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ORIGINAL RESEARCH

Assessment of mandibular angle fractures treated with three different fixation systems

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ABSTRACT

Background: A mandibular angle fracture is a type of facial fracture involving the mandible (lower jaw) bone. The present study was conducted to compare mandibular angle fractures treated with three different fixation systems.

Materials & Methods: 54 cases of mandibular angle fractures of both genders were divided into 3 groups. In group I, bioresorbable plating, in group II, 2 mm metal nonlocking miniplates were placed, and in group III, 2.0 mm locking plates were used. Intra- operative variables and complications were compared.

Results: In group I, males were 10 and females were 8, in group II, males and females were 9 each and in group III, males were 11 and females were 9. Isolated fractures were seen in 12, 10 and 5, combined fractures in 6, 8 and 13, 4 screws in 16, 18 and 17, 6 screws in 2, 0 and 1, intraoral in 18, 13 and 14 and transbuccal in 0, 5 and 4 in group I, II and III respectively. The difference was significant ($P< 0.05$). Common complications were malocclusion seen in 1 in group I and 1 in group III, infection 1 each in group II and III and delayed union 1 each in all groups. The difference was non- significant ($P> 0.05$).

Conclusion: Authors found no differences in mandibular complications rates in mandibular angle fractures treated with single 2.0 mm metal miniplates, either locking or nonlocking, or single 2.5 mm biodegradable plates.

Key words: mandibular angle fracture, locking plates, resorbable plates

Introduction

A mandibular angle fracture is a type of facial fracture involving the mandible (lower jaw) bone.[1] The mandibular angle is the area where the vertical body of the mandible meets the posterior horizontal ramus. Fractures in this region are relatively common and can result from various causes, such as trauma to the jaw, accidents, sports injuries, or physical altercations.[2]

Symptoms of a mandibular angle fracture may include pain at the site of the fracture, which can be exacerbated by movement or pressure on the jaw, swelling and bruising around the jaw area, limited or altered movement of the jaw, making it challenging to open or close the mouth, misalignment of the teeth, where the upper and lower teeth don't fit together properly, changes in the way the teeth come together when biting or chewing and numbness or tingling in the lower lip or chin area due to nerve injury.[3]

Rigid plates (2.7-mm and 2.4-mm) were introduced for placement at the inferior border of the mandible for the treatment of mandibular fractures. Such plates provide sufficient rigidity to the fragments, adequate neutralization of functional forces even in the absence of compression, and prevent interfragmentary mobility and distraction in the tension zone and thus decrease the incidence of complications.[4] The locking plate/screw system offers many advantages over other plating systems, including the ease of plate adaptation, minimal alterations in osseous and occlusal relationships during

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screw tightening, less screw loosening, and enhanced stability without transmitting excessive pressure to the underlying bone, which decreases the impairment of the blood supply.[5] The present study was conducted to compare mandibular angle fractures treated with three different fixation systems.

Materials & Methods

The present study consisted of 54 cases of mandibular angle fractures of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 3 groups. In group I, bioresorbable plating, in group II, 2 mm metal nonlocking miniplates were placed, and in group III, 2.0 mm locking plates were used. Intra- operative variables and complications were compared. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I Distribution of patients

Groups	Group I	Group II	Group III
Method	bioresorbable plating	nonlocking miniplates	locking plates
M:F	10:8	9:9	11:7

Table I shows that in group I, males were 10 and females were 8, in group II, males and females were 9 each and in group III, males were 11 and females were 9.

Table II Intra- operative variables

Variables	Group I	Group II	Group III	P value
Isolated fractures	12	10	5	0.05
Combined fractures	6	8	13	0.04
4 screws	16	18	17	0.94
6 screws	2	0	1	0.81
Intraoral	18	13	14	0.63
Transbuccal	0	5	4	0.85

Table II, graph I shows that isolated fractures were seen in 12, 10 and 5, combined fractures in 6, 8 and 13, 4 screws in 16, 18 and 17, 6 screws in 2, 0 and 1, intraoral in 18, 13 and 14 and transbuccal in 0, 5 and 4 in group I, II and III respectively. The difference was significant (P< 0.05).

