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Comparison of Open Versus Closed Reduction Techniques in Management of Condylar Fractures

Dr. Deep Datta[1]*, Dr. Pratap Chandran[2]

[1] MDS Maxillofacial Surgeon & Implantologist, Agartala, Tripura, India

Email: dr.deepdutta@gmail.com

[2] MDS Maxillofacial Surgeon & Implantologist, Chennai, Tamil Nadu, India

Abstract - This study's objective is to better understand the causes, symptoms, classifications, and treatment options for mandible fractures, with a focus on condylar and subcondylar fractures. The patient's age, the kind of fracture, the patient's systemic state, any previous fractures, the teeth, the likelihood It is important to consider the presence of foreign materials, the extent of occlusal restoration by intermaxillary fixation, and other factors before making a treatment decision.

Keywords: Faciomaxillary, mandible, tomography, fragments.

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INTRODUCTION

The mandible is the most common bone in the face to sustain a fracture. The mandibular joint is involved in 18–57% of all mandibular fractures condyle, as shown by Lindhal (1977). A mandibular condyle fracture is most often caused by a vehicle collision. Other reasons include assault, tripping, industrial accidents, accidents involving falls from great heights, and accidents occurring in sports.

Signs and symptoms of a mandibular condylar fracture might include an open bite, swelling, joint discomfort, dysfunction of the jaw, deviation of the chin, crepitus, and skin laceration. Mandibular condylar fractures may be treated using either an open or closed reduction technique.

The diagnosis of a unilateral or bilateral mandibular condylar fracture, its level, the extent of displacement or dislocation, and other radiological and clinical findings all contribute to the formulation of a treatment plan.

The functional outcomes are generally good, and the risks of surgical surgery exceed the potential benefits, according to traditional British teaching on condylar injuries. On the other hand, those who support open reduction believe that the most effective way to treat a fracture is to use the fundamental concepts of skeletal stabilization and anatomical realignment.

Potential complications that can arise from treating condylar fractures include: intraoperative hemorrhage or infection after surgery, malocclusion, loss of ramus height, facial and mandibular asymmetry, Frey syndrome, an ugly scar (Dunaway and Trott, 1996), ankylosis (0.2–0.4% of condylar fractures), anterior open bite, chronic pain, joint pain, decreased mandibular function, crepitation, hypomobility (0.8–0.10% of cases), deviation when opening the mouth, and facial nerve injury.

LITERATURE AND REVIEW

Karan Taneja, Nabeel Bhatti, (2022) This literature review set out to do just that—compare the functional outcomes, indications, and pros and cons of closed treatment against open reduction for condylar head fractures. A comprehensive examination and evaluation of all published research involving adults and condylar head fractures from 2001 to 2021 was carried out. The outcome of the literature research was the identification of 18 articles that were deemed suitable for inclusion. Maximum interincisal openness, excursive motions, the functional results experienced by the open reduction group included deviation of the midline, malocclusion, ankylosis, and persistent discomfort improved upon, according to most research. Although there are a variety of indications for surgical therapy of condylar head fractures, the most common one seems to be ramus shortening

accompanied by a loss of vertical height. As of this writing, there is no universally accepted method for treating condylar head fractures. Open reduction seems to be gaining more and more research that supports the assumption that it may provide superior functional results (and faster return to function). In some instances, nevertheless, closed therapy is still an option worth considering. As a result, tailoring care to each patient's unique needs is essential.

