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# A Detailed Anatomical Review on Mandibular Fracture

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**Review Article**

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**Abstract:** Mandible is an important and the only movable bone in the craniofacial region. According to the old anatomists, it resembles a u-v shaped blunt bend. The mandible bears teeth, and this horseshoe-shaped/ v- bend bone is attached to many muscles. Understanding anatomy and kinesiology of mandible helps the practitioner/surgeon to choose the best treatment modality and surgical approach.
**Keywords:** Anatomy, Mandibular fracture.

## INTRODUCTION

The definition of the fracture is "Breach in the continuity of bone" this is a general agreement amongst various authors: Rowe and Killey [1] Kruger [2].

### Anatomy of the lower third / mandible

Huelke [3]: Almost four times as much force is required to fracture the mandible versus maxilla. The mandible is basically a long tubular bone which is bent into a blunt V- shape with strength residing in cortical plates. The cortical bone is thicker anteriorly and at the lower border of the mandible; while posteriorly the lower border is relatively thin thus the mandible is strongest anteriorly in the midline with progressively less strength towards the condyles.

The periodontal ligament and bone alveolus also combine with the trabecular pattern in the cancellous bone and are directed in a parallel fashion up the ramus to transmit pressures up to the condylar region [3].

Halazonetis: Areas that exhibits weakness include the area lateral to the mental protuberance, mental foramen, mandibular angle and the condylar neck [4]. Huelke: If teeth are present, the socket is weak zone, especially if teeth are impacted or unerupted [4].

In many studies it states that bone fracture at the site of tensile strain, since their resistance to compressive forces is more significant. Lots of published literature shows that isolated mandible liable to a particular pattern of distribution of tensile strain when forces are applied to the symphysis menti, over one mental foramen or over the mandibular body, lead to strain at the condylar neck and along the lingual plates in the opposite molar region [5].

### Mandibular fracture

According to Neelima Malik [6] mandible is the third most likely bone face fracture following nose and zygoma.

Despite the fact that it is the heaviest and strongest facial bone, the mandible is prone to fractures for some specific reason:

- It is an open arch
- Located in the lower portion of the face
- The mechanism of hyperextension and hyperflexion of the head in a traffic accident
- Atrophy as a result of aging

### The Muscle Effect

The Direction of the causative below, the direction of line of fracture and muscle pull all influences the amount and the direction of bone displacement.

Ramus: Very little displacement as it is splinted by masseter on lateral aspect and medial pterygoid on medial aspect.

Coronoid: Rare Fracture site. Occurs due to- Reflex muscular contraction of the strong temporalis muscle. Displaced upwards towards the infratemporal fossa Condyle: Displaced upward and backward due to pull of sling of the mandible (masseter+ medial pterygoid, Aided by temporalis muscle

Bilateral Para symphysis Fracture: Anterior Fragment displaced downward and backward due to pull of suprahyoid muscles (mylohyoid+ geniohyoid+anterior belly of digastrics) and medially by mylohyoid muscle.

Midline Symphysial fracture: Minimal displacement occurs as fracture line pass between genial tubercle

Angle: Displaced upward and medially due to medial pterygoid. Bucket Handle Displacement/ fracture: Seen in case of bilateral fracture of the body of the edentulous mandible occurring near the posterior attachment of mylohyoid diaphragm, with anterior fragment displaced downwards and backward due to pull of the digastric and mylohyoid muscle [1, 2, 6-7].

**Classification**

**A) Rowe & Killey [1] Classified according to Favorability**

Vertically favorable or unfavorable [1]

Vertically Favorable: Fracture line runs- from buccal plate anteriorly and backward through the lingual plate posteriorly.

Vertically Unfavorable: Fracture line runs – from Lingual plate anteriorly and backward through the buccal plate posteriorly

Horizontally favorable or unfavorable

Horizontally Favorable: Fracture line runs from Upper Border
Downwards and Forwards

Horizontally Unfavourable: Fracture line runs- from Upper Border

Downwards and Backwards [1, 2, 8].

**B) Kazanjian and Converse [9] classified mandibular fractures**

By presence or absence of serviceable teeth in relation to the line of fracture. This may be helpful in determining treatment [9].
Class I: Teeth are present on both sides of the fracture line
Class II: Teeth are present only on one side of the fracture line
Class III: Patients is edentulous [8, 9].

