

## Long-term complications following different treatment modalities for mandibular fractures

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**Abstract**

**Background:** All the approaches for mandibular fracture treatment have their associated advantages and complications. The complications associated with treated mandibular fractures as listed in literature are found to be approximately in the range of 9% to 36 percent. Various complications seen after treating mandibular fractures can be attributed to the site of the fracture, type of fracture, displacement, peri-operative occlusion, contributing factors, and treatment chosen. **Aims:** The present trial was aimed at evaluating various long-term complications associated with different treatment procedures for managing mandibular fractures. **Materials and Methods:** 78 subjects were retrospectively analyzed within the age range of 19 years to 62 years with the mean age range of 42.4 years. The previous records of the patients were obtained from the previous hospital records for analyzing retrospectively. The patients managed either with open reduction and internal fixation or with closed reduction. Weekly follow-up was done for all the subjects for 6 weeks post-operatively to assess the complications. The collected data were subjected to statistical evaluation. **Results:** Fractures of parasymphysis and ZMC were most commonly seen in the study population which were 30.26% (n=23) and 57.69% (n=45) respectively. This was followed by fractures of the mandibular condyle and mandibular angle with the relative percentage of 29.48% (n=22) and 21.79% (n=17) respectively. The most common etiological factor associated with the mandibular fracture was road traffic accident with 66.66% (n=52) followed by the fall from some height which was seen in 15.38% of subjects (n=12), assault (n=6), and sports injury in 6.41% (n=5). The most common complaint reported by the study subjects post-operatively was malocclusion in 21.79% of study subjects. Among various malocclusions, open-bite was most commonly seen. The next common complication was paresthesia of the lower lip which was reported as a lack of sensitivity in 8.97% of subjects (n=7). Less commonly mandibular deviation/deflection, pain in TMJ, infection, and malunion was also noticed. **Conclusion:** As per the present study, a total of 47.43% (n=37) subjects presented with either major or minor complications. The most common malocclusion was open bite which was frequently seen with displaced bilateral condylar fractures. No significant difference in the postoperative complications was seen with either closed treatment or open treatment of fractured mandible.

**Keywords:** Complications, Malocclusion, Mandibular Fracture, Retrospective, Road Traffic Accidents.

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**Introduction**

Among all maxillofacial traumas, the fractures of the mandibular condyle are considered most common and constitute around 60% of total fractures. The common reasons for the fracture of the mandibular condyle are violence, fall from a height, and road traffic accidents (most common).[1] The treatment for fractured mandibular condyles aims at restoring the masticatory ability, occlusion, symmetry, and function as the bit was before the trauma. Treatment of the mandibular condylar fracture can be done based on the two protocols. These protocols include either the closed treatment which focuses on immobilization of the fracture segments using closed reduction or the open treatment where surgically the open reduction of fracture segments is done followed by the internal fixation.[2] Both the treatment methods have their pros and cons as well as their applications and limitations. Absolute and relative indications and

Fractures of the mandible are challenging for clinicians owing to the associated complications that make the outcome questionable and unpredictable for the surgeons.[4] The main post-operative aim with the treatment of mandibular fractures is restoring the occlusion as it was in the pre-traumatic phase to achieve adequate mastication with minimal effect to the various sensory nerves of the affected area.[5] The treatment modality chosen (ORIF or closed reduction) is governed by various factors as displacement, site, and occlusion. Intermaxillary fixation was widely used in past to treat fractures of the mandible.[6] However, recently open reduction and internal fixation with bone regeneration are considered as "gold-standard" for mandibular fracture treatment. For mandibular condyle, ORIF can be approached through various techniques including Preauricular, transoral, submandibular, Transparotid, or retroauricular approach. All these approaches have their associated advantages and complications.[7] The complications associated with treated mandibular fractures as listed in literature are found to be approximately in the range of 9% to 36 percent.[8] Various complications seen after treating mandibular fractures can be attributed to the site of the fracture, type of fracture, displacement, peri-operative occlusion, contributing factors, and treatment chosen. The complications usually seen with mandibular fractures are facial

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contraindications of both closed and open fracture reduction have been widely described in the literature.[3]

asymmetry, malocclusion, deviation or deflection of the mandible while opening mouth, infection, arthrosis, failure of bone formation, malunion/non-union, pain in TMJ, and/or facial nerve palsy.[9] Sometimes these complications are transient and self-limiting or might require management. These complications rarely warrant second invasive intervention, mainly in cases with malocclusion or infection.[10] The present trial was aimed at evaluating various long-term complications associated with different treatment procedures for managing mandibular fractures.

