Mandibular fractures
DSDS 420

Introduction
- The mandible is the second most commonly fractured part of the maxillofacial skeleton because of its position and prominence.

Embryology
- Divide the mandible into 5 areas
  - Area 1: Condyle: covered by fibrocartilage and has core of growth cartilages which allow endochondral bone formation throughout life.
  - Primary function of the condyle: Articulation although it has a growth centre. If you cut it the mandible still be normal.
  - Area 2: Coronoid and it is mainly for muscle attachment
  - Area 5: alveolar process for holding the teeth
  - Area 4: mandibular corpus or body to support the alveolus.
  - Area 3: the ramus: the remodelling is dependent on the other parts. So, its primary function is compensation
  - According to the remodelling process of the mandible, There is a displacement downward> forward and remodelling backward>upward.

Muscles of mastication
- Lateral pterygoid (opens the jaw, lateral movements)
- Medial pterygoid (Closes the jaw)
- Temporalis (Closes the jaw)
- Masseter (Closes the jaw)
- Other muscles such as suprahyoid muscles can help in the movement of the mandible
- Together with ligaments these muscles control the movement of the jaw in all direction.

Factors that make the mandible complex structures
- Movement
- Muscles attachments
- Related vital structures
- Teeth
- Blood supply

Blood supply of the mandible
- Inferior alveolar artery
- From the periosteum
- In atrophic mandible the blood supply may depend on the periosteum
Prevalence of mandibular fracture

- Female to male ratio 3:1
- Different incidence depending on the study and the country
- Could be single, multiple and bilateral

Biomechanical considerations

- Most of the knowledge available about the mechanism of fractures of mandible are from clinical opinion.
- When applying forces to the mandible there will be (tension and compression).
- More than 75% fractures of the mandible due to tensile strain.
- In the condyle, the fracture is mainly due to compressive force.
- Because of foramina, some weak and rigid areas and other factors, the mandible is considered a complex structure.
- Due to these factors, the force will be different and greater in some areas of the mandible compared to others.
- All types of fractures can occur in the mandible irrespective of the occlusion status.
- Impacted teeth can affect the incidence of fracture/ and reduce the condyle fracture because the area becomes weak at the impaction site, so the mandible fracture at this area before it transmits the force to the other areas.
- Mandible opening at the time of injury can increase fracture incidence

Evaluation of mandibular fractures

- Following the basic life support and ATLS system
- Evaluate other injuries for example intracranial, spinal, chest...etc.
- Accurate history.
- Features and complaints: swelling, pain, tenderness, hematoma, asymmetry, difficulty of chewing, limited mouth opening, malocclusion, lacerations, numbness (mainly to displaced fracture)..etc.

Clinical examination

- Inspection and palpation
- Shifting of movement, deviation, loss of vertical height
- Examination from top to down from behind the patient
- Palpate the movement of the condyle, external acoustic meatus. May feel no movement or the condyle is not palpable.
- Deviation toward the fractured site.
- If bilateral condylar fracture, there may be no deviation.
- Open bite, limited mouth opening, limitation of motion.
- Be aware of other causes of mandibular motion limitation (zygomatic fracture or muscle spasm)
- Bleeding can bee seen from the ear due to tear of anterior wall of the external acoustic meatus.
- Examination of soft tissues is important.
- Sublingual ecchymosis/hematoma (pathognomonic of mandibular fracture)
- Check broken teeth, step deformities, malocclusion.
- For edentulous patient dentures can be used to assess the mandible.

**Radiographic evaluation**
- 2 views at right angles to each other e.g. panoramic and reverse Towne’s view.
- Lateral oblique in case we can’t take panoramic
- Other views: occlusal, periapical.
- CT can help in more diagnosis and its indications include: significant displacement, limited range movements, changes in osseous anatomy, multiple trauma, and difficulty in obtaining plain radiographs.
- In 92% of cases of fractures can be diagnosed from panoramic radiographs compared to 66% in routine radiographs.

**Classifications**
- Displaced or non-displaced
- Favourable or non-favourable (muscles effect): if the muscle helps in the maintaining of the position of the fractured segments, this fracture can be called favourable fracture.
- For condylar fracture: level, relation of the condylar fragment, degree of displacement and degree of dislocation.
- The most common displacement of the condyle is backward and medially
- **Anatomical location**
  - Dentoalveolar: tooth bearing area
  - Symphyssis: incisors region, runs vertically or almost vertical
  - Parasympyssis: distal of the lateral incisor to the mental foramen (from alveolar process to the inferior border).
  - Body: between mental foramen to distal of the 2nd molar
  - Angle: distal to 2nd molar to the junction between the body and the ramus
  - Ascending ramus: horizontal or vertical (antero posterior or from sigmoid to the lower border).
  - Condylar: from sigmoid distally, could be intracapsular or extracapsular.
- **Pattern of fracture**
  - Simple: single, no communication with exterior
  - Compound: have communication with the exterior for example through the PDL or laceration.
  - Greenstick: involving one surface, incomplete
  - Comminuted: multiple pieces.
  - Complex: involving vital structure such as the nerve.
  - Telescoped or impacted: piece is driven into another.
  - Indirect: trauma in one side and the fracture in the other site like trauma to the chin and fracture of the condyle in the other side.
  - Pathologic: due to pathology.
  - Displaced: fracture can be non-displaced (normal location), deviated (simple angulation) or displaced (gap between fragments).
  - Dislocated: example, when the condyle moves away from the articulation
You can have combinations of different classification to describe the fracture.

- Dislocations:
  - Anterior dislocation
    - Subluxation of the condyle is anterior extension of the condyle while dislocation is not self-reducing.
    - Dislocation can also occur unilaterally
    - Dislocated mandible will show open bite
    - Dislocation without fracture can be managed by local anaesthesia and manual reduction. If unsuccessful used sedation or even GA
    - After successful reduction: restrict mouth opening by instructions or bandage.
  - Lateral dislocation
  - Superior dislocation: into the middle cranial fossa

- Effusion and hemorrhosis: collection of fluid within the joint. Management depends on the situation including observation + anti-inflammatory and soft diet. Arthrocentesis and arthroscopy or both can be used.

**Treatment of mandibular fractures**

- Reduction and fixation
- Reduction: realignment of the fractured segments into original location
- Fixation: to prevent movement of the fractured segments during the healing process
- The main aim is to have healing by primary intention (no gap between the segments).
- Intermaxillary fixation (closing the two jaws together): advantages include (can affect the speech, diet, breathing, oral hygiene and jaw function).
- Methods of fixations can include the followings:
  - Miniplates
  - Screws
  - Compression plates
  - Reconstruction plates
  - Wires, arch bars
- For edentulous patients: denture can be used or construction of gunning’s splint.
- Tooth in the fracture line:
  - Absolute indications for removal:
    - Longitudinal fracture
    - Dislocation or subluxation
    - Periapical infection
    - Infected fracture line
    - Acute pericoronitis
  - Relative indications for removal
    - Tooth to be removed later
    - Advanced caries
    - Periodontal disease
    - Doubtful tooth
    - Untreated fracture for more than 3 days