

One Versus Two Plate Management of Subcondylar Mandible Fractures

In Oral & Maxillofacial Surgery

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Disclosure

Paul Lee DMD

The following potential conflict of interest relationships are germane to my presentation.

Equipment: None

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Status of FDA devices used for the material being presented

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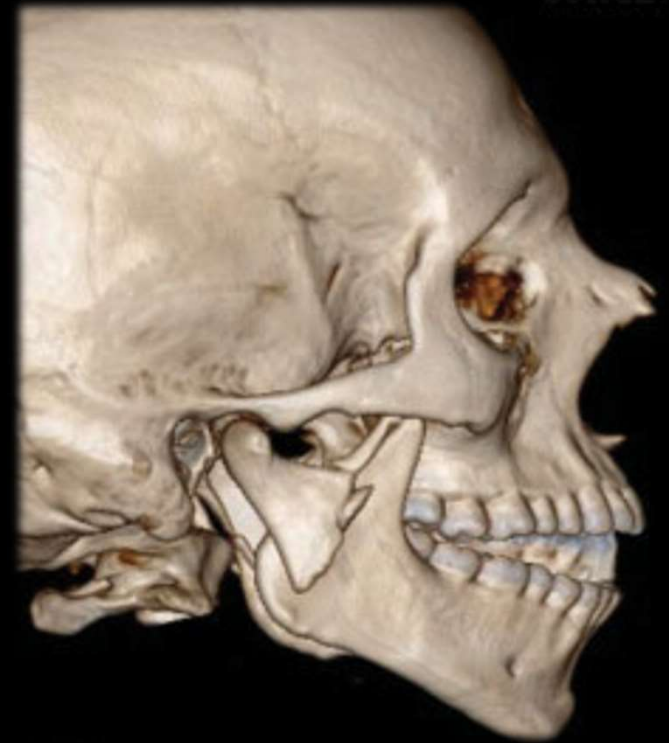


Objectives

1. Background of Condylar Fractures
2. Treat Open vs Closed
3. Types of Fixation for Open Treatment
4. Literature Review of Single vs Double Plates
5. Miami Method
6. Discussion
7. Conclusion

Subcondylar Fractures

- Condylar fractures are involved in **29-52%** of all mandibular fractures in adults
- Condylar fractures make up **11-16%** facial fractures
- Condylar head and neck fractures are involved in approximately **48%** of mandible fractures in children and decrease with increasing age



Etiology

- Assault
- MVC
- Sports Injury
- Fall



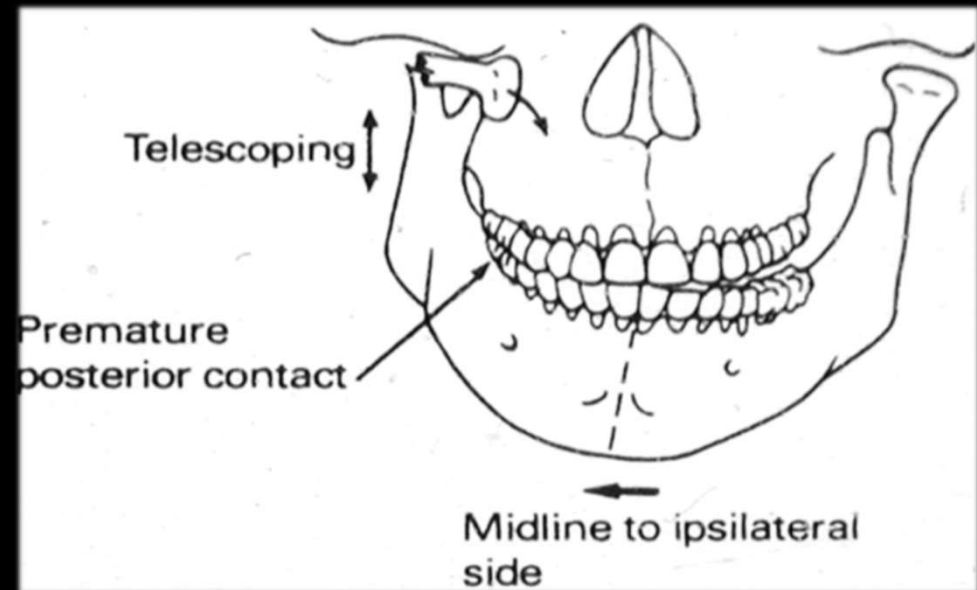
Clinical Findings

Ipsilateral to injured condyle

- Deviation of mandible on opening
- Shortening of ramus
- Deviation of mandibular midline

Contralateral to injured condyle

- Posterior open bite

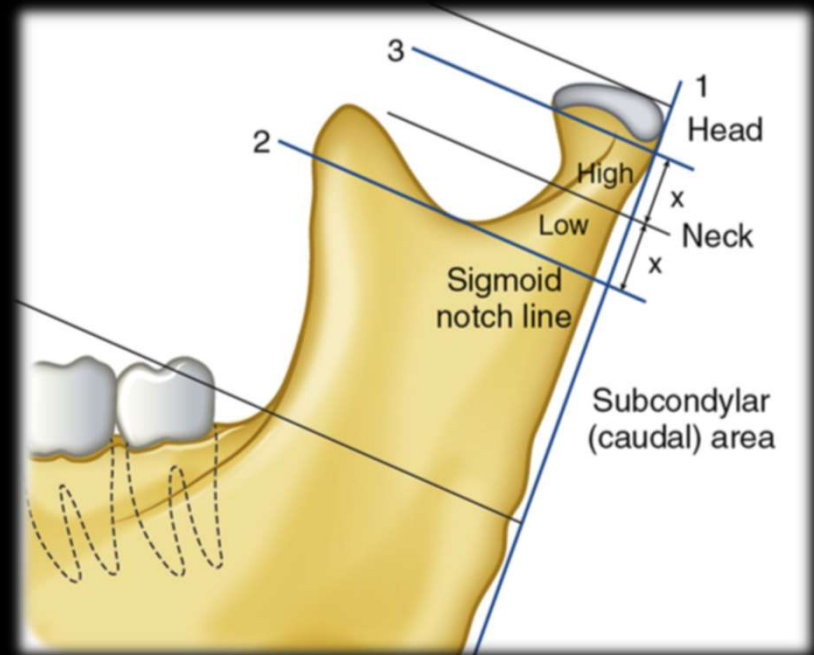


Classification of Fractures

Subcondylar fractures are classified by the displacement/dislocation of the condyle and the location of the fracture