Muhammed Shiju, Sanjay Rastogi, Prashant Gupta, Sumedha Kukreja, Roy Thomas, Amit Kumar Bhugra, Mahendra Parvatha Reddy, Rupshikha Choudhury, (2015) In order to determine whether the open or closed approach is better for treating mandibular condylar fractures, this prospective randomized controlled experiment compared the two. Fifty people who were randomly assigned to participate in the experiment had their mandibular condylar process fractures evaluated. The fractures were all displaced and had angles of 10° to 45° of angle. Clinical evaluation of functional and subjective parameters, including the visual analogue scale for pain, gait, deviation of the mouth, range of motion, and radiographic measurements, were conducted during the follow-up examinations that occurred 1st day, 2nd day, 1st week, 2nd week, 6th week, and 6 months after treatment. Maximum interincisal opening, range of motion, and TMJ pain were not significantly different between the two groups. In the immediate postoperative period, however, there was a statistically significant change in the following areas: occlusal status, deviation on mouth opening, condyle reduction, ascending ramus shortening, and condyle reduction. Both methods of treating mandibular condylar fractures were effective. There was a statistically significant difference in the anatomic reduction of the condyle between individuals treated with open reduction and internal fixation, however there was no variation on maximum mouth opening suggesting that it is superior to the closed technique.

Durmus Kocaaslan N, Karadede Ünal B, Çavuş Özkan M, Karadede B, Çelebiler Ö. (2022) Twenty-four patients with unilateral condyle fractures, ranging in age from 18 to 48 years, were administered treatment using one of three methods. All patients who did not undergo surgery were given IMF by means of braces, an arch bar or a mini screw. The sole method of treatment for eight patients was IMF. In the meantime, eleven patients underwent treatment with IMF and either a single- or an amplifier occlusal splint with two sides, whichever is more appropriate for the severity of their broken segments. The five patients who were left behind have all had their fractures treated with mini plates and undergone open reduction. A computerized tomography device was used to record images both before and after the operation. Surgeons and orthodontists assessed the patient at baseline and again after six months of treatment using radiographs and clinical exams. After healing, researchers compared the affected and unaffected sides of the condyles of patients who had suffered unilateral fractures. Patients who underwent IMF had a very small length difference of 5.94 mm when measured from the condyle's distal end that projects towards the mandible. A 3.36 mm (p0.05) difference in length was found among patients who utilised both braces and splints. Nevertheless, when comparing the groups on the trauma side to the opposite side, the groups who received either IMF alone, an occlusal splint, or both the IMF and a tiny plate showed no statistically significant change (p>0.05). None of the people exhibited ankylosis, restricted or unrestricted mouth opening, facial asymmetry, laterognathia, or retrognathia. It was possible to direct, reposition, and achieve an acceptable occlusion in patients whose occlusions were not known to have existed prior to the trauma.

Zhao, Lun & Fan, Zifei & Wang, Mingxian & Xing, Guoqiang & Zhao, Wenqi & Tan, Chengqian & Cheng, Youyou. (2020). Many wells in most oilfields produce for extended periods of time in a pseudo-steady-state. Fragmented reservoirs are most stress-sensitive at this time because to the huge reservoir pressure drop, wellbore locations are the most probable sites for fracture closure. The primary goal of doing a vertical well productivity evaluation that takes reservoir pressure drop and fracture closure into account is to this research. Developing a novel composite model capable of managing stress sensitivity and closure was the first stage in repairing damaged reservoirs. Secondly, new pseudo-steady productivity equations for vertical wells were generated using the proposed composite system, which took reservoir saturation condition into account. In the third place, we discussed the characteristics and factors that influence related inflow performance. The findings show that the performance of vertical well inflow is greatly affected by fracture closure, and that well productivity is inversely related to the radius of fracture closure. In this composite model, the influence of the stress sensitivity of the inner zone on well output differs substantially from that of the outer zone. The inner zone's stress sensitivity is far more crucial for productivity than the outer zone's. The inflow performance and productivity index curves converge on the bottom-hole pressure axis as stress sensitivity rises; elevated stress sensitivity inside the inner zone is the root cause of low well production. Optimal bottom-hole pressure and optimum production may both be achieved using inflow performance curves. Furthermore, there is a positive correlation between reservoir pressure and vertical well production. The optimization of production systems in fractured reservoirs may be supported quantitatively by these novel productivity equations and inflow performance curves.

