

Clinical Outcome of Open Reduction and Internal Fixation of Mandibular Condyle Fracture: A Prospective Observational Study

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ABSTRACT

Introduction: Condyle of mandible plays crucial role in functioning of jaw. Untimely and inadequate treatment leads to deformity of face along with range of complications. The purpose of this study was to assess outcomes of open reduction and internal fixation of mandibular condyle fractures in terms of mouth opening, facial nerve function and occlusion.

Methods: This was a prospective observational study conducted at Chitwan Medical College. Thirty-two patients of mandibular condyle fracture were treated by open reduction and internal fixation via retromandibular approach and evaluated for mouth opening, facial nerve function, and occlusion on 2nd day, 10th day and 25th day postoperatively. All collected data were entered on SPSS version 21 and analyzed using descriptive statistical methods. The results were presented as graphs and tables.

Results: Of 32 patients, 7 patients show abnormal occlusion while 25 patients show normal occlusion. A gradual improvement in mouth opening and facial nerve function was also seen on 25th day.

Conclusion: Open reduction and internal fixation gives superior clinical outcomes in terms of mouth opening, facial nerve function and occlusion. It also allows good anatomical repositioning and early function.

Keywords: Facial nerve function, Mouth opening, Occlusion, Open reduction internal fixation

Layman summary: The mandible is largest and strongest bone of face. However, it is also most common facial bone that is fractured. Condyle of the mandible is highly prevalent site of mandibular fracture. The fracture of mandible is managed by open or closed reduction. Both of the methods have their own merits and demerits. In this study, we planned to assess the outcomes of open reduction and internal fixation of mandibular condyle fractures at a tertiary care center of Nepal. We found that ORIF has a good clinical outcome in mandibular fracture in terms of mouth opening, facial nerve function and occlusion.

INTRODUCTION

Mandibular fractures are the most common facial fractures. In mandibular fractures, the condyle fracture is highly prevalent ranging from 17.5 to 52 % [1]. In children this figure rises to 24 – 72% [2]. Mandible fractures are observed more in males and main cause of fractures are road traffic accident, mostly related to alcohol; falls and interpersonal violence [3-6]. Studies from Nepal have shown road traffic accidents as major cause, followed by fall injury and assault [7,8].

Mandibular condyle fractures are managed with open or closed reduction [9]. In children, up to the age of 12-14,

most surgeons generally prefer closed reduction as bones of children are growing and flexible [10,11]. Dislocation more than 45 degree and displacement more than 2mm require open reduction and internal fixation (ORIF) [12]. Conservative management is effective in treating non-displaced mandibular condylar fractures in children up to age 15 [13]. However, with closed reduction, there are chances of malocclusion, restricted movement of jaw, facial asymmetries and degenerative joint disease [14]. Dislocated condylar fractures are traditionally managed by closed reduction followed by jaw exercise [15].

The best treatment of mandibular condyle fracture

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either by closed or open method, is still debatable [16]. In most instances, it is governed by factors such as fracture locations and the existence of concomitant fractures, as well as patient variables like age, general health, and social background [17]. Recent consensus suggests surgical therapy to have better functional outcome [16]. The use of open reduction internal fixation (ORIF) instead of non-surgical treatment for condylar fractures has become more common due to advancements in computerized tomography diagnostic techniques, surgeon expertise and the development of functionally stable osteosynthesis material [18]. Open reduction internal fixation produces noticeably better results in restoring occlusion, restoring ramus height and symmetry. However, there may be chances of scarring, facial nerve palsy, parotid fistulas, and dysfunction of the temporomandibular joint over time [19].

Mandibular condylar fractures are usually treated with open reduction internal fixation in Nepal; however, the outcome has not been studied till date. So, this study was aimed to assess outcome of open reduction and internal fixation of mandibular condyle fractures in a tertiary care center of Nepal.

METHODS

A prospective observational study was conducted at Chitwan Medical College, Bharatpur from February 2022 to September 2023. In this study duration, thirty-two patients who underwent ORIF of mandibular condyle fracture were included in the study. The data included etiology, site of fracture, side of fracture and other associated maxillofacial fractures. An informed written consent was taken from all patients. Ethical approval was obtained from the Institutional review committee, Chitwan Medical College before the commencement of study [Ref: CMC-IRC/078/79-100].

