RESEARCH
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INCIDENCE OF OPEN REDUCTION AND INTERNAL FIXATION IN CONDYLAR FRACTURE

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Abstract
The treatment of condylar process fractures has generated a great deal of discussion and controversy in oral and maxillofacial trauma and there are many different methods to treat this injury. Although condylar fractures of the mandible may be treated by closed reduction and appropriate physiotherapy, open reduction and internal fixation are indicated in specific circumstances. Condylar fractures of the mandible present a significant challenge in maxillofacial trauma management, given their impact on mandibular function and aesthetics. While conservative management has traditionally been favored for certain cases, open reduction and internal fixation (ORIF) have gained prominence as a surgical approach, offering advantages in fracture reduction and stability. However, the utilization of ORIF varies among clinicians and institutions, influenced by several factors including fracture severity, patient characteristics, and surgeon experience. Understanding the current incidence and trends of ORIF in condylar fracture management is essential for optimizing treatment strategies and improving outcomes. This study aims to investigate the incidence of ORIF in condylar fracture management, explore factors influencing its utilization, and evaluate associated outcomes. By shedding light on contemporary practice patterns, this research seeks to enhance our understanding of optimal treatment approaches and contribute to the advancement of maxillofacial trauma care.
Materials and Method: The study population was 45 Outpatients visiting the University hospital. patients who were admitted to a hospital for treatment of unilateral mandibular condylar fracture and treated with either open reduction and internal fixation or closed reduction. The data collected were tabulated in excel. Descriptive statistics and the relationship between variables were determined using the chi-square test, where $p<0.05$ was considered statistically significant.
Result: In our study, we found that the incidence of Open reduction and internal fixation is higher compared to Closed reduction Out of 45(82.2%) patients who are admitted for mandibular condylar fracture 32(82.2%) patients underwent open reduction and internal fixation and 8(17.8) patients underwent Closed reduction.
Conclusion: Patients with mandibular condylar fractures who receive ORIF have a greater risk of having an extended hospital stay, higher total medical costs, and hematoma development but a lower risk of experiencing wound complications compared to those who receive CR.
Keyword: Condylar fracture, open reduction, closed reduction.

INTRODUCTION

Mandibular fractures are the most common facial fracture. Mandibular condylar fractures are the most common mandibular fractures, It is more common in males, and common causes of traumatic facial injury include motor vehicle accidents, violence, sports-related trauma, falls, and industrial incidents.(1)) Management of condylar fractures of the mandible remains controversial, chiefly because of uncertainty over the natural history of conservatively managed fractures. A review of the literature reveals that the majority of patients treated by conservative means obtain satisfactory function. The condyle can remodel, (2,3), particularly in children.(4)Where fracture union was not anatomical, Lindahl' noted that asymmetrical movement, clicking, and tenderness of the temporomandibular joint (TMJ), although rare in children, were frequent sequelae of conservative management of condylar fractures in adults. In selected cases, open reduction and internal fixation allow for condylar fractures to be accurately reduced and rigidly fixed, resulting in an earlier return to normal function. Operations should only be considered in cases where the displaced fragments are large enough to be reduced and stabilized in three dimensions.(5)

Condylar fractures of the mandible are a common occurrence in maxillofacial trauma, representing a significant proportion of cases seen in clinical practice. These fractures typically involve the lower portion of the mandible, specifically the condylar region, which plays a crucial role in mandibular function including mastication and articulation. Management of condylar fractures has evolved over the years, with the primary goals being restoration of function, occlusion, and aesthetics while minimizing complications and morbidity.(6)

Historically, treatment modalities for condylar fractures have included both conservative and surgical approaches. Conservative management, which involves closed reduction and immobilization with intermaxillary fixation (IMF), has been favored for certain types of condylar fractures, particularly those with minimal displacement or favorable fracture patterns. However, the limitations of conservative management, such as prolonged immobilization, risk of malocclusion, and temporomandibular joint (TMJ) ankylosis, have led to a shift towards surgical intervention in many cases.(7,8)

Open reduction and internal fixation (ORIF) have emerged as a widely accepted surgical approach for the management of displaced or complex condylar fractures. ORIF allows for direct visualization of the fracture site, precise reduction of fragments, and stable fixation with various osteosynthesis techniques including plates, screws, and mini-plates. This approach aims to restore anatomical alignment, promote early mobilization, and reduce the risk of postoperative complications.(9)