Maharjan, Rajram & Bisht, Rishi & Pariyar, Dipesh. (2020). The researchers set out to examine the results of TEN as an operational therapy for femoral shaft fractures in children. Methods: From February 2017 to January 2019, researchers at the National Trauma Center's Orthopaedics Department at the National Academy of Medical Sciences conducted a

retrospective observational study. Children with femoral shaft fractures (n=22) ranged in age from 5 to 14 years old. Every fracture was treated with TEN fixations no later than nine days after the accident. Radiological and clinical evaluations were conducted on patients until their fractures healed. Flynn scoring standards were used to assess the outcomes. Between six and twelve weeks after surgery, radiological union was seen in every single instance. On average, patients spent 9 days in the hospital after surgery, with a range of 6–15 days. The operating duration was 58–115 minutes. Out of 14 patients, 63.63% had outstanding results, 27.37% had fair results, and 9% had bad results. After getting their nails removed, six patients reported that the skin discomfort at the nail insertion site had gone away. In every instance, when the nails were removed, the functional range of motion in the afflicted limb's hip and knee joints was retained. For kids between the ages of 5 and 14, TEN is a safe and efficient way to treat femoral shaft fractures.

METHODS

No mandible fractures among the patients hospitalized to the faciomaxillary unit. A pro forma was used to capture all of the essential dates. Throughout the research period, the Plastic Surgery Department documented 100 patients with mandibular fractures, 50 of them had condylar fractures. We took a thorough medical history that included the symptoms and kind of damage. The patient's overall health was evaluated with a comprehensive physical examination. Find out if the condylar fracture is on one side or both sides, whether it's within the joint or outside the joint, how many fractures there are in the mandible, and whether there are any additional major or minor injuries. 3D reconstruction orthopantomogram computed tomography (CT) scan where needed, X-ray mandible posteroanterior and lateral views, and X-ray skull anteroposterior/lateral views were among the investigations that were carried out. After the patient has been stabilized and all potential injuries have been eliminated by a comprehensive clinical and radiological examination.

The surgeon's availability and current performance were used as criteria for patient selection. Comminuted fractures can be conservatively treated with closed reduction using MMF-arch bars or IMF in patients who meet specific criteria, such as having enough opening for the mouth, normal occlusion, and preserved vertical height of the ramus. These patients can be paediatric or elderly. In situations where the mouth opening is limited, there is malocclusion or any occlusal derangement, the vertical height of the ramus, or other injuries are present, surgical therapy may include open reduction and internal fixation with micro plates and screws, followed by MMF is reduced, and there is gross displacement of fractured fragments.

The condyle fracture is evaluated intraoperatively after the completion the ORIF technique to treat associated fractures. After the condylar ligament breaks has been repaired and the patient's mouth opening is determined to be sufficient, the patient will be treated with CRMF for MMF. When enough mouth opening and steady occlusion are not achieved after closed reduction, the next step is to open reduce the condylar or subcondylar fracture. As mentioned before, the indications and contraindications dictated the mode of treatment for condylar fractures, which might be either open or closed.

Figure 1. Images from a patient's coronal computed tomography scan revealing condylar fracture displacement (A) and absence of displacement (B).

We used computed tomography (CT) and panoramic radiography to radiologically analyse the displacement of fracture fragments. In computed tomography (CT) scans, a fracture fragment was considered to have displaced if it appeared abnormally positioned with respect to the distal segment bone. Figure 1 Using binary logistic regression analysis, we looked at the correlations between fracture features and treatment approach in patients who had therapy when it comes to condylar fractures that affect just one side. In patients with displaced unilateral condylar fractures, panoramic radiographs were taken before and three months after treatment to measure the difference in ramal height between the affected and unaffected sides. This difference was examined in both the CR and OR groups by the researchers. When creating a panoramic picture, the ramal height was calculated by comparing the height of the mandibular condyle to the point where the tangent to the inferior border of the jaw meets the back edge of the ramus. The measurement was taken on both the side that had fractures and the side that had none. The figure