Popular Classification systems:

- SpiesII and Schroll
- Wassmund's Classification
- Lindhals classification



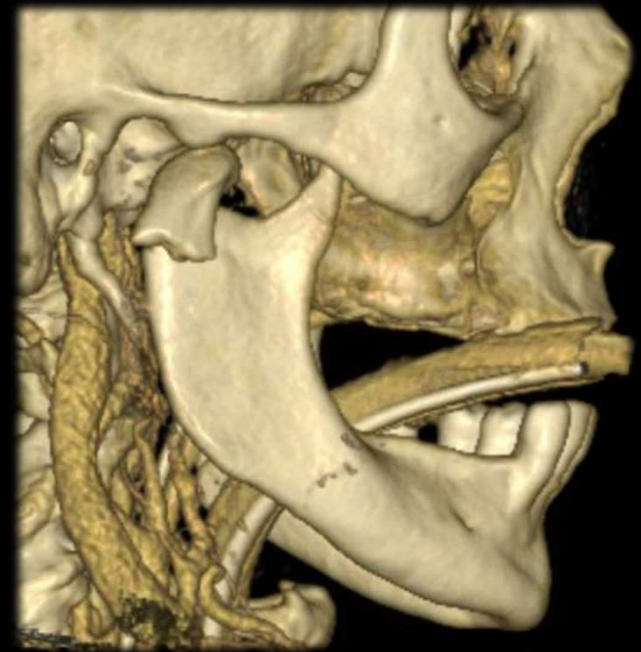
Open vs Close Trend

- CN VII injury
- Facial Scar
- Functional occlusion after treating closed
- Recent metanalysis showed that open treatment of subcondylar fracturs result in better functional outcomes



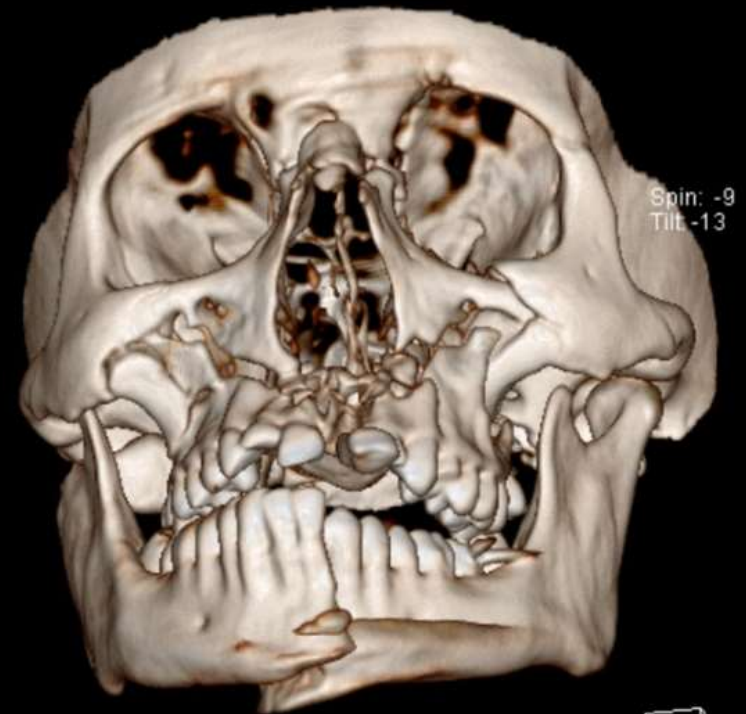
Absolute Indications for Surgery

- ~~1. Fractures into middle cranial fossa~~
2. Foreign body within joint capsule
3. Lateral extracapsular dislocation of the condylar head
4. Fracture dislocation in which mechanical stop is present on opening
5. Inability to place patient into occlusion for closed reduction



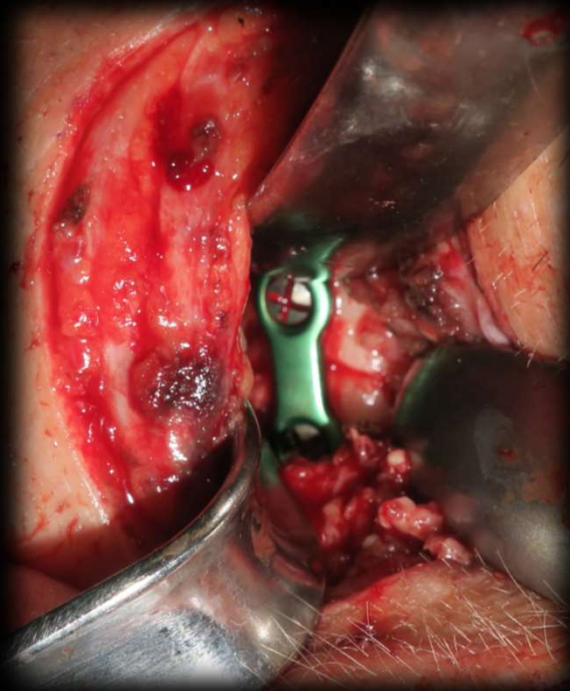
Relative Indications

1. Bilateral condylar fractures with midface fractures
2. IMF not possible due to medical reasons
3. Bilateral fractures with unclear occlusion



