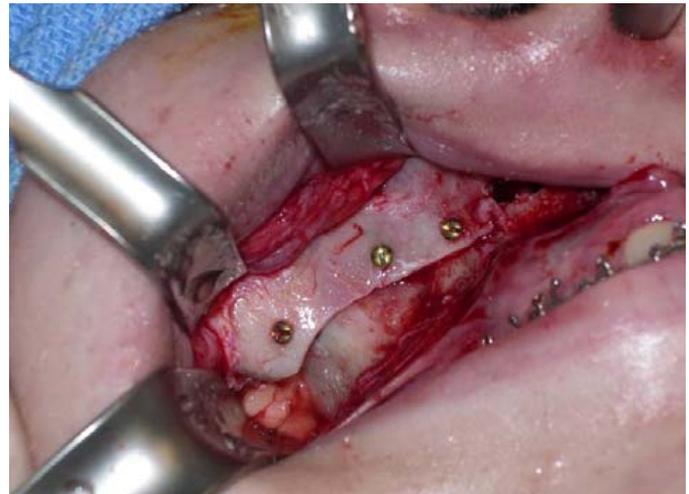
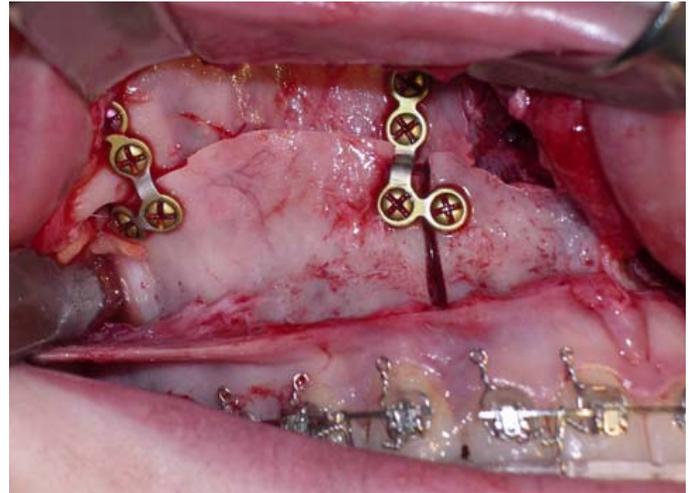


Fixation/Stabalization (cont.)

- PLATES
 - In segmental cases may include all segments in fixation although not usually necessary to incorporate anterior segment

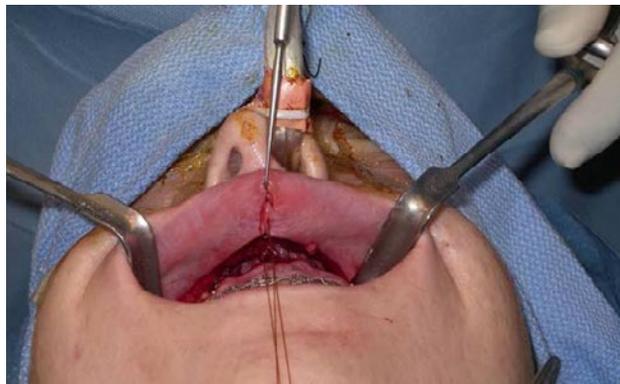
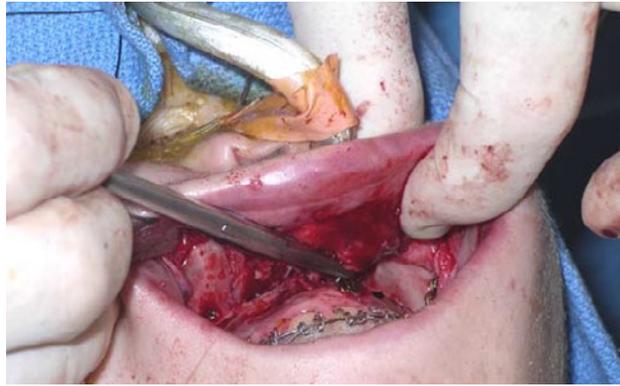
- SCREWS
 - In some cases, the direction of maxillary movement results in bone overlap that allows fixation with 6 or 8 screws.

- COMBINATION of plates and screws
 - Useful when there is end to end bone contact in some areas and bone overlap or grafting in other areas



Closure

- Alar base cinch suturing is required to help prevent unesthetic widening of the alar base
 - Grasp nasal alar base soft tissue/musculature with forceps
 - Place long resorbing 2-0 PDS suture
- Begin tightening the suture while examining the alar base to evaluate alar base width.
- Secure suture
- Mucosal closure is usually accomplished in a V-Y fashion to avoid thinning of the upper lip
 - Begin by using a single prong skin hook to form a vertical leg of the closure
- Closure is completed with chromic suture in using a horizontal mattress closure.



This manual is designed to provide an introductory overview to basic surgical techniques for the most commonly performed orthognathic surgical procedures. The techniques demonstrated are examples of the author's primary techniques for performing these surgical procedures. Modifications should be made based on the patient's clinical presentation and anatomy, the surgeon's experience and preferences regarding instrumentation, osteotomy design and fixation techniques.

The opinions expressed come from third parties and are not those of Stryker. Individual results may vary and not all patients will receive the same post-operative activity level.

Cranio-maxillofacial

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Literature Number: MAX-PR-2_Rev. None_28309.
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