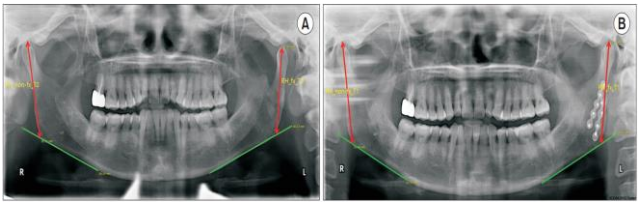

Figure 2. Comparing pre- and post-treatment measurements in panoramic radiographs. (T0: Initial condition, T1: post-treatment condition,

the acronym RH stands for ramal height, fx for fracture site and non-fx for non-fracture site.)

RESULTS

We included fifty individuals with condylar fractures during our investigation. Patients often range in age from twenty-one to thirty-plus. The vast majority of injuries happen to men. The majority of mandibular fractures are caused by RTA. According to radiological diagnoses, the left side accounts for 48.8% of cases, the right side for 25.6%, and symphysis for 14% (Table 1).

Of the fifty instances, thirteen include unilateral condylar fractures, eleven involve bilateral condylar fractures, sixteen involve unilateral subcondylar fractures, and five involve bilateral subcondylar fractures. One example is a single condyle fracture, which occurs 7 times (of which 4 are unilateral and 3 are bilateral). According to Tables 2-4, the most frequent related fracture sites are 33 percent, pan face, 16.3 percent, and symphysis, 14 percent. Of the 50 condyle fractures that were examined, 51% were found inside the capsule, while 49% were found outside of it (Table 5).

There is no occlusion (P = 0.045) in ORIF, however there is a considerably greater incidence of malocclusion in CRMF (4 instances, 10%).

Table 1: Distribution of radiological diagnosis

Radiological diagnosis	Number of cases (%)
Left	25 (48.8)
Right	13 (25.6)
Bilateral	5 (11.6)
Symphysis	7 (14.0)
Total	50 (100.0)

Table 2: Distribution of pattern of injury

Pattern of injury	Number of cases (%)
Segmented	32 (65.1)
Isolated	8 (16.3)
Combined	8 (16.3)
Pan facial	2 (2.3)
Total	50 (100.0)

Table 3: Distribution of isolated condyle

Isolated	Number of cases (%)
Bilateral condyle	3 (7.0)
Unilateral condyle	4 (9.3)

Table 4: Distribution of associated fractures

Associated fractures	Number of cases (%)
Pan facial	7 (16.3)
Ramus	2 (4.7)
Para symphysis	16 (37.2)
Symphysis	6 (14.0)
Angle	3 (7.0)
Coronoid	2 (4.7)

Table 5: Distribution of condyle fracture

Condyle fracture	Number of cases (%)
Intracapsular	25 (51.2)
Extracapsular	25 (48.8)
Total	50 (100.0)

Table 6: Distribution of associated fractures

Associated fractures	Number of cases (%)
ORIF	43 (86.0)
ORIF+MMF	5 (11.6)
MMF	1 (2.3)
Total	50 (100.0)

Table 7: Distribution of condyle

Condyle	Number of cases (%)
CRMF	20 (39.5)
ORIF	30 (60.5)
Total	50 (100.0)

Table 8: Distribution of management

Approach	Number of cases (%)
Combined	13 (30.2)
Risden	10 (23.3)
Preauricular	2 (4.7)
Intra paratotid retro	1 (2.3)

Table 9: Distribution of complications

Complications	Number of cases
Hematoma	1
PMO	3
Temp, facial nerve	2

Table 10: Distribution of late complications

Late complication	Number of cases
Infected implant and implant exit	1
Facial nerve palsy	1
Loosening and displacement of screw	1

Table 11: Closed vs open reduction

Intervention	Number of cases (%)
CRMF	20(40)
ORIF	30(60)
Total	50 (100.0)

A much larger number of restricted instances involving CRMF The p-value of 0.039 indicates that it is statistically significant with 1 in ORIF and 5 in CRMF. Five patients in the CRMF group had significant narrowing of the airway. According to Tables 6 and 7, four of the patients had malocclusion, and two of those instances had a reduced vertical height of the ramus.