Despite the increasing popularity of ORIF, there remains variability in its utilization among maxillofacial surgeons worldwide. Factors influencing the decision to perform ORIF include fracture severity, patient demographics, surgeon experience, institutional protocols, and available resources. Understanding the incidence and trends of ORIF in condylar fracture management is essential for optimizing treatment strategies, improving outcomes, and guiding future research initiatives.(10,11)

Therefore, this study aims to investigate the current incidence of ORIF in the management of condylar fractures, explore factors influencing its utilization, and evaluate outcomes associated with this surgical approach. By providing insights into the contemporary practice patterns and outcomes of ORIF, this research endeavor seeks to contribute to the ongoing advancement of maxillofacial trauma management and enhance patient care.(12,13)

Conservative technique (nonsurgical) maintains normal occlusion with less morbidity producing satisfactory results because of the immediate or early mobilization of the jaws and maintaining occlusion with the help of the arch bars and elastics.((3,14,15)Functional recovery is achieved in the earlier stages and union always occurs with less complications. However, the nonsurgical technique is frequently associated with poor long-term function, i.e., reduced mouth opening, malocclusion, and deviation on opening. Conservative reduction, on the other hand, has its own disadvantages and can prove to be uncomfortable for the patient along with a compromised airway, poor oral hygiene, speech difficulties, impaired nutritional intake with weight loss, and disuse atrophy of the masticatory muscles. In recent years, open treatment of condylar fractures has become more common mostly because of the better understanding of anatomy along with the advent of newer instruments and techniques. Open reduction and rigid internal fixation of condylar fractures ideally give the condylar process its pre traumatic position or close to the position restoring skeletal continuity re-establishing the normal mandibular position and bringing the teeth into a proper occlusal relationship. Regardless of any type of the treatment modality used, the teeth in occlusion seem to be the most important goal along with early functional recovery.

BACKGROUND

As children may sustain minimal condylar process fractures, and because they have an increased ability for bone regeneration and remodeling, numerous studies have reported favorable results following closed reduction (CR) in children. CR is mostly performed by stabilizing the fracture site using a lingual splint and circummandibular wires, intermaxillary (16)fixation with arch bars or interdental fixation, or maxillomandibular fixation. (17)However, totally dislocated or comminuted fractures may require open fixation and internal fixation (ORIF) to obtain optimal realignment. (18)

The complications of condylar fracture include pain, restricted mandibular movement, muscle spasm and deviation of the mandible, malocclusion, pathological changes in the TMJ, osteonecrosis, facial asymmetry, and ankylosis, irrespective of whether treatment was performed or not. They also include fracture of the tympanic plate, mandibular fossa of temporal bone fracture, with or without displacement of the condylar segment into the middle cranial fossa, damage to cranial nerves, vascular injury, bleeding, growth disturbance, arteriovenous fistula, and alter the balance in the masticatory muscles. (19)

Intracapsular fractures of the mandibular condyle are classified as type A, fractures through (20) the medial condylar pole; type B, fractures through the lateral condylar pole with loss of vertical height of the mandibular ramus; or 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 rarely found by conventional radiography and are more commonly detected by computed tomography (CT) scan. (8,21,22)

For moderately displaced condylar fractures, closed treatment with rigid or elastic maxillomandibular fixation is still frequently selected. The reasons for this may be the difficult surgical access to the condylar area and the frequently difficult repositioning of the proximal fragment. (23)Open reduction and internal fixation of condylar fractures may be indicated for bilateral injuries or considerably displaced condylar fractures, but 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. (24)

MATERIALS AND METHODS

Study setting

This was a university dental hospital-based retrospective, cross-sectional study conducted among patients visiting a University dental hospital in Chennai. Since this was a University hospital setting, the distribution of population contributes to a major advantage for this study. The data collected was reliable and with evidence. This study was approved by the Institutional Review Board.

Patients who were admitted to a hospital for treatment of unilateral mandibular condylar fracture and treated with either open reduction or internal fixation and closed reduction The data collected were tabulated in excel.

Data Analysis: Microsoft Excel was used for tabulation of the parameters and then the data was exported to the SPSS software version 20.0 Descriptive statistics and relationships between variables were determined using the chi-square test, where $p<0.05$ was considered statistically significant.