Types of Fixation

One Plate Fixation



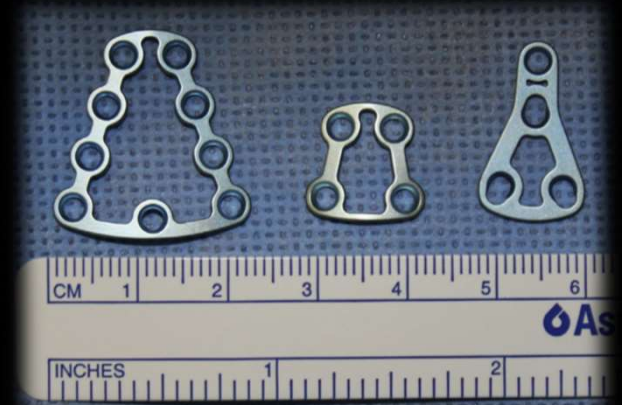
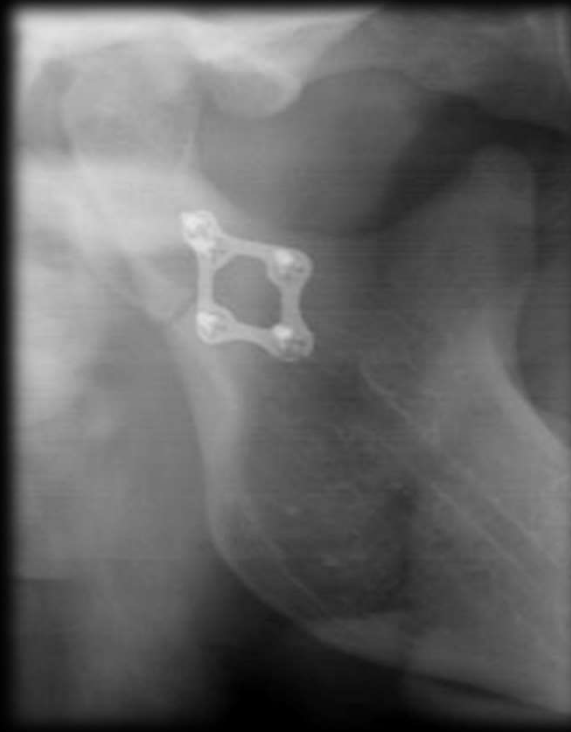
One Plate Fixation



Two Plate Fixation



Geometric Plates



Single Plate vs Double Plates

Literature Review

All articles regarding subcondylar fractures and the modality used for treatment of the fracture were reviewed between January 2000 and July 2018.

- Research was completed using mandible models
 - Polyurethane
- 3 dimensional finite-element analysis
 - With force vectors associated with muscles of mastication
- Cadaver mandible

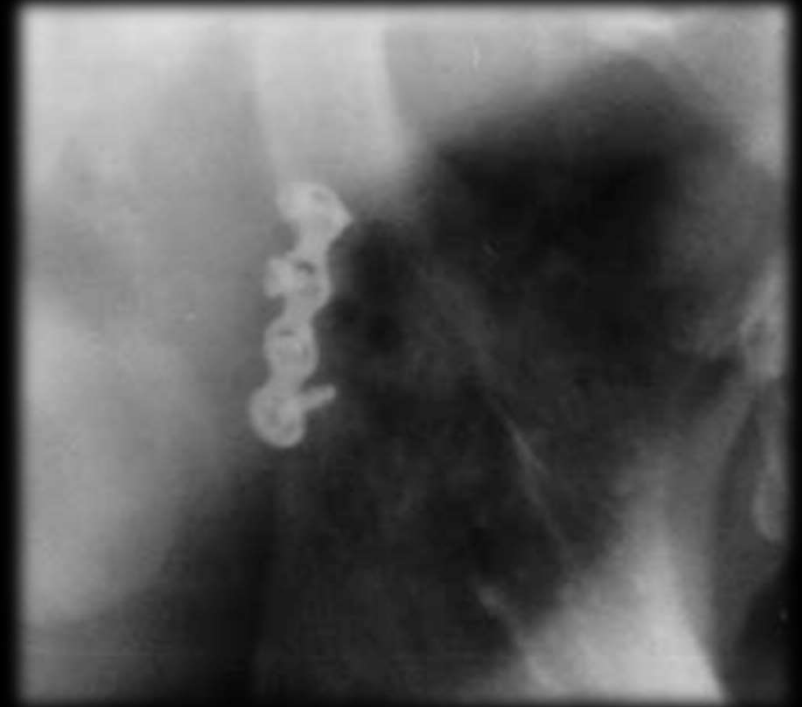
Hardware Failure

- Mean hardware failure in all subcondylar fractures was 6.5%
- Hardware failure in cases for **single miniplate** were greater than 6.5%
- **Double plate**/rhomboid plate/strut plate : <6.5% of hardware failure



Screw Loosening

- Mean Screw loosening in all subcondylar fractures was 5.6%
- Screw loosening **single miniplate** and delta plate >5.6%
- Screw loosening **two mini plates**, compression plate, strut plate <5.6%



Malocclusion

- Mean malocclusion after subcondylar fractures was 11.7%
- Malocclusion: **single plate** >11.7%
- Malocclusion: compression mini plate, **two mini plates**, delta plate <11.7%



Literature supports two plates are superior to one plate

Current Statistics at JMH

Number of cases completed at JMH from July 2013 to March 2019 with single plate fixation: **78**