#### Materials and Methods

The prospective study was undertaken at Department of Dentistry; on 78 patients with the mandibular fractures, in the period between September 2019 to June 2020. The ethical clearance was taken from the Institution Ethical committee review board. The included subjects were within the age range of 19 years to 62 years with the mean age range of 42.4 years. To be included in the study, the subjects had to be in following inclusion criteria: age of 18 years or above, mandibular fractures warranting treatment, decrease in ramal height by at least 2mm. Subjects were excluded from the study if they had fewer teeth and occlusion cannot be judged, patients with contraindication for surgery or anesthesia, associated fractures, hairline fracture patients, pan facial trauma cases, Temporomandibular joint disease, systemically unhealthy subjects. Informed consent was obtained from each subject/ caretaker regarding the treatment and associated risks.

The previous records of the patients managed surgically for the mandibular fractures in the mentioned period were obtained from the previous hospital records for analyzing retrospectively. The patients managed either with open reduction and internal fixation or with closed reduction protocol were studied. Demographic data along with the pre-treatment radiographs, trauma, and fracture-related details, treatment approach instilled and reported complications were obtained from the hospital data. Fracture sites were also noted.

The treatment with IMF was done using arch bars and guiding elastics and ligatures for 6 weeks. However, the IMF period was for 6 weeks with a follow-up every week. In cases with ORIF, mini-plates and screws were used. Post-treatment all the subjects were given antibiotics and NSAIDs (diclofenac) thrice a day for 3 days to control infection and pain in the post-operative period. Weekly follow-up was done for all the subjects for 6 weeks post-operatively to assess the complications. In cases with the uncontrolled infection that did not respond to antibiotics, the bone regenerating material was removed. The collected data were subjected to statistical evaluation.

#### Results

The study included 78 subjects treated for the mandibular fracture that were within the age group of 19 years to 62 years with the mean

age of 42.4 years. The study included 43 males and 35 females. The demographic characteristics of the study subjects are depicted in Table 1.

The fracture sites for the 78 subjects were also noted from the previous hospital records. Various sites such as condyle, ramus, body, symphysis, and or parasymphysis, and their combinations were recorded as a relative percentage and the data obtained is summarized in Table 2. Fractures of parasymphysis and ZMC were most commonly seen in the study population which were 30.26% (n=23) and 57.69% (n=45) respectively. This was followed by fractures of the mandibular condyle and mandibular angle with the relative percentage of 29.48% (n=22) and 21.79% (n=17) respectively. Other fracture site involvement was less common including the body of mandible, symphysis, ramus, coronoid, frontal, and orbital fractures respectively in decreasing order (Table 2).

The cause of the maxillofacial trauma was also assessed and noted. The most common etiology was road traffic accidents. Other associated reasons included fell from a height, assault, sports injuries, and other causes (including animal bite, gun-shot injuries, etc.) were also taken into considerations. The most common etiological factor associated with the mandibular fracture was road traffic accident with 66.66% (n=52) followed by the fall from some height which was seen in 15.38% of subjects (n=12), assault (n=6), and sports injury in 6.41% (n=5), and the least common cause was gun-shot injuries and animal bite in 3.84% subjects (n=3). The results are formulated in Table 3.

Out of 78 treated subjects, only 2.56% (n=1) subjects were edentulous. To treat the subjects, a total of 52 mini-plates and 76 screws were used. Out of 78 subjects, 14.10% (n=11) were treated using close reduction and intermaxillary fixation primarily. In 28.20% (n=22) subjects, reconstruction plates were used. The extra-oral approach was applied in 10.25% (n=8) in cases with a condylar fracture with a Preauricular approach due to extensive bilateral dislocation of mandibular condyles. The significant difference in the surgical time was associated with the number of mandibular fractures in a single subject ( $p < 0.01$ ) with the mean surgical time of 107±36 minutes.

The present trial also assessed various complications seen post-operatively in subjects treated with mandibular fractures. Various complications assessed with their relative percentages are depicted in Table 4. The most common complaint reported by the study subjects post-operatively was malocclusion in 21.79% of study subjects. Among various malocclusions, open-bite was most commonly seen. The next common complication was paresthesia of the lower lip which was reported as a lack of sensitivity in 8.97% of subjects (n=7). Less commonly mandibular deviation/deflection, pain in TMJ, infection, and malunion was also noticed.

