

Various techniques in the fixation of mandibular fractures – A review literature

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ABSTRACT

Background: The efficacy in the fixation of mandibular fractures has been improving day by day. The techniques in the refinement of fixing mandibular fractures have evolved drastically. These progressively improving techniques provide functional and esthetic outcomes in the oromandibular fixation. The recent advances in the surgical techniques, plating technology, and thorough understanding of the angiogenic property have made fixing reliably complicated mandibular fractures possible. This review article highlights the state of the art technology and latest innovations in the mandibular fracture fixation. **Conclusion:** As an end point, the newer advancements and techniques are going to be upgraded day by day, thus aiding in the comfort of the patient as well as to the clinicians for better results and better prognosis. Different types of techniques are available according to different types of mandible fractures. This article throws insight into the various techniques (conventional to contemporary) of mandibular fracture fixation readily useful to the clinician as well as to the patient on the prognosis part.

KEY WORDS: Fracture, Mandible, Prognosis, Techniques

INTRODUCTION

Fracture is nothing but a break or discontinuity of bone. Mandibular fracture is nothing but the fracture involving lower jaw or mandible. Etiology involves (1) vehicular accidents involving (road traffic accident)– 43%, (2) interpersonal violence and assaults – 34%, (3) falls – 7%, (4) contact sports 4%, (5) industrial/work related – 10%, and (6) pathological fracture – unconfirmed. Studies have shown that the incidence of mandible fractures is influenced by various etiological factors, for example, geography, social trends, road traffic legislations, seasons, etc.

With rare exception, mandible fractures are not surgical emergencies. Emergencies involving mandibular fracture happen with unfavorable fractures involving bilateral parasymphysis fracture pulling the anterior part backward and compromising the airway.^[1] Paralysis of tongue and consequently leading to choking.

There are various types of mandible fractures.

Simple – Includes closed linear fractures, compound or open, comminuted, greenstick, pathologic, multiple, impacted, atrophic, complicated, or complex

Classification by Anatomic Region

Dingman and Natvig anatomic locations of mandible are as follows: Condylar process, coronoid, ramus, angle, body, symphysis, parasymphysis, and alveolar process.

DISCUSSION

Treatment Protocol

- Primary survey
 - A. Airway maintenance and cervical spine protection
 - B. Maintenance of breathing and ventilation
 - C. Circulation and hemorrhage control
 - D. Disability/neurological examination – AVPU
 - E. Exposure under proper environment.
- Secondary survey – head-to-toe evaluation, including a complete history and physical examination and reassessment of all vital signs
- Tertiary survey in hospital care.

Definitive in-hospital Treatment

Reduction which means the restoration of a functional alignment of the bone fragments by the use of occlusion, i.e., by

- Open reduction
- Closed reduction.

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Fixation through fracture line, that is, by immobilization and to allow bone healing

- Rigid
- Non-rigid.

Indications for closed reduction will be non-displaced favorable fractures, grossly comminuted fractures, significant loss of overlying soft tissue, edentulous mandibular fractures, mandibular fractures in children, coronoid process fractures, and condylar fractures. Open reduction can be done on displaced unfavorable fractures, multiple fractures of the facial bones, midface fractures and displaced bilateral condylar fracture, fractures of an edentulous mandible with severe displacement of fracture segment, edentulous maxilla opposing a mandibular fracture, delay of treatment and interposition of soft tissue between non-contacting displaced fractures fragments, malunion, and conditions contraindicating intermaxillary fixation.

Tooth in line of fracture can be removed in cases of vertical fracture of the mandible, dislocation or subluxation, periapical infection, infected fracture line, and acute pericoronitis.^[2] Relative indications will be functionless advanced caries, advanced periodontal disease, doubtful teeth, and teeth involved in untreated fractures presenting more than 3 days after injury.^[3]

Methods of Immobilization

Intermaxillary fixation with osteosynthesis by transosseous wiring, circumferential wiring, external pin fixation, bone clamps, transfixation with Kirschner wire. intermaxillary fixation without osteosynthesis by compression plates, mini plates, lag screws.

Period of immobilization will be 3 weeks for young adults with fracture of the angle receiving early treatment, in which tooth removed from fracture line if tooth retained in fracture line add 1 week of immobilization, fracture at the symphysis add 1 week of immobilization, those with age 40 years and over add 1 or 2 weeks of immobilization, and children and adolescents subtract 1 week of immobilization. Various dental wiring techniques will be Essig's wiring-(single-double wiring) (Charles J. Essig), Gilmer's wiring, Risdon's wiring- (twisted labial wire) (E. Fulton Risdon), Ivy eyelet wiring (Robert H. Ivy), clovehitch wiring, Col. Stout's multiloop wiring (R. A. Stout), and button wiring (Varzad Hovhannes Kazanjian).

Management of Coronoid and Ramus Fracture

Most ramus fractures can be treated with maxillomandibular fixation (MMF) \times 6 weeks, the most intraoral plating, external approach for plating is similar to that of angle fractures, coronoid fracture

is uncommon and if it occurs, it is usually associated with a zygomaticomaxillary complex fracture.^[4]

Management of Condylar Fracture

Most condyle fractures can be treated with MMF \times 2–4 weeks. If the head is involved, MMF is limited to 2 weeks to prevent temporomandibular joint (TMJ) ankylosis.^[5] Frequent scenario is a condyle fracture with contralateral parasymphyseal, body, or angle fracture – treat contralateral fracture with open reduction and internal fixation (ORIF) and condyle fracture with MMF \times 2–4 weeks.^[6] When plating is required, an external approach is preferred. External approach is similar to the angle approach but with the superior end of the incision brought to about 2 cm from the earlobe.^[7] Controversial treatment options are between closed or open reduction; treatment aim will be to recover normal TMJ function. Treatment choice depends on fracture level, amount of displacement, adequacy of the occlusion, and age.