Transient Facial Nerve Weakness: **1**

Permanent Facial Nerve Weakness: 0

Malocclusion: 0

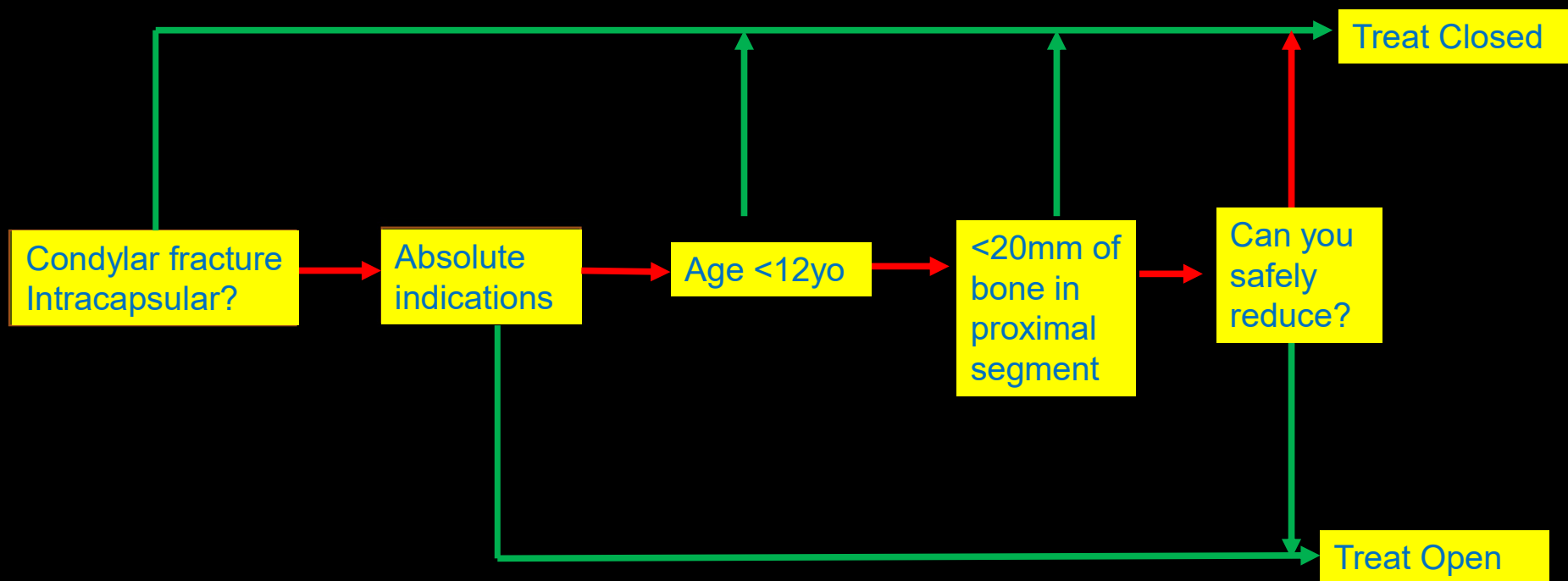
Failed Hardware: **1*(1.28%)**

Loose Screws: 0

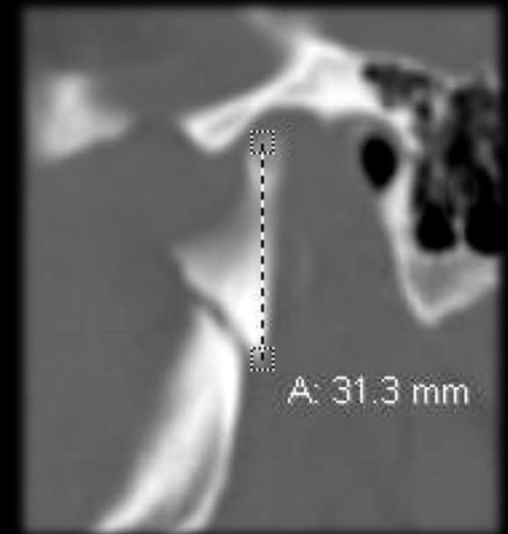
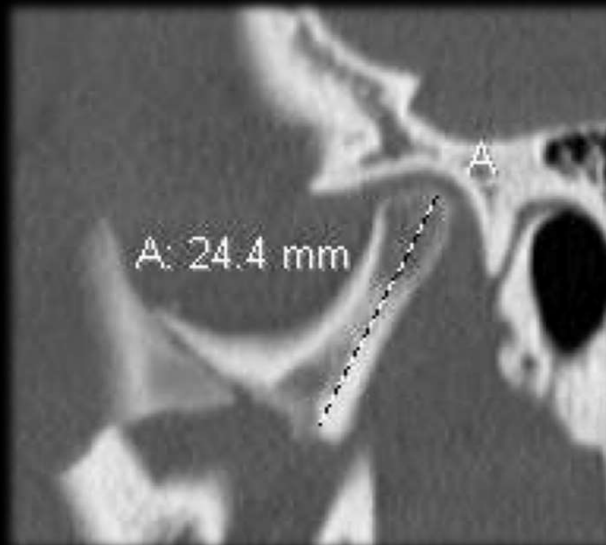
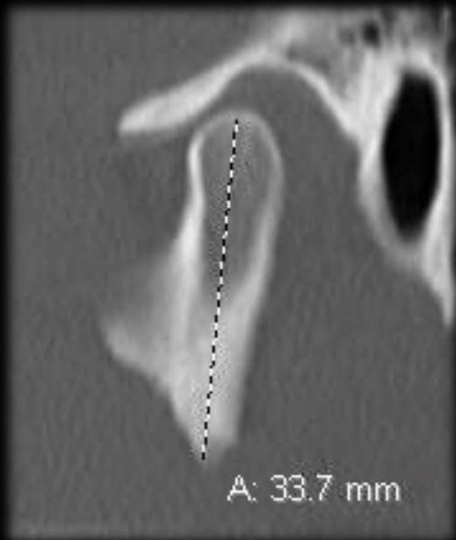
Salivary fistula: **2(2.56%)**

Infection: 0

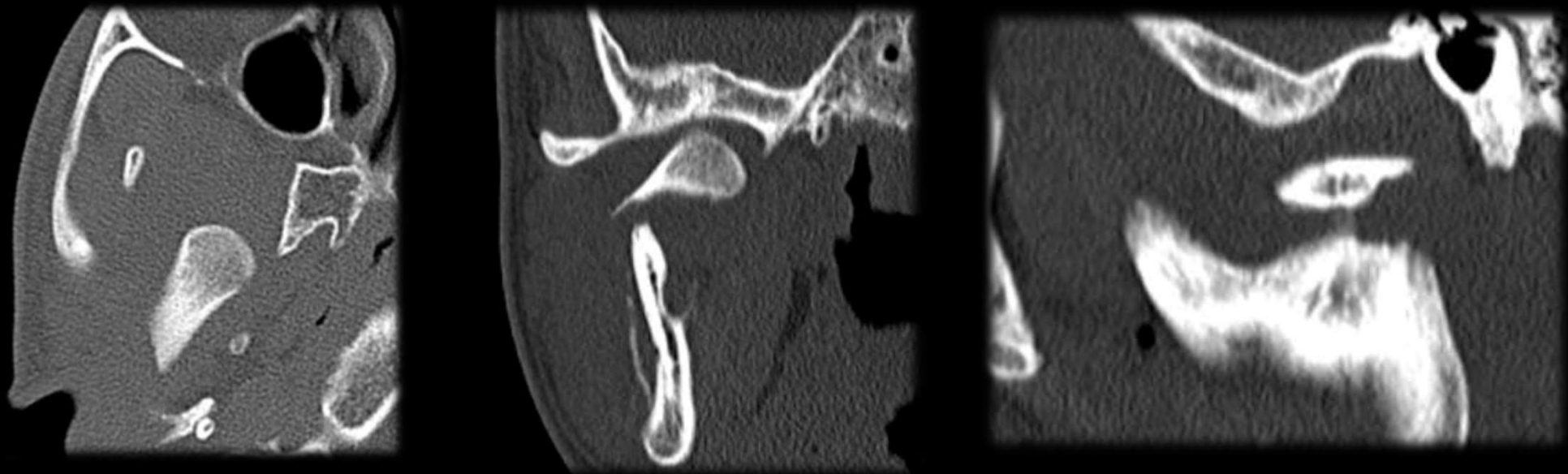
Case Selection in Patients with Malocclusion