**Table 1: Demographic characteristics of the study subjects**

S. No	Characteristic	Value
1	Total subjects	n=78
2	Mean Age (in Years)	42.4±8.31 years
3	Age Range	19-62 years
4	Gender	55.12% males and 44.87% of females
a	Male	n=43
b	Female	n=35

**Table 2: Relative Percentage of fracture sites in the study subjects**

S. No	Mandibular Fractures	Relative Percentage	Number (n=78)
1.	Angle	21.79%	17
2.	Body	12.82%	10
3.	Parasymphysis	29.48%	23
4.	Condyle	28.20%	22
5.	Ramus	2.56%	2
6.	Symphysis	5.12%	4
7.	Coronoid	3.84%	3

8.	ZMC fractures	57.69%	45
9.	Frontal fractures	2.56%	2
10.	Orbital fractures	1.28%	1

**Table 3: Aetiology of mandibular fractures in the study subjects**

S. No	Etiology of Fracture	Number (n=78)	Relative Percentage
1	Road Traffic Accidents	52	66.66%
2	Fall from Height	12	15.38%
3	Assault	6	7.69%
4	Sport Injuries	5	6.41%
5	Others (Gunshot injuries and animal bite)	3	3.84%

**Table 4: Complications of mandibular fracture treatment in the study subjects**

S. No	Complication (at 6 weeks)	Number (n=37)	Percentage	Intervention Needed
	Transient Paresthesia (Lower lip)	7	8.97%	0
	Malocclusion	17	21.79%	17
	Cross-bite	6	7.69%	6
	Open-Bite (Anterior)	4	5.12%	4
	Open- Bite (Posterior)	5	6.41%	5
	Open- Bite (Lateral)	2	2.56%	2
	Mandibular deviation/deflection	4	5.12%	4
	Infection	2	2.56%	2
	Pain in TMJ	2	2.56%	2
	Malunion	5	6.41%	5
	Non-union	0	0%	-

## Discussion

The present trial was aimed at evaluating various long-term complications associated with different treatment procedures for managing mandibular fractures. The study included 78 subjects treated for the mandibular fracture that were within the age group of 19 years to 62 years with the mean age of 42.4 years. The study included 43 males and 35 females.

The gold-standard for treating mandibular fractures is an open reduction with internal fixation along with osteosynthesis which was also adopted as a treatment modality in the present study. This was supported by the study of Zachariades et al[11] in 2006, where authors concluded that early mobilization is associated with ORIF which is a desirable requisite of condylar fractures. In the study results, no difference was seen in the complications for either the subjects treated with ORIF or closed reduction.

Regarding the mandibular fractures, fractures of parasymphysis and ZMC were most commonly seen in the study population which were 30.26% (n=23) and 57.69% (n=45) respectively. This was followed by fractures of the mandibular condyle and mandibular angle with a relative percentage of 29.48% (n=22) and 21.79% (n=17) respectively. Other fracture site involvement was less common including the body of mandible, symphysis, ramus, coronoid, frontal, and orbital fractures respectively in decreasing order. These findings were consistent with the study of Manodh et al[12] in 2016 where the mandibular fracture was seen commonly in subjects with maxillofacial trauma owing to the tendency of turning face to the side on blow out force application making mandible more prone to the fracture. The study by Manodh et al also confirms the findings of the present study that symphysis is the most common area to be fractured listing it as the weakest point due to long canine roots. These findings were also confirmed by Lee JH et al[13] in 2010.

Concerning the post-operative complications, a total of 47.43% (n=37) subjects presented with either major or minor complications. The most common malocclusion seen was open-bite 6.41% anterior and 2.56% posterior) which was seen both in anterior and posterior teeth. However, in literature no data regarding open bite exclusive is available. Various other malocclusions were also seen in study subjects. The similar findings were shown by Vega et al[14] in 2011 who concluded that providing the delayed treatment or no treatment to maxillofacial fractures can lead to malocclusion. Also, Ellis et

al[15] in 2005 confirmed that even post-treatment malunion or inability of various anatomical structures to maintain harmony may lead to malocclusion. Another common complication seen was jaw deviation which was seen in subjects with dislocated condylar fractures. Open bite and other malocclusions required interventions for correction. Two subjects that presented with infection were treated with antibiotics, where one subject was conservatively managed and in other osteosynthetic plate was removed.

## Conclusion

The present trial was aimed at evaluating various long-term complications associated with different treatment procedures for managing mandibular fractures. The study included 78 subjects treated for the mandibular fracture that were within the age group of 19 years to 62 years with the mean age of 42.4 years. The study included 43 males and 35 females. As per the present study, a total of 47.43% (n=37) subjects presented with either major or minor complications. The most common malocclusion was open bite which was frequently seen with displaced bilateral condylar fractures. No significant difference in the postoperative complications was seen with either closed treatment or open treatment of fractured mandible. The study had few limitations including non-establishment of significance owing to small sample size, shorter monitoring period, and single-institutional study hence bias was not eliminated. Further research with larger sample size and longer monitoring period is needed to reach a definitive conclusion.

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