RESULT

Incidence of Condylar Fractures by Age and Gender

The occurrence of condylar fractures was analyzed across different age groups and genders. Among the age categories, the highest incidence was observed in individuals aged 21-30 years (40%), followed by those aged 31-40 years (24%), 11-20 years

(22.22%), 41-50 years (11%), and 51-60 years (2%). In terms of gender distribution, males accounted for the majority of cases at 82.22%, while females represented 17.78% of the cases.(Figures 1 and 2)

Surgical Interventions for Condylar Fractures

The surgical management of condylar fractures primarily involved open reduction and internal fixation (ORIF) and closed reduction (CR). Among the procedures performed, ORIF was the predominant approach, accounting for 75.45% of cases, while CR was utilized in 24.56% of cases. This indicates a preference for ORIF over CR in treating condylar fractures.(Figure 3)

Causes of Condylar Fractures

The leading causes of condylar fractures were identified as road traffic accidents (50%) and interpersonal violence (20%), with the remaining 30% attributed to other causes. Road traffic accidents emerged as the primary cause, highlighting the significant role of external trauma in the occurrence of condylar fractures.(Figure 4)

Treatment Modalities by Age and Gender

Analysis of treatment modalities based on age revealed variations in the utilization of Open reduction and internal fixation and Closed reduction across different age groups. In the 11-20 age group, 15.56% of cases were treated with ORIF, while 6.67% underwent CR. Similarly, in the 21-30 age group, 35.56% received ORIF, and 4.44% underwent CR. Among older age groups, the proportion of cases treated with ORIF decreased, with only 2.22% of individuals aged 51-60 undergoing this procedure.(Figure 5)

Furthermore, the distribution of treatment modalities differed between genders. In males, ORIF was the predominant treatment, accounting for 71.11% of cases, whereas CR was utilized in 11.11% of cases. Conversely, in females, ORIF was employed in 11.11% of cases, while CR was utilized in 6.67% of cases. These findings suggest a gender-based disparity in the choice of surgical interventions for condylar fractures.(Figure 6)

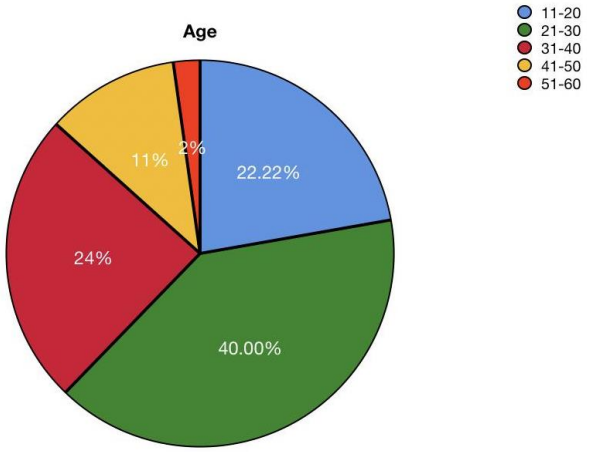

Figure 1

Pie chart showing the Age distribution among the patients. Blue color denotes patients of age 11- 20 years, Green color denotes patients of age 21- 30 years, and Red color denotes patients of age above 31-40 years. Yellow color indicates patients of age 41- 50 years, and Orange color denotes patients of age 51- 60 years. 22.22% of patients belonged to the group of 11- 20 years,40% of patients belonged to the group 21- 30 years of age, 24.44% of patients belonged to the group 31- 40% years of age,11.11 % of patients belonged to the group 41- 50 %,2.22 % of patients belonged to the group of 51- 60 years of age.

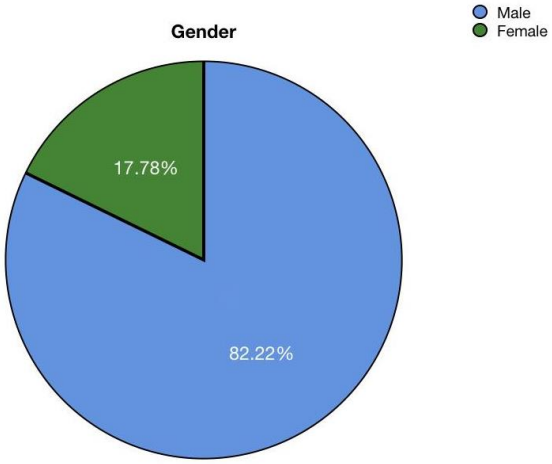

Figure 2

Pie chart showing the gender distribution among patients. The blue color denotes Male patients and the Green color denotes female patients. 82.22% of patients were male, and 17.78% were female.

