

To Study the Outcome of Closed and Open Reduction of Unilateral Mandibular Condyle Fractures: A Retrospective Study

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ABSTRACT

Background: Condylar fractures represents one of the common fractures occurring in the maxillofacial region. The uniqueness of the condylar anatomy and associated structures results in special consideration in their management and correction. This study was carried out to assess the efficiency between the closed and open methods and requirement of surgical procedures in such fractures.

Materials and Methods: The study was carried out on fifty patients with unilateral condylar fractures. Records of twenty-five patients were studied and divided into 2 groups – those who had been treated by surgical method (Group A) and by non-surgical method (Group B).

Results: Maximal inter-incisional opening in group I, i.e close reduction achieved only in 10 (40%) out of 25 of the cases at the end of 3rd month and 6th month post operatively follow up whereas in Group II open reduction achieved 15(60%) out of 25 of the cases at the end of 3rd month and 4(80%) out of 5 cases at the end of 6th months post-operative follow up. This shows that open reduction is a better treatment technique when compared to closed reduction.

Conclusion: Patients with condylar fractures treated with open reduction, the results proposed that post-operative occlusion was better rehabilitated at different follow up visits with minimal concerns in comparison to the closed reduction method.

Keywords: Mandibular condyle fractures, Temporomandibular joint, Occlusion, Open reduction, closed reduction.

INTRODUCTION

Mandible fracture is the second most common fracture of the facial bones. Among mandibular fractures, condylar region is the site accounting for almost 25-35% of cases^{1,2} and has still maintained to be a topic of debate. It occurs usually through indirect injury from a traumatic impact on the chin and seldom arise from direct trauma unless

accompanied by fracture of zygoma. Injury to condylar region deserves special consideration apart from rest of the mandible because of anatomical differences and the healing potential³. Condylar fractures are classified according to their anatomical location and according to the degree of dislocation of the articular head. There are two

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methods of principal therapeutic modalities to these fractures: functional and surgical.

The absolute indications for open reduction has been described by **Zide and Kent (1983)**³ According to various studies, displaced low sub condylar fractures should be treated by open reduction as there were no post-operative malocclusion, wound infections and neurosensory deficits. Those preferring closed reduction, claim that functional recovery is to the same extent, after both open and closed reduction and also morbidities associated with surgical treatment is avoided.⁴

The objective of treatment of condylar fracture is the recovery of anatomic form and function, with particular care to re-establish the occlusion. However with regards to the condylar segment, a series of controversies have been debated between the proponents and opponents of Open Reduction Internal Fixation and Closed reduction of condylar fractures. Newmann et al. had found that maxillomandibular fixation causes reduced mouth opening in Closed Reduction and Maxillomandibular fixation (CRMMF) group while Marker et al. could not find any association between maximum mouth opening and maxillomandibular fixation in these groups. Luc Smets et al. reported more malocclusions in patients treated using the CRMMF whereas Richard Haug et al. found no differences in malocclusion.⁵

Although there are equal studies supporting both open and closed reductions, there has been considerable increase in the incidence of long term complications associated with closed form of treatment. It is still in dilemma about the clear guidelines for treatment and precise functional evaluation of surgical treatment of condylar fractures. This study was aimed at comparing outcome of closed and open reduction of condylar fractures.^{6,7}

MATERIALS AND METHODS

The study followed a retrospective design and was carried on records of fifty patients with unilateral condylar fractures who were treated in the Department of General Surgery, Safdarjung Hospital. Twenty-five patients were selected who were treated by surgical method (Group A) and

another twenty-five selected who were treated by nonsurgical method (Group B). The following selection criterion was considered:

Inclusive Criteria

- Unilateral fracture of the condyle
- Condylar fracture associated with complex trauma of maxillofacial region
- Adults above 18 years of age irrespective of sex
- No pre-existing pathological conditions of TMJ
- No gross pre-traumatic skeletal mal-relationship of the jaws

Exclusive Criteria

- Patients who presented with all other skull fractures except mandibular fractures
- Patients who had bilateral mandibular condylar fractures
- Patients who had failed to follow-up and edentulous patients

The clinical examination in all patients was primarily aimed at evaluating functional limitation and discomfort of temporomandibular joint. All TMJs were assessed for protrusive and excursive movements, pain, clicking, locking or crepitus. Maximum mouth opening and deviations from the midline during mouth opening were recorded. Facial symmetry and dental midline deviation were documented. The antero-posterior position of the mandible, sagittal and vertical open bite was recorded. An evaluation of occlusion and pain in the temporomandibular joint was evaluated using 5 unit scale where 1 indicates a good outcome and 5 indicating worst outcome.

