

A study for assessing the functional outcome of closed reduction in mandibular condylar fractures

¹Dr. Keerthi R, MDS, Professor, Department of Oral and Maxillofacial Surgery, V S Dental College & Hospital, KR Road, VV Puram, Bengaluru – 560004

²Dr. Vishnu Venugopal, MDS, Post-graduate Student, Department of Oral and Maxillofacial Surgery, V S Dental College & Hospital, KR Road, VV Puram, Bengaluru – 560004

³Dr.Thiyam Sophia Devi, MDS, Post-graduate Student, Department of Oral and Maxillofacial Surgery, V S Dental College & Hospital, KR Road, VV Puram, Bengaluru - 560004

Corresponding Author: Dr. Thiyam Sophia Devi, MDS, Post-graduate Student, Department of Oral and Maxillofacial Surgery, V S Dental College & Hospital, KR Road, VV Puram, Bengaluru – 560004

Citation of this Article: Dr. Keerthi R, Dr. Vishnu Venugopal, Dr. Thiyam Sophia Devi, “A study for assessing the functional outcome of closed reduction in mandibular condylar fractures”, IJDSIR- February - 2022, Vol. – 5, Issue - 1, P. No. 36 – 41.

Copyright: © 2022, Dr. Thiyam Sophia Devi, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: Fractures of the condylar process of the mandible are common and account for 21-52% of all mandibular fractures. Despite this, controversies over classification, diagnosis, and management has persisted since the injury was first reported. The principle area of controversy lies in the choice of management of condylar fractures in patients over the age of 12 years and this controversy continues. Symptoms include long term pain, limitation of jaw movement and function, malocclusion, and asymmetrical growth. Mandibular condyle fractures are managed by two treatment modalities - open and closed reduction. Most condylar fractures treated by traditional methods of closed reduction have a reasonable outcome, but the

severity of condylar injuries is often underestimated and the clinical outcome can be suboptimal particularly with regard to occlusion, inappropriate TMJ function and disuse muscular atrophy. To counteract these outcomes open reduction has taken over the attention but closed reduction is still used because of the problems related to open reduction like nerve and blood vessel injury, scars and infections leading to non-union / mal-union etc.

Methods: In our study we have assessed functional outcome of Closed Reduction in mandibular condylar fractures in 30 patients reported to VS Dental College and Hospital, using clinical parameters like Occlusion, Mouth opening, Lateral excursion, Deviation, Pain, Clicking and Crepitus etc.

and radiological criteria's like Pattern of fracture, Level of fracture, Shortening of ramus and Angulation of the fracture over a period of six months.

Results: Successful functional rehabilitation was possible in 25 patients by closed reduction.

Conclusion: The clinical and radiographically parameters were found to be significant and plays a major role in treatment planning and outcome of the treatment.

Keywords: Mandibular fractures, Condyle, TMJ

Introduction

Fractures of the mandibular condyle have been recognized and treated for almost 150 years¹ The fractures of the condylar process of the mandible are common and account for 21-52% of all mandibular fractures.² Clinical and imaging techniques now widely available can lead to accurate classifications and influence in the diagnosis and treatment.²

Signs and symptoms of the condylar fracture which influence the treatment regimen are, a) Pain and tenderness b) Swelling locally c) Limitation of mandibular movement d) Displacement of mandible to the injured side e) Malocclusion f) Massestic spasm.

The ultimate prognosis will be influenced by the following factors:(I) Age of patient; (2) level of fracture; (3) degree of malposition; (4) dentition and occlusion; (5) extent of damage to temporomandibular joint.¹

Two treatment modalities are considered in the treatment of the mandibular condylar fractures, Open reduction and closed reduction. The length of follow-up is important if decisions about therapy are to be made. The major problems resulting from treatment

of displaced articular fractures by closed reduction are not only early dysfunctions but late arthritic changes occurring 10 to 50 years later in a joint that is not in its appropriate anatomic position.

Long-term sequelae associated with closed reduction techniques (pain, arthritis, limitation of motion) may also occur with open reduction. Obviously, not all mandibular condyle fractures should be treated by closed reduction regardless of pre-existing or traumatically induced problems as each fracture is unique. For this reason, decisions on how to treat most fractures should not be based on the radiograph alone.³

The more rigid the Osteosynthesis and fixation of the condylar process, the higher the risk of postoperative remodeling and aberrative change in both the involved as well as the contralateral joint. These aspects, as well as the complications related to the surgical procedure such as hemorrhage, resorption of the condyle, or facial nerve paresis, have led many surgeons to avoid surgical management of condylar fractures in favour of Non-surgical treatment.⁴

The functional rehabilitation of the temporomandibular joint after fracture or trauma relies completely on the remodeling capacity of the joint; particularly in children.

Clicking and Crepitation's are the most common dysfunctions of the stoma to gnathic system in most of the population.