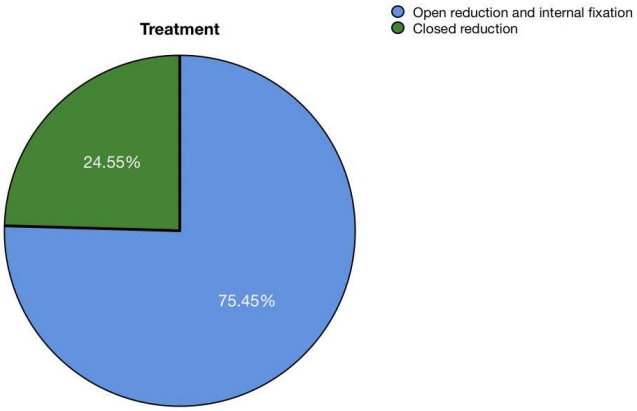

Figure 3

Pie chart showing the treatment distribution among patients. The blue color denotes patients who got treated by open reduction and internal fixation and the Green color denotes patients who got treated by closed reduction. 75.45% are patients who got treated by open reduction and internal fixation 24.55% are patients who got treated by closed reduction.

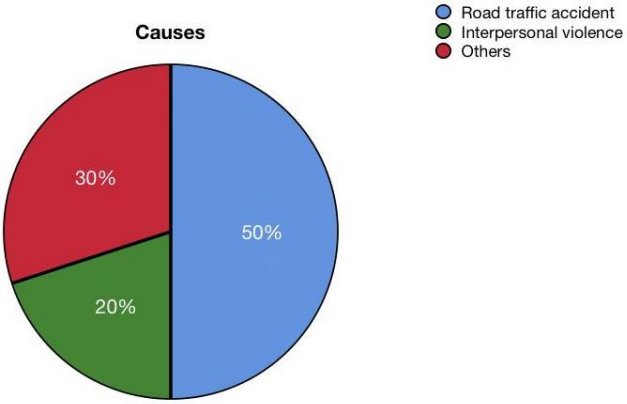

Figure 4

Pie chart showing the Causes of condylar fractures occurred among the patients. Blue color denotes road traffic accidents, Green color denotes Interpersonal violence, and Red color denotes other causes. 50% of patients belonged to the group of road traffic accidents, 20% of patients belonged to the group Interpersonal violence, 30% of patients belonged to the group of other causes.

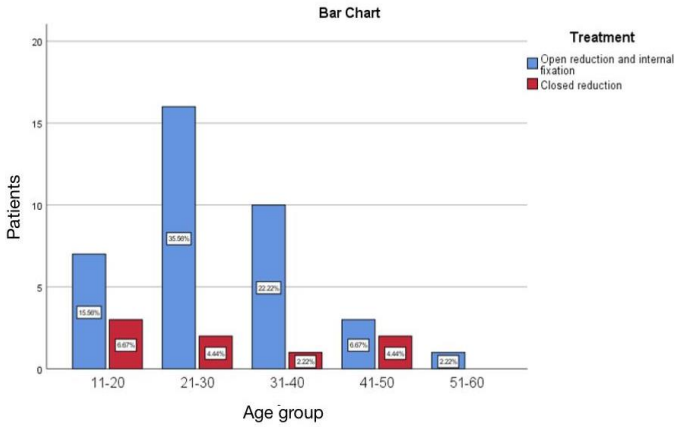

Figure 5

The bar chart depicts the association between the type of treatment in patients in different age groups. The X-axis represents age distribution, and the Y-axis represents the type of treatment in patients. Patients who are treated by open reduction and internal fixation are seen higher among all age groups compared to patients who are treated by closed reduction

The Chi-Square test was done and was found to be statistically significant (Pearson Chi square=0.400, P value=0.000(>0.05).