Motor and sensory nerve evaluation and post-operative scar were also taken into consideration. Using a bite force measuring device maximum voluntary bite forces was recorded at both the fractured side and non-fractured side at one month and one year post treatment period. The values of both the sides were taken and were compared between both the groups.

Radiographic assessment: Condylar fractures were assessed based on Lindahl's classification⁸ as head, neck and subcondylar fracture. Pre-treatment and Post-treatment panoramic radiographs were taken after one month and one year, evaluated for shortening of ramus as evaluated by Uwe Eckelt at

al.⁹ Tracings were made of the condylar head, neck, ascending ramus and mandibular angle. Ramus height was calculated between the mandibular plane and a tangent drawn to the superior most point of the condyle and measured along the ramus line on both the fractured and non-fractured sides. Reduction of height was determined by the difference in length between both the sides in millimeters. The differences in mean values between ORIF and CRMMF groups were statistically analyzed using unpaired t tests in SPSS software for windows. Differences were considered statistically significant when $p < 0.05$.

RESULT

In this present study, 50 patients with isolated condylar fractures and condylar fractures with other associated fractures were included. Out of 50 patients, 33 (66%) were male and 17 (34%) were female. Left side was involved in 24 cases and the right in 26 ($P > 0.05$). There were 27 sub-condyle and 23 neck fractures ($P > 0.05$). Among the 25 patients in the non-surgical group, 13 had fracture of the neck and 12 were having subcondylar fractures. Among the 25 patients in the surgical group, 10 had fracture of the neck and 15 had sub-condylar fractures. Those patients who had no complaints about the occlusion but they were having either improper wear and tear of the teeth or they had no proper occluded cusps of the teeth were considered having good occlusion. However, those patients who had even a minor complaint about occlusal disturbances were considered having poor occlusion even though they fulfilled the other two requirements for good occlusion i.e. wear and tear patterns of the teeth and inter-digitation of cusps. In our study we found that patients treated surgically have less rate of occlusal disturbances as compared to patients treated with non-surgical technique.

Maximal inter-incisional opening in group I, that is, close reduction achieved only in 10 (40%) out of 25 of the cases at the end of 3rd month and 6th month post operatively follow up whereas in Group II open reduction achieved 15(60%) out of 25 of the cases at the end of 3rd month and 4(80%) out of 5 cases at the end of 6th months post-operatively follow up.

In our study the lateral excursion of mandible in close reduction group was normal in 1(20%)

patients out of 5 patients at the end of 1 month and 2(40%) out of 5 of the cases at the end of 3rd and 6th months of follow-up whereas in group II open reduction extrusive movement was normal in 3(60%) out of 5 of the cases at the end of 1 month and 5(100%) of all the cases at the cases at the end of 3rd, 6th months of follow-up post operatively.

Deviation in group I of closed reduction was present in 15(60%) out of 25 cases at the end of 1 and 3rd months and 20(80%) out of 25 cases present at the end of 6th month follow-up post-operatively whereas compared to group II of open reduction deviation was present in 5(20%) out of 25 cases at the end of the 1 month follow-up post operatively. Occlusion in group I close reduction was fine in all patients except in one at end of 1 month and none at the end of 3rd and 6th months where as in group II open reduction occlusion was achieved in all patients. A comparison between closed and open reduction techniques can be observed in Figures 1 and 2.



Fig 1: Closed Reduction of left condylar fracture: (A) Preop Occlusion (B) Postop Occlusion (C) Preop OPG (D) Postop OPG

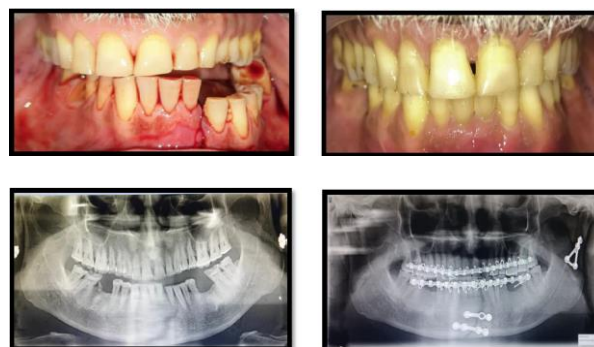


Fig 2: Open Reduction of left condylar fracture: (A) Preop Occlusion (B) Postop Occlusion (C) Preop OPG (D) Postop OPG