Advantages of open reduction will be early mobilization of the mandible, better occlusal results, better function, maintenance of posterior ramal height, and avoidance of facial asymmetries. Disadvantage will be risk of damage to the facial nerve branch and there is a chance for cutaneous scar.

Closed reduction includes MMF with elastics, degree of displacement of the condyle fracture is used in the deciding whether to approach by closed method or open method. Mikkonen *et al.* recommended open reduction if the condylar displacement was $>45^\circ$ in a sagittal or coronal plane. Widmark *et al.* recommended opening such fractures if the displacement was $>30^\circ$. Absolute indication will be displacement of the condylar head into the middle cranial fossa, impossibility of obtaining adequate occlusion by closed reduction, lateral extracapsular displacement of the condyle, and invasion by a foreign body (e.g., gunshot wound).

Relative indications will be bilateral condyle fracture in edentulous patients; unilateral or bilateral condyle fractures when splinting is not recommended for medical reasons; bilateral condyle fractures associated with comminuted midface fractures; and bilateral condyle fractures and associated anthropological problems (e.g., lack of posterior occlusal support).

Management of Mandibular Angle Fracture

One of the most common fracture sites. Non-displaced fractures can be treated with MMF \times 6 weeks. Although maintenance of the absolute rigidity on the treatment of angle fractures has been major principle. In 1973, Michelet *et al.* described the use of small, malleable bone plates for the treatment of angle fractures. This led to a change from the previous belief that rigid fixation was necessary for bone

healing. Later, Champy *et al.* validated the technique by performing several clinical investigations. They determined the most stable location where bone plates should be placed based on the “Champy’s ideal lines of osteosynthesis.” Disadvantage is that there is inability to achieve absolute immobilization.

A prospective study performed by Amrishi Bhagol *et al.* looked at eight methods for treating mandibular angle fractures: (1) Closed reduction, (2) extraoral ORIF with a large reconstruction plate, (3) intraoral ORIF using a single lag screw, (4) intraoral ORIF using two 2.0-mm minidynamic compression plates, (5) intraoral ORIF using two 2.4-mm mandibular compression plate, (6) intraoral ORIF using two non-compression miniplates, (7) intraoral ORIF using a single non-compression miniplate, and (8) intraoral ORIF using a single malleable non-compression miniplate. In the study, they found out that extraoral ORIF with a reconstruction plate and intraoral ORIF using a single miniplate had least complications (7.5% and 2.5%, respectively). Thus, they concluded that these two methods were best for angular fracture management.

Management of Body of the Mandible Fracture

Simple fractures involving the body of the mandible can be effectively treated with one miniplate along the Champy line of osteosynthesis. Dissection should be done avoiding the damage to mental nerve which supplies the lower lips. Intraoral approach will be best in these cases, arch bars placed and MMF wires secured before incision, 5 cm incision made in the gingivobuccal sulcus over the fracture, and leaving a 1 cm cuff of tissue from the mucogingival junction for closure. Dissection carried to bone. Mental nerves identified and preserved. Fracture line debrided, reduced, and MMF tightened. Four-hole tension band secured between the tooth roots and mental foramen with monocortical screws. Larger 2.3–2.7 mm system titanium plate is secured anteriorly through the intraoral incision with 2–3 screws. MMF wires cut and occlusion checked; if satisfactory, incision is closed.

Management of Symphysis and Parasymphysis Fracture

Several authors have shown that miniplate fixation in symphysis and parasymphysis is very effective way to fix this fracture.^[8] The most common approach – transoral gingivolabial and gingivobuccal incision. Larger comminuted fractures, an external approach may be necessary to accurately and rigidly fixate the mandible.^[9] Simple symphysis fractures can be treated with two miniplates fixation. Single miniplates not given – displaces on torsional forces during functions. One miniplate is placed at the inferior border and the second plate is placed superiorly. Several authors have shown that miniplate fixation along these lines

is a very effective way to fixate these fractures. More rigid fixation should be considered for comminuted fractures. Lag screws are used in the reduction of the lingual border of the fracture and reestablish the appropriate intergonial distance by squeezing the mandibular angles together. For optimal strength, two lag screws are placed.

Geriatric Patient with Mandible Fracture

Fractures of the edentulous mandible most commonly involve the body region.^[10] Can be treated by either open or closed reduction methods. Closed reduction with the use of prosthetics (existing dentures or Gunning splints). The current accepted concept in geriatric mandible fracture is to go for open reduction and internal fixation.

CONCLUSION

As an end point, the newer advancements and techniques are going to be upgraded day by day, thus aiding in the comfort of the patient as well as to the clinicians for better results and better prognosis. Different types of techniques are available according to different types of mandible fractures. This article throws insight into the various techniques (conventional to contemporary) of mandibular fracture fixation readily useful to the clinician as well as to the patient on the prognosis part.

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