Graph I Intra- operative variables

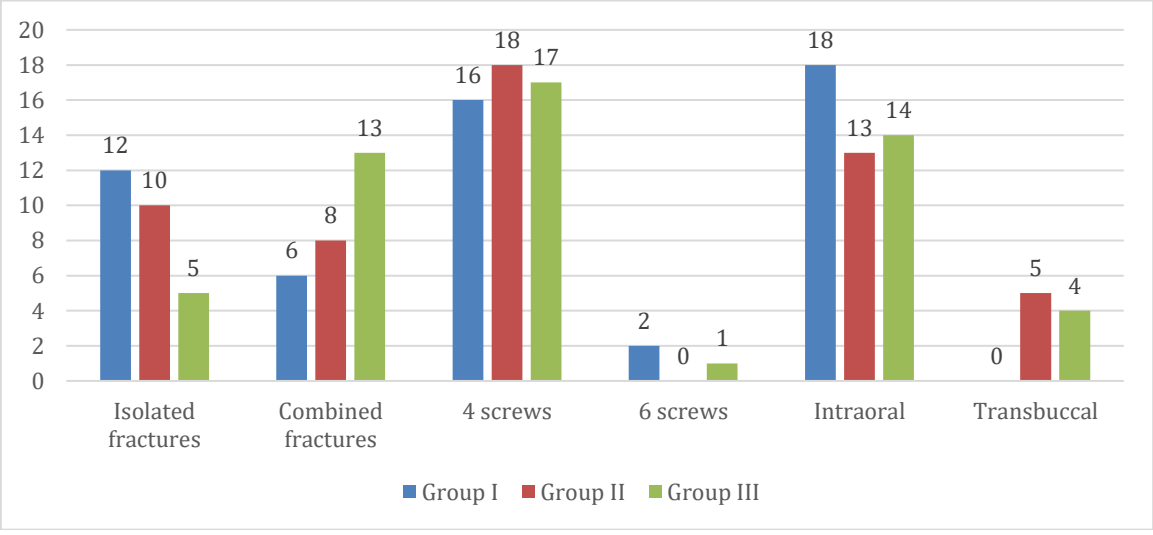

Table III Assessment of complications

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Complications	Group I	Group II	Group III	P value
Malocclusion	1	0	1	0.97
Infection	0	1	1	0.97
Delayed union	1	1	1	1

Table III shows that common complications were malocclusion seen in 1 in group I and 1 in group III, infection 1 each in group II and III and delayed union 1 each in all groups. The difference was non-significant (P> 0.05).

Discussion

Mandibular fractures, which are frequently treated in maxillofacial departments, are generally brought on by assault and automobile accidents.[6] The most challenging mandibular fractures to repair are mandibular angle fractures, which account for 23-42% of all mandibular fractures and have the highest postsurgical complication rate (ranging from 0% to 32%).[7] The best approach for treating mandibular fractures should aim for immediate function, minimal sequelae, a flawless anatomical reduction, functional stable fixation, and painless movement of the affected segments.[8] An adequate understanding of the surgical anatomy, biomechanical stresses at the angle, the condition of occlusion, and the existence of a third molar in the mouth is necessary for the treatment of mandibular angle fractures.[9] The present study was conducted to compare mandibular angle fractures treated with three different fixation systems.

We found that in group I, males were 10 and females were 8, in group II, males and females were 9 each and in group III, males were 11 and females were 9. Bhatt et al[10] evaluated the outcomes of mandibular angle fractures treated with metal 2.0 mm locking, metal 2.0 mm nonlocking, and 2.5 mm resorbable systems. A total of 60 case records of over four years were included. The mean age of the patients was 27.4 years. Fifty-five were males and five females. There were 20 nonlocking and 16 locking metal miniplates and 24 bioresorbable plates. In 55 (91.6%) cases there was a third molar in the fracture line. In 51/55 (92.7%) cases the third molar was retained. In seven patients, postoperative complications were seen. There was no difference between the complication rates of the three treatment groups. Infection was the most common complication followed by delayed union and hardware failure.

We found that isolated fractures were seen in 12, 10 and 5, combined fractures in 6, 8 and 13, 4 screws in 16, 18 and 17, 6 screws in 2, 0 and 1, intraoral in 18, 13 and 14 and transbuccal in 0, 5 and 4 in group I, II and III respectively. Elsayed et al[11] compared the clinical outcomes of three different types of hardware that are used in mandibular angle fracture fixation. The patients were categorized into the following groups: group A, in which a single 2.0-mm locking miniplate was used; group B, in which a single rigid 2.3-mm plate was used; and group C, in which a single lag screw was inserted. All patients were followed for 6 months. With regard to intraoperative variables, significant differences were found among the groups in the duration of surgery and cost. Group C had the shortest surgical time, followed by group A and then group B. Two patients, one in group A and one in group B, suffered an occlusal discrepancy after surgery. Of the group A patients, two exhibited wound dehiscence and one had an infection. One patient in group B had an exposed plate. Sensory nerve involvement was noted in three group C patients and one group B patient. The lag screw was associated with the fewest complications and exhibited all of the advantages of plating systems in the treatment of angle fracture. The lag screw involved the least hardware and a short operating time, however the differences were not significant.

We found that common complications were malocclusion seen in 1 in group I and 1 in group III, infection 1 each in group II and III and delayed union 1 each in all groups. Chiodo et al[12] compared the performance of locking versus nonlocking Synthes 2-mm mandibular fixation plates. Two experimental groups composed of 10 locking and 10 nonlocking 2-mm plates were secured to randomly selected osteotomized bovine ribs using 10-mm monocortical screws. The specimens were loaded using a 4-point bending system to the point of failure using a MTS model 309.00 servo-hydraulic testing system with a custom fabricated fixator. Overall, there were no statistically significant differences between the locking and conventional 2-mm mandibular plate. Of the 20 samples tested, 1 (nonlocking) had a unique early screw failure (pullout) inconsistent with any other

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samples and was not analyzed. Of the remaining 19 samples, 17 produced a yield failure, bend, or stretch rather than a plate fracture. Both of the plate fractures occurred in the non locking plates. Although the data suggested that this mode of failure was more common in non locking plates, the difference between both groups in the mode of failure did not achieve statistical significance. Thus, yield was the predominant mode of failure for both types of devices. The force at which each device failed was also similar in both groups. The force of failure for the non locking plates was 559.9 N, whereas the locking plate failure strength was 637.8 N. The results indicated that there was no suggestion that one plate might be stronger than the other.
The limitation the study is small sample size.

Conclusion

Authors found no differences in mandibular complications rates in mandibular angle fractures treated with single 2.0 mm metal miniplates, either locking or nonlocking, or single 2.5 mm biodegradable plates.

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