

Original Research Article

Study of open versus closed reduction of mandibular condyle fractures

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ABSTRACT

Background: Condylar fractures of the mandible are a commonest occurrence in maxillofacial surgery. Many surgeons prefer closed therapy with maxillomandibular fixation, while open treatment with rigid internal fixation has become more common in recent years. This study provides a comparative evaluation of open and closed reduction of the mandibular condyle.

Methods: The 50 patients with condylar fractures were treated with open and closed reduction as per the requirement.

Results: A higher incidence of unilateral segmented condylar fractures were seen in young adult males. Open reduction and internal fixation (ORIF) with a combined approach was the preferred treatment of choice with fewer post-op complications.

Conclusions: ORIF is a suitable technique in the treatment of condylar fractures as it promises few complications

Keywords: Mandibular condyle, Mandibular fractures, Condylar fractures

INTRODUCTION

The condylar, condylar neck and sub-condylar fractures are the most common mandibular fractures. They account for 17.5-52% of all mandibular fractures.¹⁻² The higher incidence of condylar fracture can be attributed to the binding of the mandibular ramus with high stiffness and the mandibular condyle head with low stiffness.³ An indirect force applied to the mandibular condyle head is the most common cause. Physical trauma is the most common external cause, although other external causative factors include vehicle accidents, aggression, occupational hazards, falls, sports, and gunshot wounds. Osteomyelitis, benign or malignant tumours, and muscle spasms after electric shock treatment are internal causal causes.⁴

Pain, restricted mandibular mobility, muscular spasm and deviation of the jaw, malocclusion, and pathological alterations in the TMJ, osteonecrosis, facial asymmetry, and ankylosis are all sequelae of condylar fracture, regardless of whether treatment was undertaken or not.⁷

The age of the patient, whether the fracture is unilateral or bilateral, the presence of any previous mandibular fractures, the depth and displacement of the fracture, the presence of teeth, and the degree to which occlusion is disrupted all influence treatment considerations.⁵

Since the first mandibular condyle neck surgery in 1925, there has been debate on treating mandibular condyle fractures: conservative closed reduction and functional therapy versus open surgical reduction.⁶

The anatomic position (intracapsular and extracapsular) and degree of dislocation of the articular head are used to classify condylar fractures. 1) Intracapsular fractures of the condyle are classified as type A, fractures involving the medial condylar pole; 2) Type B, fractures through the lateral condylar pole with loss of vertical height of the mandibular ramus; or 3) Type M, multiple fragments, comminuted fractures.

The majority of mandibular condyle fractures involve the condylar neck, with few reports of intracapsular fractures.

Sagittal or vertical fractures of the mandibular condyle and chip fractures of the medial part of the condylar head are missed by conventional radiography. However, they are often visualised by computed tomography (CT) scan.⁷

For moderately displaced condylar fractures, closed treatment with rigid or elastic maxillomandibular fixation (MMF) is still employed. Closed reduction is considered in these cases due to difficult surgical access to the condylar area and the difficult repositioning of the proximal fragment.⁸ ORIF of condylar fractures may be used for bilateral injuries or considerably displaced condylar fractures. Still, closed treatment and intermaxillary fixation (IMF) may be indicated in cases where condylar displacement is minimal, and the height of the ramus is almost normal.⁹

The absolute indications for open treatment of condylar fractures are in cases of bilateral fractures, major dislocations, when closed treatment does not re-establish occlusion, concomitant fractures of other areas of the face that compromise occlusion and for which RIF will be used, foreign bodies such as firearm projectiles causing dislocation of the condyle in relation to the middle cranial fossa.⁷

Aim

Aim of the study was to compare the outcomes of open and closed reduction of mandibular condylar fractures.

METHODS

This was a prospective study conducted in the department of plastic surgery where 50 patients with mandibular condylar fracture ranging between 18-55 years reporting to the department between 2007 to April 2009 were selected and treated accordingly with open or open or closed reduction.

The study excluded edentulous patients, patients below the age of 18 years, patients with comminuted angle fractures, patients with systemic issues, patients with osteoporosis and osteopetrosis, and patients receiving chemotherapy or radiotherapy.

A detailed history of the nature of the injury and its symptoms were obtained. In addition, a thorough physical examination was performed to determine the patient's overall health.

Ethical consent was obtained from the ethical committee of the hospital. In, addition, both informed and written consent was obtained from the participants about the procedure.

All patients had a maxillofacial CT scan preoperatively and postoperatively to assess the anatomical reduction.

Based on the extent of injury, open or closed reduction was performed. For instance, cases with adequate mouth opening, normal occlusion, vertical height of ramus maintained, comminuted fracture, and intra-capsularun displaced fractures were managed by closed reduction with MMF-arch bars or IMF. Likewise, cases with reduced mouth opening, with malocclusion or with any occlusal derangement, with a reduced vertical height of the ramus, with the gross displacement of fractured fragments, associated with other injuries were surgically managed by ORIF with mini plates and screws, followed by MMF in some cases. In addition, a closed reduction of condylar fracture was done. First, it was assessed if the occlusion was maintained after closed reduction and adequate mouth opening. Then, the surgeon proceeded with MMF and CRMF (Closed reduction maxillary fixation) for condylar fracture. On the other hand, even if stable occlusion and adequate mouth opening weren't achieved after closed reduction, then open reduction of the condylar/sub-condylar fracture was done.

Patients were discharged within three to five days postoperatively. However, they were periodically followed up after one week, two weeks, one month, and three months to assess post-operative complications, including occlusion stability and other complications.

Patients were discharged three to five days after surgery. After one week, two weeks, one month, and three months, they were followed up to assess post-operative problems such as occlusal stability and any untoward complications.

