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INTERNAL MAXILLARY FIXATION RELIABILITY IN CONTRAST TO OPEN REDUCTION FOR THE MANAGEMENT OF MANDIBULAR CONDYLE FRACTURES

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ABSTRACT

Background: The goal of treating broken mandibular condyles is to return the affected jaw to its pre-trauma state in terms of masticatory ability, occlusion, symmetry, and function. The two methods can be used to treat the mandibular condylar fracture. These protocols consist of two types: the closed therapy, which employs closed reduction to immobilise the fracture segments, and the open treatment, which involves open reduction of the fracture segments by surgery, followed by internal fixation.

Aim: to compare the post-treatment results of closed therapy versus open surgical treatment for mandibular condyle fractures.

Methods: 42 individuals were treated with either open reduction with internal fixation or closed reduction utilising IMF in 2 groups (n = 12). The clinical parameters of lateral excursion and protrusion, occlusion, mandibular ramus height, deviation/deflection during jaw opening, and pain evaluation using VAS were measured at 1stand 3rd day and at 1, 3, and 6 weeks. The gathered data were examined statistically.

Results: For Group I and Group II, the inter-incisal opening was 8.125±0.3467mm and 6.016±.1528mm, respectively. These values were statistically significant (p ~0.00001). In the surgical groups, it climbed to 17.433±0.3822mm at 3 months and 19.175±0.3696mm at 6 weeks post-operatively. The interincisal opening for the non-surgical group was smaller during the first postoperative week, and subsequently it grew to 9.375±0.2734mm and 12.208±0.1881mm, respectively, at the third and sixth months. Both of these results have statistical significance (p ~<0.00001). At 1, 3, and 6 months recall, the protrusive movement increased in Group I, with means of 0.4667±0.403, 2.275±0.2006mm, and 2.7917±0.0289 mm, respectively.

Conclusion: The current study concludes that, in terms of inter-incisal opening, lateral excursion and protrusive mandibular movement range, pain parameters, facial symmetry, occlusion, and ramal height restoration in a 6-week follow-up period, surgical open reduction and internal fixation treatment of the mandibular condylar fracture is superior to non-surgical closed reduction.

Keywords: Condyle, Closed reduction, Fracture, Mandible, Open reduction and internal fixation, ramus height

INTRODUCTION

Mandibular condyle fractures are the most frequent kind of maxillofacial trauma, accounting for around 60% of all fractures. The most frequent causes of mandibular condyle fractures include falls from heights, violent injuries, and car accidents.[1]

The goal of treating broken mandibular condyles is to return the bit to its pre-trauma state in terms of masticatory ability, occlusion, symmetry, and function. The two methods can be used to treat the mandibular condylar fracture. These protocols consist of two types: the closed therapy, which employs closed reduction to immobilise the fracture segments, and the open treatment, which involves open reduction of the fracture segments by surgery, followed by internal fixation.[2]

Each of the therapy approaches has advantages and disadvantages, as well as uses and restrictions. The literature has extensively shown the relative and absolute benefits as well as contraindications of both closed and open fracture reduction.[3]

Clinical outcomes for closed, conservative treatment of the broken mandibular condyle have been positive. Post-operative dysfunctions after conservative and closed therapy for mandibular condyle fractures have not been extensively studied.[4]

For the situations that apply, different indications for different cases of mandibular condyle fracture have been presented. Surgeons used to generally favour the conservative, closed fracture reduction approach because they believed it produced results that were both acceptable and satisfying after treatment. Due to the historical non-surgical management of mandibular condyle fractures, there is a dearth of information about the long-term assessment of surgical outcomes after open or closed reduction of the fracture.[5,6]

Surgery is a dangerous and challenging treatment for mandibular condylar fractures because of the possible harm that surgery exposure can do to muscles, nerves, and other anatomic tissues.[7] The benefits of conservative closed therapy were the ability to use arch bars and elastics to restore the natural occlusion with satisfactory outcomes.[8]

With the closed therapy, early mobilisation of the jaw, a less complicated recovery, and improved fracture reduction are anticipated. Closed reduction is also linked to a few drawbacks, such as weight loss, difficulty speaking, mastication, airway obstruction, non-functional masticatory muscle atrophy, and poor oral hygiene, even though non-surgical reduction typically causes malocclusion, decreased mouth opening, deviation, or deflection on the opening of the jaws.[9]

Lately, there has been an increase in attempts and ease of treatment for condylar fractures due to improvements in surgical procedures, improved accessible tools, and more understanding of anatomical components.[10] It is simpler to achieve natural normal position restoration or a position that is almost identical to the pre-trauma normal position of the condyle with open reduction and internal fixation. Additionally, internal fixation and open reduction aid in preserving the mandible's and teeth's ideal occlusal position.[11]

The most crucial objective to be accomplished after treatment, regardless of whether open or closed reduction is used, is to restore the jaws' proper occlusal relationship and optimal function.[12]

While there should be less than 35–45 displacement of the condylar fracture accompanied with or not associated with more than 5 mm decrease in the mandibular ramus height for the fracture to be regarded a possible candidate for surgical therapy, There are currently no definite standards to determine if a closed or open reduction is necessary, or if surgery is necessary or not.[13] In order to compare the post-treatment results of closed therapy versus open surgical treatment for mandibular condyle fractures, the current clinical experiment was carried out.