**C) Lindahl [20] classified condylar fractures based on**

**1). Classification of fracture level**
Condylar head
- Condylar neck.
- Sub condylar region [10].

**2). Classification of the dislocation at fracture level of the condylar Neck and Sub condylar fracture:**
- Angulation with Medial override
- Angulation with lateral Override
- Angulation with Without Override
- Fissure

**3.) Classification of the position of the Condylar Head with respect to the Articular Fossa:**
- No Displacement
- Slight Displacement
- Moderate Displacement
- Dislocation

**4.) Classification of the Condylar Head Fractures:**
- Horizontal
- Vertical
- Compression[10]

**I) FLOSA Classification [6, 8-9]**

The first attempt for unified and standard classification of mandibular fractures is a so-called formula of fracture of Gratz. It consists of alphanumeric symbols analogic to a TNM classification of tumors. The author mentions the following categories:

F- Fracture
L- Localization
O- Occlusal disorders
S- Soft tissue injuries
A-Associated maxilla-facial injuries

F: Fracture
Fo: Incomplete Fracture
F 1: Single Fracture
F2: Multiple Fractures (Segmental Fractures)
F3: Comminuted Fracture
F4: Fractures with a bone defect

L: Location

L1: Precanine
L2: Canine
L3: Post canine
L4: Angular
L5: Supra –Angular
L6: Condylar
L7: Coronoid
L8: Alveolar

O: Occlusion

Oo: No Malocclusion
O1: Malocclusion
O2: Nonexistent Occlusion (edentulous Mandible)

S: Soft-Tissue Involvement

So: Closed
S1: Open Intraorally
S2: Open Extra orally
S3: Open Intra and Extra orally
S4: Soft- tissue defect

A: Associated Fractures

Ao: None
A1: Fracture and /or loss of teeth
A2: Nasal Bone
A3: Zygoma
A4: Le Fort 1
A5: Le Fort 11
A6: Le Fort 111

**Etiology**

The cause of maxillofacial fractures varies widely from one country to another because of social, cultural and environmental factors [11-12].

Asadi *et al.* reported the most common site of the lower jaw to sustain injury in his study was the angle of the mandible [13], supporting the results of Halazonetis: when lower jaw is fractured at single location, angle is the most vulnerable site [4], However, Ellis *et al.* stated that body is more prone to trauma than the angle [7].

Al Ahmed *et al*. in his study of 252 cases recorded 51% cases of Mandibular Fracture and 49% Mid Face Fracture[14]. Brasilerio *et al*. reported prevalent anatomic region of facial fractures as Mandible 41.3% followed by Zygomatic Complex Fracture 38.9 % Nasal Bone Fracture 22.2%, Maxilla 6.0 %, and Frontal 2.4 % [15].

**Radiographs**

Panoramic radiographs bitewings, frontal cephalometric radiographs, and lateral head films have predominantly been used [16-19].

Radiographs can also yield information about the density of the surrounding bone. The sclerotic cancellous bone may require that the surgeons remove more bone to facilitate fracture reduction and bone plating, whereas bone with sparse trabecula ion would require less force and less bone removal [16].

| Conventional Radiographic projections:[16-20] |
|---|
| Postero-Anterior View of Skull |
| Lateral oblique 30 degree of concerned side |
| Occlusal view of mandible |
| Tmj- Open and closed mouth |
| Intraoral periapical X-ray – for dentoalveolar fracture. |

| Specialized radiographs:[18-19] |
|---|
| Orthopentograph |
| C.T. scan of Mandible and/or T.M.J |
| M.R.I for muscles |

Similar predictions about the surgical access and degree of difficulty need to be made regarding the position of an impacted mandibular third molar or fracture line which relates to the position of the inferior border, angle, and ramus of the mandible [2, 6-9, 17]. Also of major importance is the position of the fracture line relative to the neurovascular bundle in the mandible, i.e., the inferior alveolar (mandibular) canal [6-9, 17-20].

**CONCLUSION**

For Proper diagnosis by a maxillofacial surgeon and to provide better treatment and care for the trauma patient, it is necessary to know the proper anatomy, classification, and radiographs techniques. A detailed review also helps the dental surgeon for a fair understanding of cases with successful surgical outcomes

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