All data were recorded and analyzed.

RESULTS

In our study, 50 patients with a condylar fracture who met our inclusion criteria were registered. The most affected age group was 21-30 years (Table 1) with a male dominance (Table 2).

Table 1: Age distribution.

Age group (Years)	N	Percentage (%)
<20	3	6
21-30	21	42
31-40	15	30
41-50	9	18
>51	2	4

Table 2: Gender distribution.

Gender	N	Percentage (%)
Male	36	72
Female	14	28

Results based on radiological diagnosis

In Table 3, the left condyle showed a higher incidence of fracture followed by the right condyle. The 10% of the cases reported bilateral condylar fractures, while symphyseal fractures were the least. Table 4 shows that cases of unilateral condylar fractures exceeded those of bilateral condylar fractures in this study. Unilateral sub-condylar fractures were 3 times more than bilateral sub-condylar fractures.

Table 3: Radiological diagnosis.

Radiological diagnosis	N	Percentage (%)
Left	26	52
Right	13	26
Bilateral	5	10
Symphysis	6	12

Table 4: Isolated condylar involvement, (n=50).

Condyle	N	Percentage (%)	Sub-condyle	Percentage (%)
Unilateral	14	28	18	36
Bilateral	12	24	6	12

The pattern of injury in this study showed the highest number of cases of segmented condylar fractures while pan fascial fractures were the least (Table 5).

Table 5: Pattern of injury.

Pattern of injury	N	Percentage (%)
Segmented	28	56
Isolated	11	22
Combined	9	18
Pan fascial	2	4

Results based on intervention

The highest number of cases in this study were treated with ORIF followed ORIF combined with MMF and the least number of cases were treated with MMF as seen in Table 6.

Table 6: Intervention performed.

Fracture treatment	N	Percentage (%)
ORIF	40	80
ORIF + MMF	8	16
MMF	2	4

Table 7 shows that (ORIF) were employed in more cases than closed reduction maxillary fixation (CRMF).

Table 7: Closed vs open reduction.

Intervention	N	Percentage (%)
CRMF	20	40
ORIF	30	60

In open reduction cases, a combined surgical approach was used in most patients in this study, shown in Table 8.

Table 8: Surgical approach used.

Approach	N	Percentage (%)
Combined	15	30
Risdon	12	24
Preauricular	2	4
Intra parotid retro	1	2

Results based on complications

Out of the total patients treated with ORIF, none reported post-reduction malocclusion, and only 2 patients reported restricted mouth opening while 28 reported adequate mouth opening.

In CRMF treated cases, 6 out of 20 patients reported malocclusion and restricted mouth opening.

DISCUSSION

In their study, Hagan et al discovered a clear mandibular fracture pattern where the condyle region proves to be the most common site of fracture.¹²

Our research shows that young adult males showed a higher incidence of condylar fracture, which has also been reported by Thapa et al.¹⁰ This can be attributed to younger men taking part in more high-risk activities and, therefore, unilateral involvement of the condyle was higher than bilateral condylar fractures. Similar results were reported in a retrospective study by Andersson et al.¹¹

Based on the clinical and radiological findings related to fracture, open/closed reduction was planned. However, in our study, most cases were treated with ORIF (80%) with fewer complications and promising results.

ORIF was the surgeon's choice in this study as most cases were of segmented condylar fractures (26%) as displacement related to these fractures are considerable.

Through Towne's and panoramic radiographs, Ellis et al studied 61 patients treated by ORIF for unilateral condylar process fractures. The images were traced and digitized, and the position of the fractured condylar process was statistically compared with the position of the non-fractured condylar process in both the coronal and sagittal planes. Post-surgery, the difference in position between the fractured and non-fractured sides averaged less than 2° (not significantly different), indicating a good reduction of the fractures. However, subsequently, between 10% and 20% of condylar processes had postsurgical changes in the position of more than 10°. Thus, this research showed the potential to reduce the fractured condylar process anatomically, but

changes in the position of the condylar fragment may then result from a loss of fixation.¹³

Nussbaum et al provided a review of previous research that explicitly evaluated whether open or closed treatment of condylar fractures produced better outcomes. However, the findings were ambiguous regarding whether open or closed therapy should be utilised for mandibular condylar fractures.¹⁴

In our study, a combined (Risdon and intraoral) approach to access the condyle while performing ORIF. This approach markedly reduced the risk of nerve damage with a better restoration of functionality and much lesser post operative complications. In a similar study, Cortese et al suggested that a combined pre-auricular and intraoral approach for surgical treatment of sub-condylar and condylar neck fractures can be used to avoid facial nerve injuries.¹⁶

Complications related to ORIF used in this were markedly less. For example, no malocclusion was reported, while only 2 cases were reported with restricted mouth opening.

Spinzia et al conducted a retrospective study to evaluate the long-term clinical and radiological outcomes after surgical treatment of 25 patients with a total of 26 extracapsular condyle fractures. Eighty percent of the patients recovered their occlusion, 88 percent had no facial nerve impairment, and 88% had acceptable surgical skin scarring. The patients had a complete recovery of temporomandibular joint functions and were reported to be asymptomatic in 72% of cases. All of the patients' post-operative radiographs showed that the anatomical condylar region had recovered well, and 80 percent of them had no post-operative problems. The average patient satisfaction rating was 8.32 out of ten. Our findings support the use of ORIF in conjunction with post-operative functional rehabilitation therapy for patients with extracapsular condylar fractures.¹⁵

CONCLUSION

Management of mandibular condylar fractures is a matter of intrigue for maxillofacial as well as plastic surgeons. This study advocates the use of ORIF in displaced segmented mandibular condylar fractures with a combined approach as it promises lesser complications and better restoration of functionality.

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