Proximal Segment is >20mm



Location of Proximal Segment in Relation to Fossa

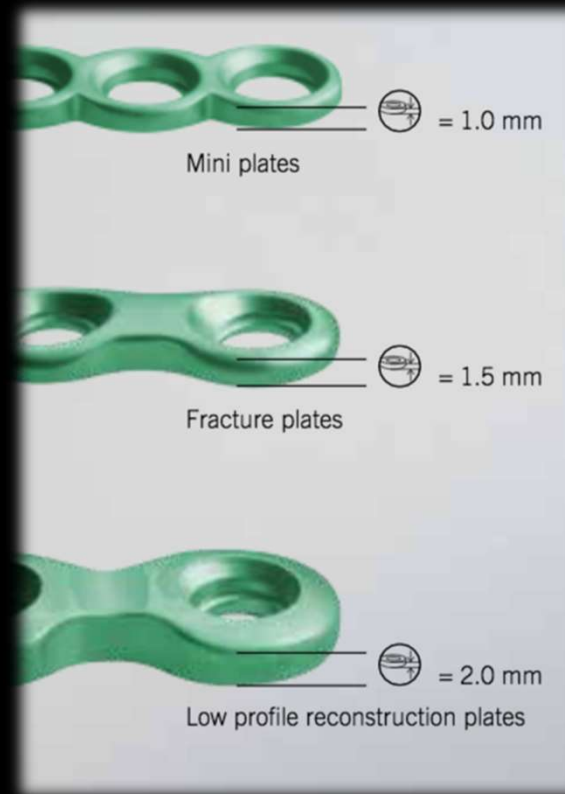
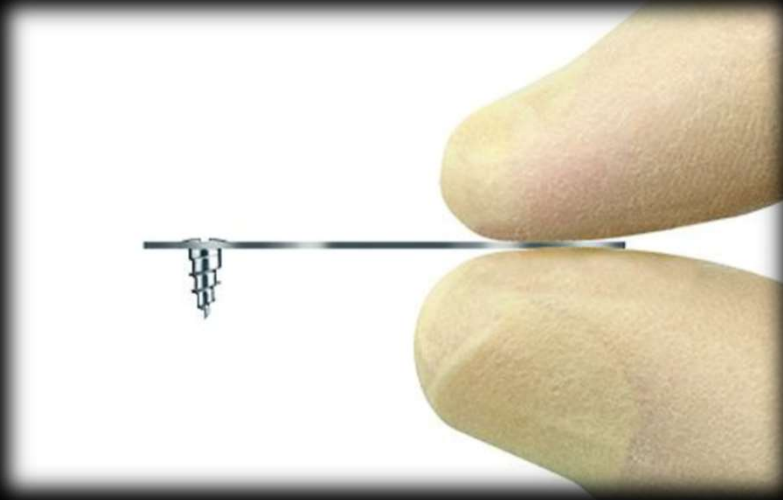


Miami Method

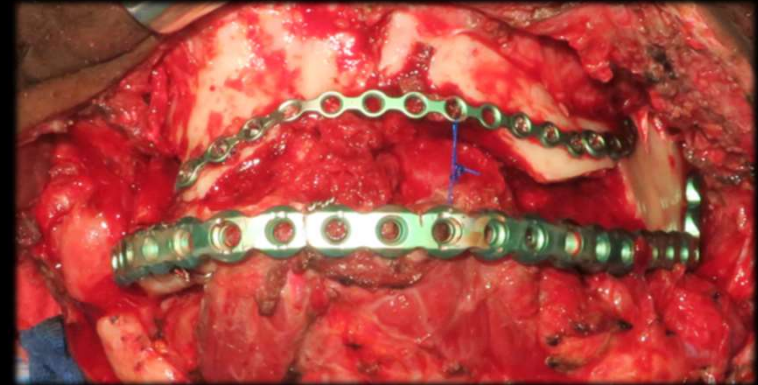
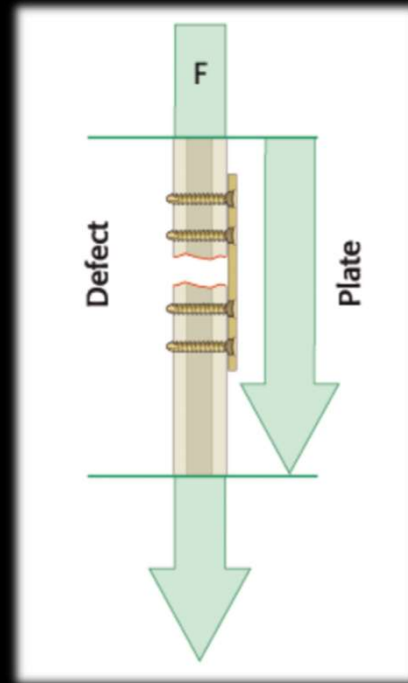
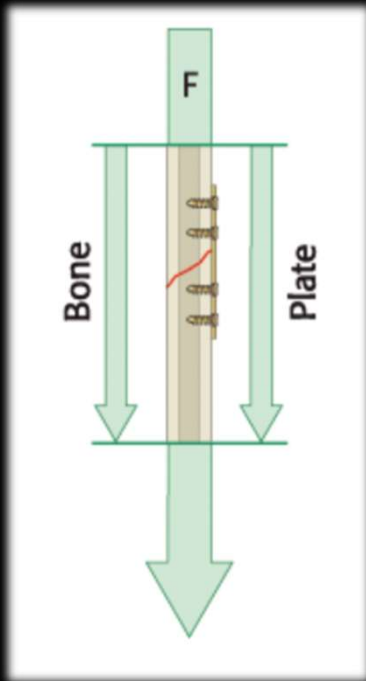
1. Place Erich Arch Bars/IMF screws on patient
2. Expose fracture
 1. Transparotid retromandibular approach
3. Reduce fracture
 1. Distraction of the mandible often required to recapture the proximal segment into anatomical location
4. Place patient into maxillomandibular fixation
5. Fixate the fracture with one 4 hole mandible fracture plate along the posterior border of the mandible
6. Assess occlusion
7. Remove maxillomandibular fixation*
8. Soft diet for 6 weeks following surgery