DISCUSSION

In the past decades a number of investigations and outcome study appeared in the literature that have compared non-surgical with surgical treatment of mandibular condyle fractures. We have discussed the outcomes of non-surgical and surgical treatment for mandibular condyle fractures from the results of our study. Ellis et al⁸⁻¹⁵ provided the most detailed and thorough comparison of the outcomes of the closed and open approaches to mandibular fractures in a series of 9 publications. In summarizing the outcomes literature regarding the closed approach versus open reduction and internal fixation (ORIF), the latter has been associated with scar development and temporary (6 months) paralysis of facial nerve branches. The closed approach is associated with numerous problems. These include chronic pain, malocclusion, asymmetry, limited mobility, and gross radiographic abnormalities. Hidding et al¹⁶ compared the 1 to 5-year postoperative findings of 20 patients treated with ORIF to 14 who were managed conservatively. The conservative group was treated with maxillomandibular fixation for 2 weeks and then postoperative physiotherapy. The ORIF group was managed with wire or rigid osteosynthesis. They found that deviation on opening occurred in 64% of patients treated conservatively compared with 10% managed with ORIF.

No differences were found in mastication, or maximum inter-incisal opening between groups. Radiographic findings noted anatomic reconstruction in 93% of ORIF patients but only 7% of the conservative group. Haug et al¹⁷ reported the long-term post-operative results of 10 patients treated with closed reduction and 10 patients by ORIF. There were no statistically significant differences between the ORIF and closed reduction. Satisfactory results do not always require exact anatomical repositioning. Even when impaired growth of the mandibular ramus on the fractured side is apparent, good aesthetic and functional results are possible. The ORIF group was associated with perceptible scars, and the closed reduction group with chronic pain.

Ellis et al, discussed about the advantages of retromandibular approach over the pre-auricular approach, submandibular approach and intraoral

approach for ORIF of condylar fractures.⁸ In their opinion the best approach for ORIF of condylar fracture is retromandibular approach. In our study 12 cases (55%) were approached through the retromandibular approach for reduction of sub-condylar fractures. Out of 25 patients in open reduction group, 4 patients had facial nerve weakness, one had upper eyelid weakness and the other had lower lip weakness which resolved in 4-5 weeks. Based on our study retromandibular approach provides safer and better reduction of condylar fractures and this finding correlates with the study of Narayanan et al,¹⁸ Tang et al,¹⁹ Biglioli et al²⁰ and Devlin et al²¹. Patients' mouth opening ranged from 32-41 mm in closed reduction group and 33-44mm in open reduction group. Our results showed statistically significant difference in maximal mouth opening. Open reduction group exhibits good mouth opening post operatively when compared to closed group, which correlates with the study of Eckelt et al,²² Vesnaver.²³ Mandibular deviation towards fractured side was noted in 20 patients (80%) treated by closed method which was attributed to reduced ramal height. This finding correlates with the study of Silvennoinen et al.²⁴ In our study there is no statistically significant difference in malocclusion found between open and closed group which correlates with the study of Haug et al.¹⁷ Radiographically Vertical ramus height was significantly reduced in 18 patients (55%) treated by closed method. whereas open group had normal vertical ramus height. This finding correlates with the study of Ellis et al,¹¹ Eckelt et al,²² Danda et al.²⁵ Lateral excursive movements were within the normal limits for both the groups which correlate with the findings of De Riu et al.²⁶ Pain on lateral excursion was elicited in 12 patients (48%) treated conservatively whereas 6 cases (28%) of open group patient had pain on lateral excursion. This findings correlates with the observation by Worsae et al.²⁷ Two of the patients treated by open reduction had temporary facial nerve weakness which subsequently resolved in 3-4 weeks of duration. There were no severe clinical complications in either treatment group. In particular, there was no permanent damage to the facial nerve branches in the surgically treated group. This finding correlates with the study of Eckelt et al.²² According to Haug et al there was higher perception of scaring associated with open group when compared to closed group.¹⁷ In our

study all patients who were treated by open method showed acceptable surgical scar. Postoperative infection rate in our study is very minimal; out of 25 patients in open group one patient had post-operative infection which was managed by proper antibiotics. Patients' treated by open method had the advantage of early recovery of function in terms of pre-traumatic occlusion, mastication, speech and enhanced nutrition. On the other hand non-surgically treated patients required prolonged period of maxilla-mandibular fixation and elastic traction which cause significant disturbances.

CONCLUSION

Patients where mandibular condylar fractures were treated with open reduction and internal fixation (surgical technique) the results suggested post-operative occlusion was better rehabilitated at different follow up visits with minimal concerns in comparison to the closed reduction method.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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