Mandibular condyle fractures were divided into 2 groups: intra- or extra-capsular fracture; this classification is based on the anatomical aspects such as the condylar head, condylar neck, and subcondylar region. Another classification method is based on the condyle position, i.e., undisplaced, deviated, displaced (with medial or lateral overlap or complete separation), or dislocated (outside the glenoid fossa) condyle fractures [1].

After taking proper history, clinical examination such as pain in temporomandibular region, limited mouth



Figure 1: (A) Coronal section of CT SCAN showing condyle fracture (B) Retromandibular incision line (C) ORIF with two miniplate (D) Maximum intercuspation of teeth (E) Postoperative orthopantomogram (F) Postoperative mouth opening (G) Postoperative scar (H) Facial nerve function

opening and deviation of mandible in affected site, open bite. Diagnosis of mandibular condylar fracture was confirmed by orthopantomogram (OPG) and computerized tomography (CT). Demographic data were also collected. Patients requiring open reduction and internal fixation of condylar fracture and those who gave informed consent were included for study. Informed written consent was taken from the patient and their attendant. Fitness for operative procedure under general anesthesia was assured. All the surgical procedure and subsequent follow-up evaluations were done by one maxillofacial surgeon and supporting team.

Under general anesthesia and aseptic measures, retromandibular incision mark was given 0.5 cm below ear lobule and posterior to the ramus of mandible (2 to 2.5 cm) and infiltration of the incision line was done on lidocaine with adrenaline (1:80000). Incision was given up to platysma muscle and subplatysmal flap was reflected. After that parotid fascia and parotid gland were identified. Pterygo-masseteric sling was dissected and periosteum reflected up to sigmoid notch and posterior border of ramus of mandible up to fractured segment. Fixation of fracture was done with two miniplate with 4 holes and screw keeping posterior border and another plate 5 mm anterior to posterior plate (Figure 1). Haemostasis maintained suture was done layer by layer and pressure dressing was given. Antibiotics, analgesics, corticosteroid, IV fluid was prescribed to manage postoperative sequelae. Each patient was prescribed methylcobalamin for 3 weeks for transient branches of facial nerve injury. Patients were advised for aggressive physiotherapy for mouth opening exercise and facial nerve function. Standard metallic scale was used to measure maximum oral opening between incisal edge of maxillary and mandibular central incisor and recorded in second, tenth and twenty fifth post operative day. Molar relation according to angel's classification was used to assure occlusion. Facial nerve injury was classified according to House-Brackmann Facial Nerve Grading System [1] and recorded in second, tenth and twenty fifth post operative day.

All collected data were entered on SPSS version 21 and analyzed using descriptive statistical methods. The results were presented as graphs and tables.

RESULTS

In total of 32 enrolled patients, 25 were male (78.1%) and 7 were female (21.9%) with median age 28.5 years. Twenty-eight patients (87.5%) were injured due to road traffic accidents. Fifteen patients (46.9%) had fracture in the neck of the condyle (Table 1).

Postoperative outcome such as mouth opening, facial nerve injury and occlusion were recorded in 2nd, 10th and 25th post operative day. Range of mouth opening was 20.06mm ± 5.14, 30.63mm ± 5.27 and 39.13mm ± 3.81 in 2nd, 10th and 25th post operative day in all the patients (Table 2).

On second day, grade 3 facial nerve injury observed in one patient, grade 2 facial nerve injury observed in sixteen patients while grade 1 facial nerve injury observed in fifteen patients. On twenty fifth day grade 3 facial nerve injury observed in one patient, grade 2 facial nerve injury observed in four patients and grade 1 facial nerve injury observed in twenty-seven patients (Table 3). Of the 32 patients, 25 patients (78.12%) showed normal occlusion and 7 patients (21.87%) abnormal occlusion (data not shown).