MATERIALS AND METHODS

24 patients with mandibular condylar fractures who were hospitalised to emergency department were included in the study. The Institution Ethical Committee Review Board granted the ethical clearance for this study. The participants who were included ranged in age from 19 to 42, with a mean age of 32.6 years.

To be included in the study, Age of eighteen years or older, a single condylar fracture without a mandibular body or ramus fracture, and a minimum two-millimeter reduction in ramal height were the inclusion criteria that the individuals had to meet. The following conditions led to the exclusion of research participants: fewer teeth and inability to estimate occlusion; patients contraindicated for surgery or anesthesia; related fractures; temporomandibular joint dysfunction; and subjects with systemic illnesses. Every patient and carer gave their informed permission after being informed about the hazards involved with the therapy.

The twenty-four chosen subjects were split into two groups at random (n = 12). While Group II participants had open reduction and internal fixation following optimum occlusion, Group I subjects received IMF utilizing arch bar splinting and guiding elastics without the need for surgery, Titanium mini-plates and screws were used to decrease and stabilize the fracture parts. The participants who were fit for therapy were selected after pre-operative testing and relevant laboratory tests were completed. For every individual, pre-operative CT scans and pantomograms were performed. Under general anesthesia, internal fixation and open reduction were performed on group II.

Following surgery, the participants in both groups underwent assessments on the first and third days, as well as at the one, three, and six-week marks. The mandibular motions in lateral excursion and protrusion, bilateral optimum occlusion via intercuspation of first molars, interincisal opening, mandibular ramus height, and deviation/deflection during jaw opening were all measured for group II throughout all follow-up visits.

For Group I, the parameters were assessed only at the 3rd and 6th week post-operative. In addition, the Visual Analogue score was used to quantify pain for both groups at all recalls intervals using a scale of -10. Using OPG, the Ramal height was measured. The gathered information was statistically assessed.

RESULTS

With 24 participants split into two groups (n = 12), the current prospective clinical experiment was conducted to assess the results of both surgical and non-surgical therapy for mandibular condylar fractures. A cautious approach was taken with one group and an open approach with

others. The included participants ranged in age from 19 to 42 years old, with a mean age of 32.6 years. There were 45.83% females and 54.16% men (n = 13). Table 1 contains a list of the research individuals' demographic details.

When the pre-operative distance between the incisors was measured for both groups, it was discovered to be 8.125±0.3467mm for Group I and 6.016±.1528mm for Group II. These results were statistically significant (p ~0.00001). In the surgical groups, it climbed to 17.433±0.3822mm at 3 months and 19.175±0.3696mm at 6 weeks post-operatively. The interincisal opening for the non-surgical group was smaller during the first postoperative week, and subsequently it grew to 9.375±0.2734mm and 12.208±0.1881mm, respectively, at the third and sixth months (Table 2). Both of these results have statistical significance (p ~<0.00001). The closed reduction IMF technique rapidly restored ramal height and facial symmetry. For both groups, the average motions in lateral excursion and jaw protrusion were assessed. Within Group I, the mean protrusive movement range was 2.275±0.2006 mm, 2.7917±0.0289 mm, and 0.4667±0.403 mm at 1, 3, and 6 months after recollection, respectively. At 1, 3, and 6-month recall, it grew by 1.7161±.5096 mm, 2.4333±0.3339 mm, and 2.8083±0.0289 mm, respectively, in Group II. At one week, the surgical group showed statistically significant improvement (p <0.00001). Table 3 displays the non-significant results at 3 and 6 weeks (p=0.17309 and 0.17129, respectively).

Regarding the lateral excursion movement, it rose by 0.7917±0.0289mm, 4.3417±0.4231mm, and 5.0333±0.2103mm for Group I at 1, 3, and 6 months, respectively. Group II yielded identical results, measuring 2.4167±0.038mm, 6.2167±0.3129mm, and 8.3833±0.4345mm, in that order. With p <0.00001, these values were statistically significant across all time periods (Table 4).