Discussion

Miniplate vs Fracture Plate



Load Sharing vs Load Bearing plates



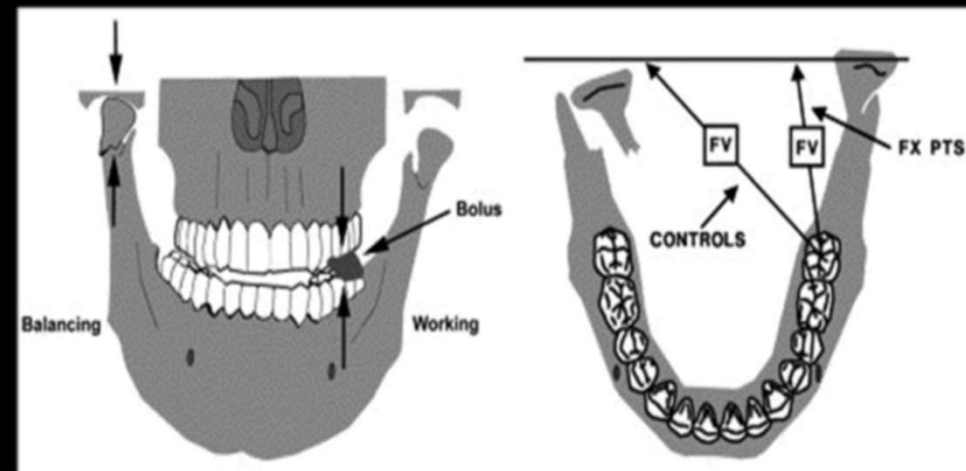
Maximum Bite Force

- Maximum bite force of adult male age independent is **285N** (~64lb of force) at first molar region_f
- Average bite force in women is 30% lower than men
- Bite force in anterior is less than posterior dentition
- Maximum bite force reduced to 60% for 6 weeks following injury
- Expect **161-169.5N** (~38.44lb) at first molar region



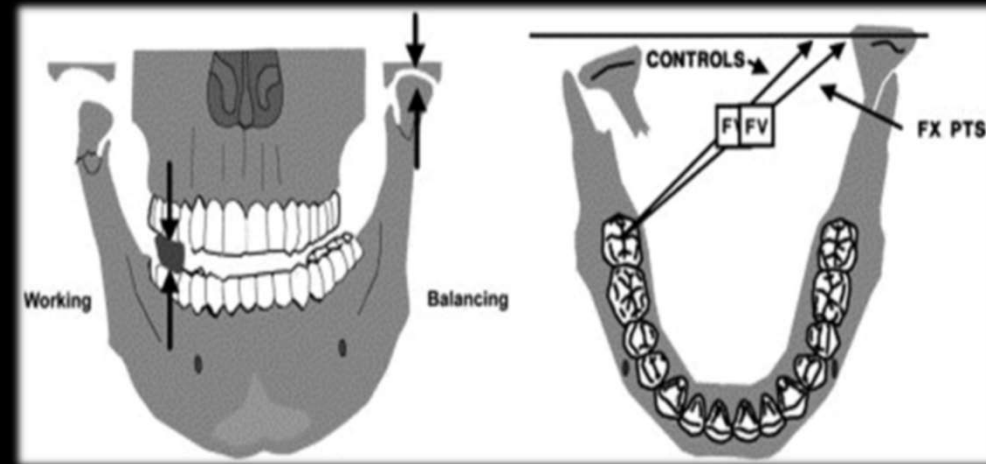
Biomechanics of Mandibular Condyle

- Occlusion on the **contralateral** side will result in forces being exerted on the injured condyle



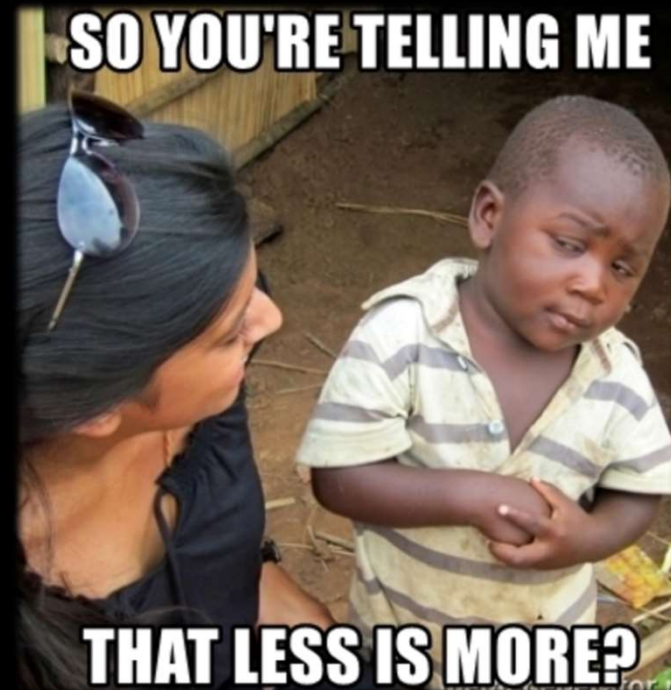
Biomechanics of Mandibular Condyle

- Occlusion on **ipsilateral** posterior dentition results in maximum forces on uninjured condyle
- Minimal loading of the injured condyle on ipsilateral loading



4 Reasons for 1 plate vs 2 plates

- **Less** exposure
- **Less** retraction
- **Less** surgical time
- **Less** hardware



Conclusion

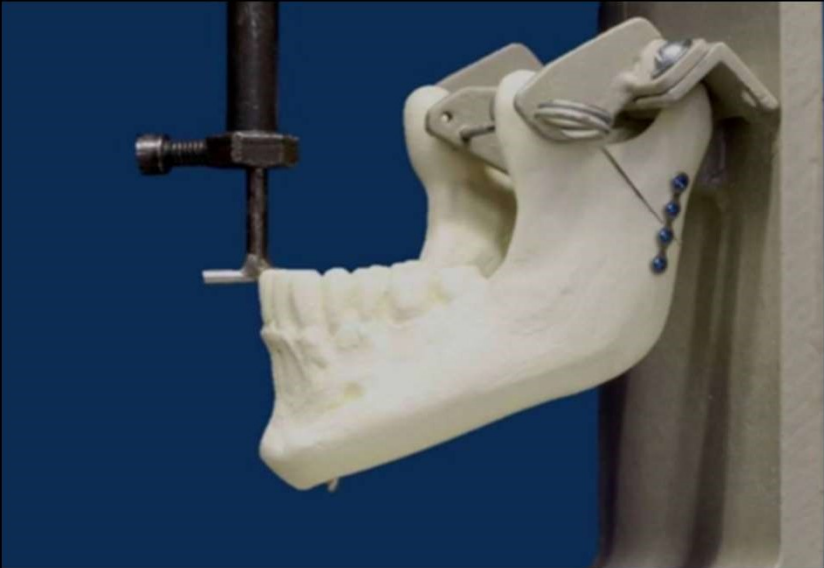
- Open treatment of subcondylar fractures result in better functional outcomes than closed treatment
- Case selection is important
- Current literature would support the use of two mini plates over one for subcondylar fracture repair
- Our program has found that a single mandible fracture plate has been sufficient for fracture repair of subcondylar fractures
- We will continue long term follow up to assess long term results.