Table 1: Demographic characteristics of patients (n=32)

Variable	Category	N (percent)
Age [Median (Q3-Q1)]		28.50 (36-25)
Sex	Male	25 (78.1)
	Female	7 (21.9)
Cause of Injury	Road Traffic Accident	28 (87.5)
	Fall	2 (6.3)
	Assault	2 (6.3)
Site of fracture	Neck of condyle	15 (46.9)
	Sub Condyle	17 (53.1)
Fracture side	Left	13 (40.6)
	Right	12 (37.5)
	Bilateral	7 (21.9)
Presence of Associated Fractures		21 (65.6)
Occlusion	Satisfactory	25 (78.12)
	Unsatisfactory	7 (21.88)

Table 2: Mouth Opening (n=32)

Variable	Mean ± SD
Mouth opening on day 2	20.06mm ± 5.14
Mouth opening on day 10	30.63mm ± 5.27
Mouth opening on day 25	39.13mm ± 3.81

Table 3: Facial Nerve Injury grading in patients at 2, 10 and 25 days (n=32)

Grade of Nerve Injury	Grade 1, n (%)	Grade 2, n (%)	Grade 3, n (%)
Day 2	15 (46.87)	16 (50)	1 (3.13)
Day 10	23 (71.87)	8 (25)	1 (3.13)
Day 25	27 (84.4)	4 (12.5)	1(3.1)

DISCUSSION

Condylar fractures are the most common facial fractures but still a topic of debate regarding treatment. In earlier days, conservative management was the preferred treatment of choice. However, in recent years, the use of open reduction internal fixation instead of non-surgical treatment for condylar fractures has become more common due to advancements in computerized tomography diagnostic techniques, surgeon expertise, and the development of functionally stable osteosynthesis material [16].

The mouth opening is one of the most important parameters to observe the success of the surgery of

fractures of maxilla and mandible [1]. As a common conscience the mouth opening is less in the initial day of surgery then gradually increases which is also assisted with physiotherapy [1]. In the present study the mouth opening was observed to be 20.06mm \pm 5.14, 30.63mm \pm 5.27 and 39.13mm \pm 3.81 in 2nd, 10th and 25th post operative day in all the patients. According to Nowair et al. the mouth opening with retromandibular approach was >40 mm in 91% of case; there was no evidence of aperture impairment following surgery [20]. In the study conducted by Tatsumu et al, the average mouth opening of 42 mm and 49 mm was reported at 3 and 6 months [21]. The present study was more focused on outcome of 2nd, 10th and 25th post operative day. This study can also expect similar range of mouth opening [20,22].

In such mandibular fracture patients, postoperative trismus is inevitable. This is due to injury to the masseter muscle, haematoma development, and surgical insult to surrounding structures after open reduction internal fixation of fractures of the mandible condyle. Hence such patient requires aggressive physiotherapy of mouth opening exercises such as use of tongue blade (5 times a day for 30 minutes), antibiotics, and analgesics [1].

At times there are also issues of injury to the facial nerve. A study has reported 12% to 48% of prevalence of transient injury to facial nerve branches when the retromandibular transparotid approach was used [22]. In another study, Chen et al reported 4.2% of facial nerve disturbance rate on submandibular approach while 11% in the case of retromandibular approach [23]. However, in the present study there was no postoperative permanent nerve palsy reported by patients.

In the present study, on 25th day using retromandibular trans parotid approach in 5 (15.6%) patients, there was transient damage to branches of facial nerve. The facial nerve's postoperative function was assessed 24 hours after the procedure, as well as at 1, 6, and 12 weeks [24]. In this study postoperative follow up was taken on the 2nd day, 10th day and 25th day. The main causes of transient facial nerve palsy include electrocauterization of the arteries next to the facial nerve and severe retraction as opposed to neurotmesis [25]. It is also caused by nerve fiber edema. In the present study, for these patients were treated with three weeks of methylcobalamin 1500 mcg, corticosteroids, and physiotherapy for the same side's angle of mouth in front of a mirror.

Of the 32 patients, 25 patients (78.12%) showed normal occlusion and 7 patients (21.87%) abnormal occlusion. Spinzia et al reported occlusal disturbances in 5 (20%) patients whereas the remaining 20 (80%) had normal occlusion [1]. In this study occlusal disturbances were corrected with occlusal grinding.

The present study is a single center study so the results of the study cannot be generalized to whole Nepal. The number of cases were less and the study had a smaller duration of follow up.

CONCLUSION

The treatment of mandibular condyle fracture is still debatable. From this study we can conclude that open reduction and internal fixation gives superior clinical outcomes in terms of mouth opening, facial nerve function and occlusion. It also permits early function and appropriate anatomical realignment.

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Ethical Approval: This research was approved by IRC of Chitwan Medical College with the reference number of CMC-IRC/078/79-100 on 9th February, 2022.

Consent: Informed written consent was obtained from the all the participants before data collection.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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