Of the 26 instances who underwent ORIF, the combination approach (preauricular + risden/modified sub mandibular) was the most often employed method. When treating subcondylar fractures, the Risden method is by far the most popular choice (Table 8).

Head end elevation and the use of adequate analgesics helped all instances of post-operative facial oedema after ORIF to progressively go away within three to five days. A haematoma formed in one patient, but it was carefully emptied and handled with caution. Three patients had transient facial nerve palsy, most often affecting the frontal lobe, which resolved on its own within a few weeks. Three individuals had temporary difficulty opening their mouths as a result of intense discomfort and muscular spasm, which eventually went away. Implant exit was used to control implant migration in one instance. Tables 9 and 10 show that after three months, the contaminated implant was removed via an implant exit procedure.

DISCUSSION

In the realm of mandibular fractures, the most prevalent kind is the mandibular condyle fracture, and the approaches to treating this fracture have sparked debate. Treatment options for mandibular condyle fractures vary, but they all have the same goal of restoring normal function to the TMJ via the

restoration of its proper anatomical position. Therefore, long-term follow-up should be used to evaluate treatment effectiveness and early treatment outcomes on issues such temporomandibular joint dysfunction, temporomandibular joint ankylosis, or growth difficulty.

That is why, looking at the big picture, it's crucial to manage functional challenges and aesthetic issues. After deciding between closed and open reductions, the ultimate goal Patients with mandibular fractures should undergo therapy to regain stability of the occlusal joints, normal opening of the mouth, normal movement of the temporomandibular joint (TMJ), prevent discomfort and derangement of the joint, and ensure proper development. Along with each case's treatment based on the guidelines that were developed. Every aspect of condylar fracture treatment is predicated on a set of critical parameters, including the patient's age, the fracture's orientation, whether or if there are other injuries, relative to the jaw, whether it is intracapsular or extracapsular, whether it is simple or comminuted, and whether it is medially or laterally displaced. For example, conservative management of comminuted fractures can be achieved through When the patient meets the following requirements: sufficient openness of the mouth, proper occlusion, and maintained vertical height of the ramus, closed reduction with MMF-arch bars or IMF may be performed age group (geriatric or paediatric), and all intracapsular undisplaced fractures.

Also, when other injuries are present, the surgical management may involve When the mouth opening is limited, there is malocclusion or any occlusal derangement, the vertical height of the ramus is measured, and internal fixation with micro plates and screws is undertaken, followed by MMF is reduced, and there is gross displacement of fractured fragments. After the ORIF for the related fracture is completed, the condyle fracture is evaluated intraoperatively when the necessity for ORIF arises. Once the condylar fracture has been repaired and the patient's mouth opening is determined to be sufficient, the patient will be treated with CRMF for MMF. When the reduction is closed, the patient does not experience stable occlusion and does not expand their jaw enough., the next step is to open reduce the condylar or subcondylar fracture. The prevalence of combined and significantly displaced fractures, as well as RTAs, is increasing due to high-velocity injuries. Therefore, the need for ORIF has grown.

CONCLUSION

Thanks to CT scans with 3D reconstruction and excellent orthopantomograms, we can now identify even the smallest fractures with great accuracy. Recent advances in the field of allied medicine have made it possible to treat mandibular fractures at the same time, greatly improving the management of patients with multiple injuries. By creating an inside incision rather than an outside scar, intraoral incisions not only get access to the affected area but also meet the cosmetic standards set by the patient.

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Corresponding Author

Dr. Deep Datta*

MDS Maxillofacial Surgeon & Implantologist, Agartala, Tripura, India

Email: dr.deepdutta@gmail.com