O M S

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Spiessl and Schroll Classification

System is based on the location of the fracture and the deviation of the segments

Type I: condylar neck fracture without deviation/ displacement (Fig. 2)

Type II: low condylar neck fracture with deviation/ displacement (Fig. 3)

Type III: high condylar neck fracture with deviation/ displacement (Fig. 4)

IIIa: ventral

IIIb: medial

IIIc: lateral

IIId: dorsal

Type IV: low condylar neck fracture with dislocation

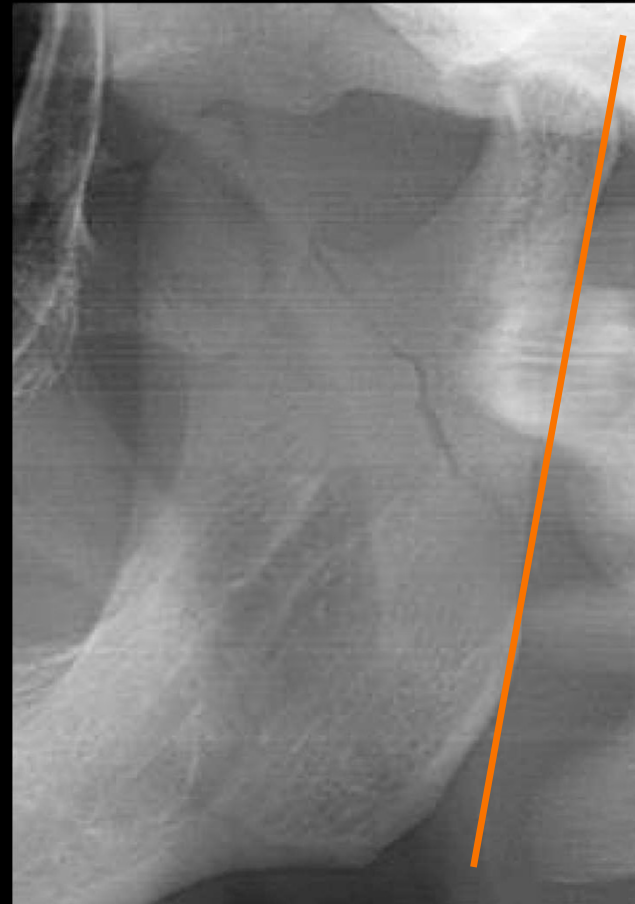
Type V: high condylar neck fracture with dislocation

Type VI: intracapsular fracture of the condylar head

Current literature

- January 2000-July 2018 articles reviewed
- Double plate/rhomboid plate/strut plate : <6.5% of hardware failure
- Single plate and compression plate : >6.5% hardware failure
- Screw loosening single plate and delta plate >5.6%
- Screw loosening two mini plates, compression plate, strut plate <5.6%
- Malocclusion: compression mini plate, two minim plates, delta plate <11.7%
- Malocclusion: single plate >11.7%

Type 1 fracture



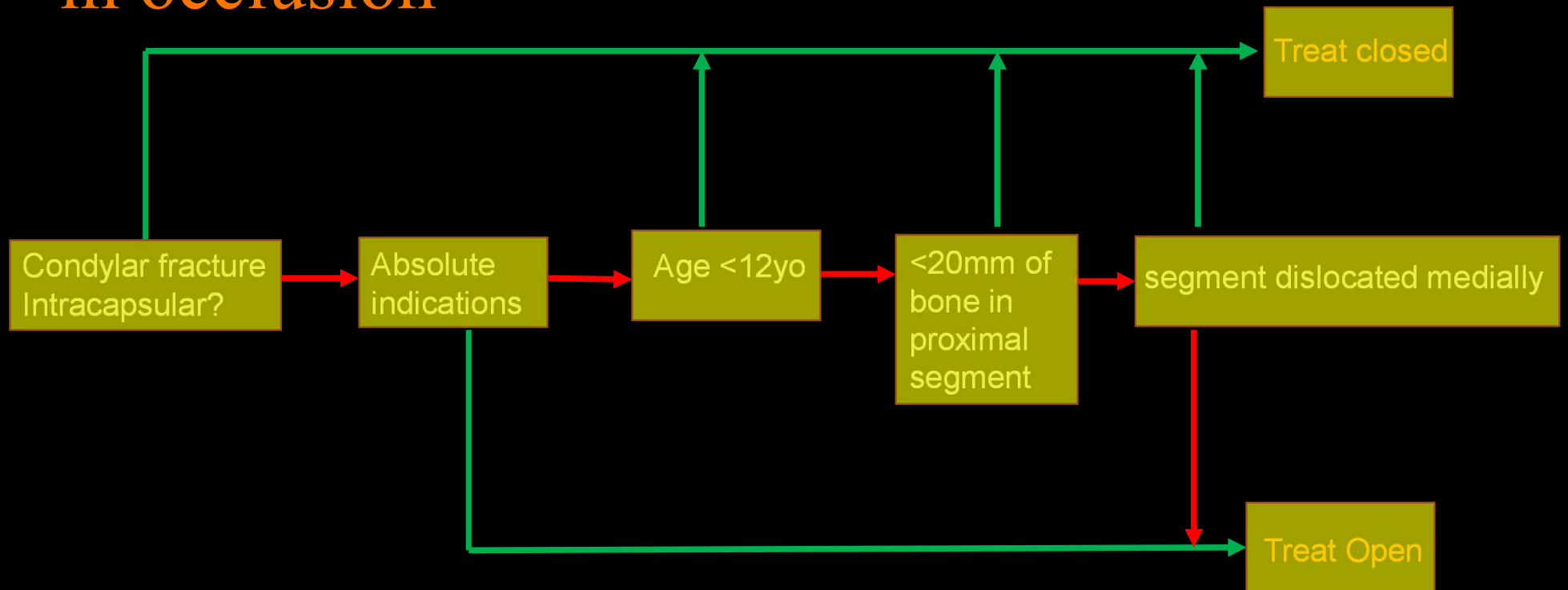
Risks vs Benefits considerations

- Do you have at least 20mm of bone in the proximal segment of bone?
- Is the condyle in the fossa?
- Soft tissue thickness of face
- Minimally displaced?
- Change in occlusion noted
- Bruxism?
- Above max bite force