Irrespective of age, the remodeling process in the TMJ always occur as a result of displacement or dislocation of the fractured fragment. Remodeling can be considered as a process needed to meet the function and growth, with an increase in age there is reduced cellular activity, and condylar fractures can also

cause complications like ankylosis and fibrosis of TMJ mostly in teenagers⁶, and after remodeling, complications like arthrosis, chronic TMJ pain etc. can develop even after 10-20 years.⁵

Due to these controversies in management of mandibular condylar fractures, and the complications of the surgical treatment which outweigh the benefits in many of the cases, the diagnosis and treatment plan of condylar fractures should be studied in detail and the functional outcome of the closed reduction of the fractures should be assessed clinically as well as radio graphically, in order to take the appropriate measure.

Aim of the study: To assess the functional outcome of closed reduction in mandibular condylar fractures.

Objectives of the study: To analyze the functional outcome of closed reduction in mandibular condylar fractures using clinical parameters and radiographic (CBCT) evaluation.

Materials and Methods

A Total of 30 patients who had sustained unilateral or bilateral condylar fractures were included in the study.

Exclusion criteria

1. Patients with absolute indications for open reduction
2. Patients with contraindications for closed reduction because of systemic conditions Asthma, Epilepsy, CNS disorders etc
3. Patient with head injuries with longer duration for recovery.
4. Comminuted fractures of mandible,
5. Pan facial fractures,
6. Completely Edentulous patients.

Patient opting for closed reduction underwent Maxillo-mandibular fixation with either Arch bar or Eyelet wiring or IMF Screws depending upon their oral hygiene status for a period of 2 to 3 weeks. They were analyzed for functional outcome following the closed reduction for the treatment of condylar fractures. Clinical parameters like occlusion, asymmetry at rest and during mouth opening, maximum inter-incisal distance, deviation of jaw, signs of TMJ dysfunction and radiographic parameters like level of fracture, pattern of fracture, shortening of ascending ramus and angulation of condylar process with respect to glenoid fossa were assessed at regular intervals of 1week, 4 weeks, 12 weeks and 24 weeks. Eventually in patients treated with closed reduction if necessity arose, they were subjected for open reduction and internal fixation which was informed to the patient prior to the commencement of the study and it was assessed separately.

Results

A total of 30 cases were selected for the study in which 24 (80%)were male patients and 6 (28%)were females.17 (56.7%) cases had unilateral condylar fractures and 13 (43.3%) had bilateral condylar fractures.

Table 1

PARAMETER	PRE-OP	24 WEEKS	STATISTICAL SIGNIFICANT	P-Value
Mouth opening	2cm	3.74cm	yes	<0.001
Occlusion	Deranged (66.7%)	Deranged (16.7%)	yes	<0.001
SOR	4.27mm	4.17mm	no	0.18
DOM	No deviation (53.3%)	No deviation (66.7%)	no	0.30
LE	4.43mm	9.23mm	yes	<0.001
Pain	96.7%	20.0%	yes	<0.001
Clicking	20 patients (66.7%)	8 patients (26.7%)	yes	<0.001
Creptus	7 patients (23.3%)	7 patients (23.3%)	no	>0.05
Crossbite (posterior)	Absent(15 patients)-50%	Absent(27patients)-90.0%	yes	<0.001
Open Bite (anterior)	11 (36.7%)	5 (16.7%)	yes	<0.001
Open Bite(posterior)	15 (50%)	3 (10.0%)	yes	<0.001
Angulation (Right)	26.23	26.23	no	>0.05
Angulation(Left)	37.60	37.73	no	>0.05

*SOR: Shortening of Ramus, DOM: Deviation of Mandible, LE: Lateral excursion.

Discussion

About 35% of all mandibular fractures are fractures of the condyle.⁶ Most condylar fractures are treated by traditional method of closed reduction. They have reasonable outcome, but the severity of the condylar injuries is often underestimated and the clinical outcome can be suboptimal particularly with occlusion.⁶

Zide and Kent in 1983 gave both absolute and relative indications considering closed treatment to be more appropriate in the management of condylar fractures rather than open reduction.³

Absolute Indications

- a) Lateral extra capsular displacement.
- b) Impossibility of obtaining adequate occlusion by closed reduction.
- c) Displacement in to middle cranial fossa.
- d) Invasion by foreign body.

Relative Indications

- a) Unilateral or bilateral condylar fractures where splinting is not possible due to medical reasons.
- b) Bilateral condylar fractures with comminuted mid-facial fractures, Prognathism or Retro-prognathism.
- c) Bilateral condylar fractures in edentulous patient without splint.
- d) Periodontal problems, Loss of teeth.
- e) Unilateral condylar fracture with unstable base.

Any cases with low or sub-condylar fracture with multiple fractured mandible or Le-Fort fracture, fractures dislocated condylar fossa, fragment with medial tilt more than 14 degree, Ramus shortening more than 5%, Bilateral fractures with open bite, Gross fracture, Dislocated fracture, Abnormal function or malocclusion should be preferred for surgical treatment.⁷

After appropriate informed discussion as to the risks, benefits and alternatives available, patient's understanding and based on the patient's preference and when no absolute and relative contraindications are present, closed reduction can be advised.

