History

- Ancient Egypt: The Edwin Smith Treatise
- Written approx 3000 BC, translated in 1862
- “An ailment to be treated”
- “An ailment with which to contend”
- “An ailment not to be treated”
The Edwin Smith Treatise

- “If thou examinst a man having a fracture in his mandible, thou shouldst place thy hand upon it...and find that fracture crepitating under they fingers, thou shouldst say concerning him: one having a fracture in his mandible, over which a wound has been inflicted, thou will a fever gain from it.”
- The cause of death was believed to be sepsis
Ancient Greece-Hippocrates

- The son of a physician-priest
- Written in 460 BC
- Describes MMF!
Hippocrates

“Displaced but incomplete fractures of the mandible where continuity of the bone is preserved should be reduced by pressing the lingual surface with the fingers while counterpressure is applied from the outside. Following the reduction, teeth adjacent to the fracture are fastened to one another using gold wire.”
“Modern” Europe

- The first European medical school was in Salerno, Italy in 1180
- Heavily influenced by religion.
- “…take olbaisum, mastic, colophene, glue and dragon blood; all this must be mixed with liquefied resin until it becomes ointment, which is placed over (the fracture)…”
Anatomy: Bony Landmarks

- Condylar Process
- Coronoid Process
- Ramus
- Angle
- Body
- Symphysis/parasymphysis
Occlusion: The Angle Classification

- Based upon the relationship of the first mandibular and maxillary molars
- Class I: normal occlusion
- Class II: an “underbite”
- Class III: an “overbite”
- Observe wear facets
Common Sites of Fracture

- Condyle 36%
- Body 21%
- Angle 20%
- Parasympyphsis 14%
- Coronoid, ramus, alveolus, symphysis 3%
- Weak areas include 3rd molar and canine fossa
Innervation

- CNV3, the mandibular n., through the foramen ovale
- Inferior alveolar n. through the mandibular foramen
- Inferior dental plexus
- Mental n. through the mental foramen
Arterial Supply

- Internal maxillary artery
- Inferior alveolar artery
- Mental artery
Musculature: Jaw Elevators

- Masseter: Arises from zygoma and inserts into the angle and ramus
- Temporalis: Arises from the infratemporal fossa and inserts onto the coronoid and ramus
- Medial pterygoid: Arises from medial pterygoid plate and pyramidal process and inserts into lower mandible
Musculature: Jaw Depressors

- Lateral pterygoid: lateral pterygoid plate to condylar neck and TMJ capsule
- Mylohyoid: mylohyoid line to body of hyoid
- Digastric: mastoid notch to the digastric fossa
- Geniohyoid: inferior genial tubercle to anterior hyoid bone
Favorable Fractures

- Those fractures where the muscles tend to draw fragments together
- Ramus fractures are almost always favorable as the jaw elevators tend to splint the fractured bones in place
Unfavorable Fractures

- Fractures where the muscles tend to draw fragments apart
- Most angle fractures are horizontally unfavorable
- Most symphyseal/parasymphyseal fractures are vertically unfavorable
Diagnosis of Mandible Fx: The History

- ROS: bone disease, neoplasia, arthritis, CVD, nutrition and metabolic disorders, endocrine disorders
- TMJ and ankylosis
- MVA - compound, comminuted fractures
- Fists often single, non displaced fractures
- An angled blow to the parasymphysis often leads to contralateral condylar fractures
- An anterior blow to the chin can lead to
Physical Exam

- Change in occlusion is highly diagnostic
- Anterior open bite suggestive bilateral condylar or angle fractures
- Posterior open bite common with alveolar process or parasymphyseal fractures
- Unilateral open bite with ipsilateral angle or parasymphyseal fracture
- Retrognathic (Angle III) seen with condylar or angle fractures
Physical Exam, Cont

- Anesthesia of lower lip is "pathognomonic" of a fracture distal to the mandibular foramen
- The converse is not true: not all fractures distal to the mandibular foramen have mental n. anesthesia
- Trismus of less than 35mm also highly suggestive of mandibular fracture
Physical Exam, Cont

- Inability to open the mandible suggests impingement of the coronoid process on the zygomatic arch
- Inability to close the mandible suggests a fracture of the alveolar process, angle, ramus or symphysis
Lacerations and Ecchymosis

- Mandibular fractures can often be directly visualized beneath facial lacerations.
- Lacerations should be closed after definitive therapy of the fracture.
- Ecchymosis is diagnostic of symphyseal fractures.
The mandible should be palpated with both hands, with the thumb on the teeth and the fingers on the lower border of the mandible. Slowly and carefully place pressure, noting the characteristic crepitation of a fracture.
Radiographic Exam

- Panorex shows the entire mandible, but requires the patient to be upright. It also has particularly poor detail of the TMJ and medial displacement of the condyles
- AP - ramus and condyle
- Submental - symphysis
- CT - condylar fractures
General Principles of Treatment

- The general physical status should be thoroughly evaluated.
- 40% associated with significant injury, 10% of which are lethal
- Cerebral contusion is common
- ABC’s!
- Almost never emergent
General Principles, Cont

- Dental injuries should be treated concurrently
- Reestablishment of occlusion is the primary goal
- Fractured teeth may jeopardize occlusion
- Mandibular cuspids are cornerstone of Tx
- Prophylactic antibiotics
General Principles, Cont

- With multiple facial fractures, mandibular fractures are treated first
Closed Reduction

- Grossly comminuted fractures
- Significant tissue loss
- Edentulous mandibles
- Fractures in children
- Condylar fractures
- Contraindicated in SzDo, psych, and compromised pulmonary function
Open Reduction

- Displaced, unfavorable fractures of angle
- Displaced unfavorable fractures of the body or parasympyphysis, as these tend to open at the inferior border, leading to malocclusion
- Multiple fractures of facial bones
- Displaced, bilateral condylar fractures
Closed Reduction of the Dentulous Patient

- Erich Arch Bars. Can lead to periodontal inflammation.
- Avoid fixating incisors, as these teeth are moved by the wires
- Ivey loops
Closed Reduction of the Partially Edentulous Patient

- Partials and circum wires or screws
- Acrylic partials with incorporated arch bar wires
Closed Reduction of the Edentulous Patient

- Dentures with circum wires and screws
- Fabricated acrylic plates (Gunning Splints)
- In fractures of both the mandible and maxilla, circumzygomatic and circum-mandibular wires should be tied together to prevent telescoping of maxilla
Open Reduction and Osteosynthesis

- Simpler than rigid fixation
- MMF still required
- Useful in angle, parasympphyseal fractures
ORIF

- Performed with compression plates and lag screws
- MMF generally not required
- Eccentrically placed holes and screws placed at angles “compress” the bone
Complications

- Socioeconomic groups
- Infection (James, et. al.)
- Delayed healing and malunion. Most commonly caused by infection and noncompliance
- Nerve paresthesias in less than 2%
Study by James, et al.

- Prospective study of 422 pts
- Infection rate 7%
- 50% of infections associated with fractured or carious teeth
- ORIF led to 12% infection rate
- Staph, strep, bacteroides
- Prophylaxis, tooth extraction
Controversies

- Prospective, 8 year study at Parkland involving angle fractures
- Nonrigid fixation had 17% complication rate
- AO Recon plate had 8% complication rate
- DCP had 13% complication rate
- Non compression plate 3% complication rate