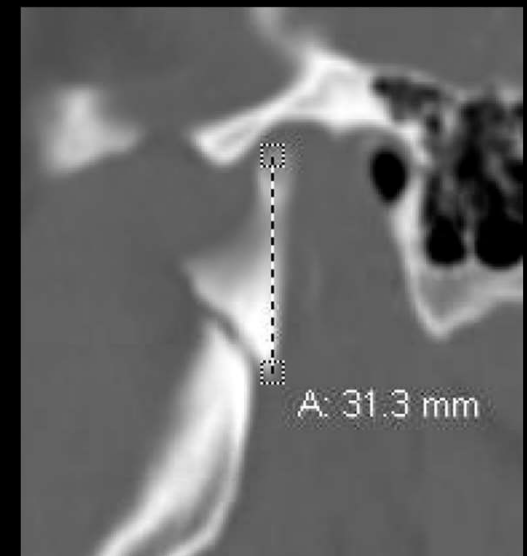
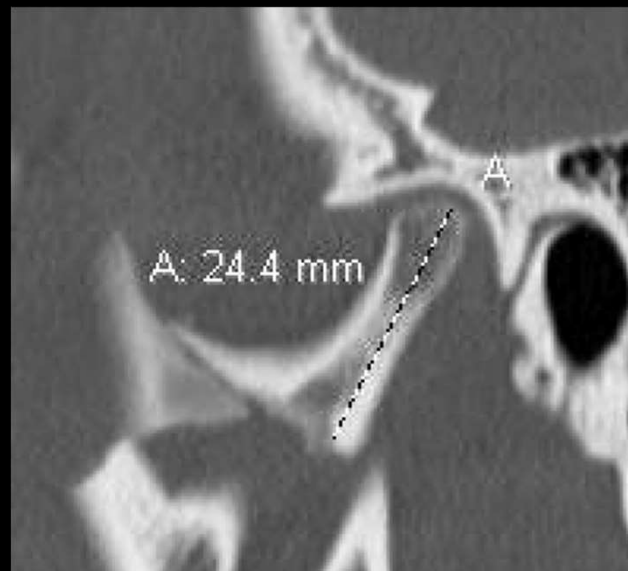
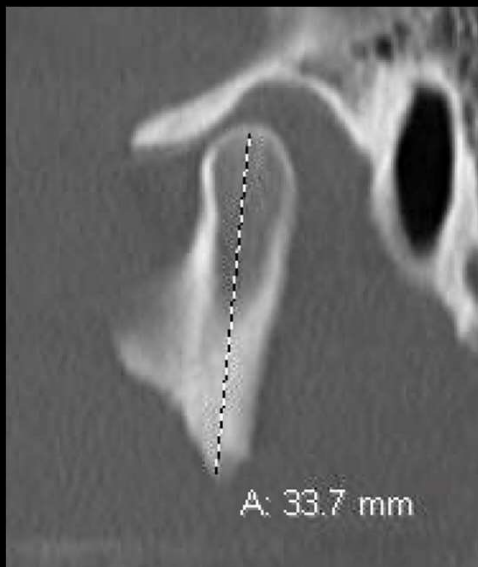




Condylar Fracture Decision Tree with change in occlusion

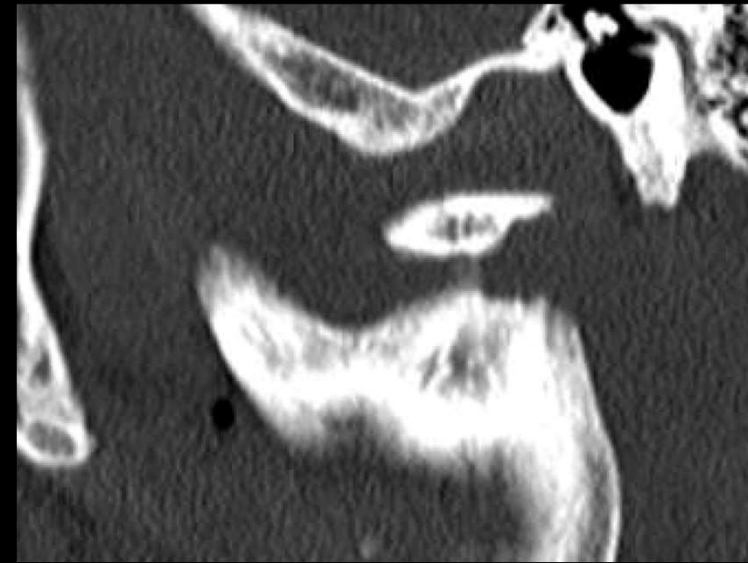


Proximal Segment is a minimum of 20mm



Location of proximal segment in relation to fossa

R



Issues with the studies

- In vitro studies
 - The amount of forces placed on the joints ranged from 200-500***
 - Actual maximum bite force of an adult male is 284N_[3]
 - Bite force after injury to subcondylar region is at 60% for 6 weeks following injury
 - Force vectors used to test non-physiological
 - Use of mini plates as opposed to fracture plates**
 - Finite analysis models showed no contact of the bone

Physiology of mandibular condyle

- Forces on the condyle are decreased when bite force is placed on ipsilateral side due to joint opening
- Force on contralateral condyle with maximum force on biting
- Joints bilaterally have maximum load when the bite force is placed on the anterior dentition
- Tension zone during mastication is along the anterior border of the condylar neck and ****MEDIAL SURFACE**
- Neuromuscular changes to decrease forces on the condyle.

- **Tension Zone** would be predominately along the medial aspect of the mandible
- By placing the plate along the posterior border of the mandible the plate can help mitigate forces

Why is it successful?

Immediate reestablishment of vertical height of mandible

- With decreased exposure we strip less of the blood supply
- More cortical bone along the posterior border of mandible
- Patient selection
- Amount of forces on the subcondylar region following injury is decreased