Patients were kept on IMF for a time duration of three to four weeks which was followed by physiotherapy in the post IMF period. Mostly four exercises were prescribed for the patient, Maximal mouth opening, lateral excursions, protrusive excursions and closing against resistance.

Patient who had functional occlusion after release of IMF were advised to chew 10 chewing gums per day as physiotherapy measure, patients were advised to chew on both the sides. During each follow up the patient were given a new goal as per the improvement in their measurements. Post IMF, If the mouth opening was found to be reduced the patient was instructed to wedge wooden ice cream sticks between the teeth to increase the mouth opening.

Any patient with difficulty in achieving occlusion after IMF were put on guiding elastics for minimum of one week for 24 hours a day, if the patient was still not able to achieve occlusion they were considered as failure. Later these patients were considered for orthodontic correction or surgical correction.⁸ The lateral excursion on average seen in our study was 4. 2-4.3mm on both the fractured side and normal side, which then showed significant improvement in further follow ups. A Total of 10 cases had posterior cross bite preoperatively in our study. Postoperatively after 6 months three cases had posterior cross bite indicating failure in successful functional rehabilitation. All these cases had bilateral condylar fractures due to which we were not able to achieve occlusion. In successive follow ups these cases had their cross bite corrected by guiding elastics and

brought to functional occlusion. Angulation of condylar fractures seemed to be influencing the postoperative outcome of the cases in our study. Out of 30 cases included, the ones in which the functional outcome were successful had an angulation in coronal and sagittal section less than 45 degree which were 25 in number and in the cases with more than 45 degree angulation, we were not able to achieve all the parameters for the successful functional rehabilitation and those 5 cases had significant TMJ dysfunction after 6 months.



Figure 1

Conclusion

The results from our study indicate that all the fractures of the mandibular condyle which are favourable for a closed reduction should be treated by the same, considering the surgical risk associated with the approach to the condyle. Selection of the cases and correct interpretation is very important as it greatly influences the postoperative outcomes⁹. After considering criteria's like shortening of the ramus of mandible, angulation of the condyle, mouth opening , occlusal discrepancies like Open bite , Cross bite and TMJ dysfunction like Pain, Clicking, Crepitus etc, we

have reached a conclusion that patients in whom the angulation of the fractured fragment is less than 45 degree, ramus shortening less than 8 mm, un-displaced and moderately deviated condylar fractures can be managed by closed reduction with successful functional rehabilitation such as mouth opening greater than or equal to 4 cm and lateral excursions greater than 8 mm and with less TMJ dysfunction like pain, clicking, crepitus etc. However to give a proper comment on the TMJ dysfunction after condylar fracture detailed study is advised with a long term follow up.

Abbreviations

TMJ – Temporo-mandibular Joint, RCU- Ramus Condyle Unit, CBCT – Cone Beam Computed Tomography, CNS – Central Nervous System, ORIF – Open Reduction and Internal fixation, CRMMF – Closed reduction by Maxillo-Mandibular fixation, MCF – Mandibular Condylar Fractures, CTR – Conservative Treatment

References

1. MacLennan WD. Consideration of 180 cases of typical fractures of the mandibular condylar process. *British journal of plastic surgery*. 1949 Jan 1;5(2):122-8.
2. Mitchell DA. A multicenter audit of unilateral fractures of the mandibular condyle. *British Journal of Oral and Maxillofacial Surgery*. 1997 Aug 1;35(4):230-6.
3. Zide MF, Kent JN. Indications for open reduction of mandibular condyle fractures. *Journal of Oral and Maxillofacial Surgery*. 1983 Feb 1;41(2):89-98.
4. Raveh J, Vuillemin T, Ladrach K. Open reduction of the dislocated, fractured condylar process: indications and surgical procedures. *Journal of*

- Oral and Maxillofacial Surgery. 1989 Feb 1; 47(2):120-6
5. Worsaae N, Thorn JJ. Surgical versus nonsurgical treatment of unilateral dislocated low subcondylarfractures: a clinical study of 52 cases. Journal of oral and maxillofacial surgery. 1994 Apr1; 52(4):353-60.
 6. Newman L. A clinical evaluation of the long-term outcome of patients treated for bilateral fracture of the mandibular condyles. British Journal of Oral and Maxillofacial Surgery. 1998 Jun 1; 36(3):176-9.
 7. Choi KY, Yang JD, Chung HY, Cho BC. Current concepts in the mandibular condyle fracture management part II: open reduction versus closed reduction. Archives of plastic surgery. 2012 Jul; 39(4):301.
 8. Throckmorton GS, Ellis Iii E. Recovery of mandibular motion after closed and open treatment of unilateral mandibular condylar process fractures. International journal of oral and maxillofacial surgery. 2000 Dec 1; 29(6):421-7
 9. Ellis III E, Throckmorton GS. Treatment of mandibular condylar process fractures: biological considerations. Journal of Oral and Maxillofacial Surgery. 2005 Jan 1; 63(1):115-34