Seven individuals in Group I and nine in Group II had disrupted occlusion; condylar repositioning helped to restore optimum occlusion six weeks after surgery. At the end of six months, Group I and II's mandibular deviation on mouth opening (mean) had dramatically decreased from 1.30mm and 1.60mm, respectively, measured during the pre-operative phase. Group I and II's pre-operative VAS pain scores were 5.125±0.3415 and 4.75±0.3477, respectively. After one week, the scores substantially decreased to 4.275±0.3108 and 3.2833±0.2823, with a p-value of 0.14127 and <0.00001, respectively (Table 5). In order to compare the post-treatment results of closed therapy versus open surgical treatment for mandibular condyle fractures, the current clinical experiment was carried out. One of the most frequent fractures of the mandible is a condylar fracture.

DISCUSSION

The condylar fractures were treated in this research. As demonstrated by a 1998 research by a number of writers, including Baker, who observed better mandibular motions and mouth opening after broken mandibular condylar treatment, treating condylar fractures was deemed crucial.

Despite the fact that improvements in surgical technique and their predictability have made surgical care more popular, traditional management is still preferred since it is less likely to damage facial nerves and is easier to get surgical access, as noted by Ebenezer B14 in 2010.

Following the research by Hyde15 in 2002, where authors reported substantial clinical improvement in the interincisal opening with both surgical and closed therapy, interincisal

opening was found to be significant in both groups in the current experiment, with a p-value of <0.00001.

Protrusive motions and lateral excursion were also shown to significantly improve with open reduction and closed treatment (p-value ~0.00001). Similar results, with improvements of 16 mm with surgery and 13 mm with closed therapy, were reported by Eckett et al.16 in 2006.

Carneiro et al.'s (2008) research, however, contradicted the current one by showing no change in mandibular motions following therapy. Regarding pain perception, there was a significant difference seen between the two groups in the surgery group, with p-values of 0.14127 and <0.00001 at baseline and six weeks, respectively, indicating considerably lower pain perception. These results came from studies conducted by Haug18 and Hyde et al.15, where a p-value of less than 0.05 indicated a statistically significant difference in the two groups' perceptions of pain.

The current study was validated by these results. By the time the ramus height was restored six months after surgery, the current trial's acceptable fracture reduction and ideal occlusion had been reached. These results followed investigations by Ebenezer in 2010, Danda et al. (2010), and Eckelt et al. (2006), where radiographically a satisfactory anatomical reduction of the fractured mandibular condylar segments was accomplished and the mandibular ramus height was re-established.

The current study demonstrated and accepted that surgical treatment was superior to non-surgical treatment for the reduction of mandibular condyles. It also recommends that surgeons adopt open reduction and internal fixation as surgical therapy instead of non-surgical closed reduction for mandibular condyle fractures.

CONCLUSION

The current study concludes that, in terms of inter-incisal opening, lateral excursion, and protrusive mandibular movement range, pain parameters, facial symmetry, occlusion, and ramal height restoration in a 6-week follow-up period, surgical open reduction and internal fixation treatment of the mandibular condylar fracture is superior to a non-surgical closed reduction. On the other hand, non-surgical therapy is superior since it minimises invasion and shields possible anatomical structures from damage. These drawbacks are resolved with the development of surgical methods. A lower sample size, confounding bias, and a shorter monitoring period are some of the study's shortcomings.

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TABLES

Parameters	**Value**
Average Age (in Years)	32.6 years
Age Range	19-42 years
Sex	54.16% males (n=13) and 45.83% females (n=11).
Male	54.16% (n=13)
Female	45.83% (n=11)

Table 1: Demographic characteristics of the study subjects

Time	Group I (IMF)	Group II (ORIF)	p-value
Pre-operative	8.125±0.3467	6.016±.1528	<0.00001
3 week post-operative	9.375±0.2734	17.433±0.3822	<0.00001
6 week post-operative	12.208±0.1881	19.175±0.3696	<0.00001

Table 2: Interincisal opening at different time-intervals of the study subjects

Changes in protrusive movements at different time-intervals of the study subjects	Group I (IMF)	Group II (ORIF)	p-value
1 week	0.4667±0.403	1.7161±.5096	<0.00001
3 week	2.275±0.2006	2.4333±0.3339	0.17309
6 week	2.7917±0.0289	2.8083±0.0289	0.17129
Changes in VAS score for pain at different time-intervals of the study subjects Follow			
1 week	0.7917±0.0289	2.4167±0.038	<0.001
3 week	4.3417±0.4231	6.2167±0.3129	<0.001
6 week	5.0333±0.2103	8.3833±0.4345	<0.001

pre-operative	5.125±0.3415	4.75±0.3477	0.14127
post-operative 6 week	4.275±0.3108	3.2833±0.2823	<0.00001

Table 3: comparison of both groups