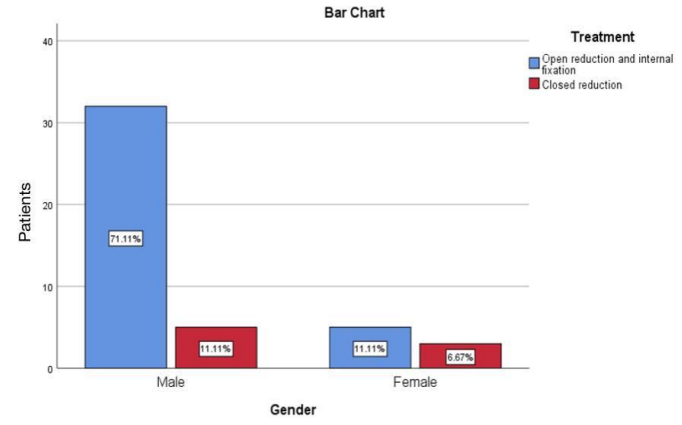

Figure 6

Bar chart depicts the association between the type of treatment in patients and gender. The X-axis represents gender distribution, and Y-axis represents the type of treatment in patients. Patients who are treated by open reduction and internal fixation are seen higher in males than females and patients who are treated by closed reduction are higher in females than males Chi-Square test was done and was found to be statistically significant (Pearson Chi square=0.108, P value=0.000(>0.05).

DISCUSSION

The results of this study underscore the significance of age, gender, and mechanism of injury in the occurrence and management of condylar fractures. The predominance of condylar fractures in younger age groups highlights the vulnerability of this demographic to traumatic injuries, particularly those resulting from road traffic accidents and interpersonal violence. Additionally, the higher proportion of males affected by condylar fractures emphasizes the need for targeted preventive measures and tailored treatment strategies to address gender-specific risk factors and healthcare disparities.

The preference for ORIF over CR in the surgical management of condylar fractures reflects the efficacy and clinical benefits associated with this approach, including improved anatomical reduction, stability, and functional outcomes. However, the variations in treatment modalities across age and gender warrant further investigation to elucidate the underlying factors influencing surgical decision-making and patient outcomes.

Results of the present cross-sectional study conclude that the incidence of open reduction is higher compared to closed reduction and demonstrate that patients who undergo ORIF have an increased risk of longer hospital stays, higher medical costs, and hematoma development, but a lower risk of wound complications than patients who undergo CR. This may be an important finding in support of decision-making, as no consensus has been reached to date regarding the treatment of mandibular condylar fractures by open vs. CR. In a meta-analysis involving 23 published studies, Al-Moraissi et al determined that patients treated with ORIF had less pain and improved occlusion than those treated with CR. Shiju et al(4)compared ORIF and CR in 50 randomized patients with mandibular condylar fractures and demonstrated that both treatments had acceptable results. Among 21 patients with displaced subcondylar fractures, ORIF was associated with better clinical and radiological results.

In that study, surgical management was associated with fewer ipsilateral chin deflections on mouth opening, smaller asymmetry of lateral movements and condylar motion, fewer occlusal disturbances, less facial asymmetry, faster-chewing rehabilitation, and smaller bite force asymmetry between the injured and uninjured sides. However, no differences were found between the 2 groups in maximal mouth opening or joint pain.

Treatment of the condyle with closed treatment in adults is indicated in cases of minimum and high dislocations, fractures of the head of the condyle (intracapsular), and systemic risks of submitting the patient to general surgery. According to Marker et al., It is a non-traumatic, safer, and more reliable method. Nevertheless, Ellis and Throckmorton4 argue that in closed treatment, the TMJ is subject to undergoing three types of transformation: regeneration, change in the temporal component of the TMJ, and loss of posterior vertical dimension, either capable of returning to being a new synovial joint or not.(25,26) Nussbaum et al.(27)(2008) published a critical analysis of the past studies that have directly compared if open or closed treatment of condylar fractures produces the best results. The results were inconclusive regarding whether open or closed treatment should be used for the management of mandibular condylar fractures. Because of the relatively poor quality of the available data and the lack of other important information, the question of preferred treatment remains unanswered, and there is a need for further research. The authors propose that in future investigations the patients need to be randomized into treatment groups, and the examiners need to be blinded to how the patients are treated. Similar methods of treatment need to be used. Standardized methods of fracture classification, as well as data collection and reporting, need to be established so that valid comparisons among studies can be made. Studies with adequate sample sizes to determine clinically meaningful effects should be undertaken. (28–30).

CONCLUSION

Analysis of the data of 45 patients hospitalized for unilateral mandibular condylar fractures indicates that patients who undergo ORIF are more compared to CR and ORIF have an increased risk of a longer hospital stay, higher medical costs, and hematoma development, but have a lower risk of wound complications than patients who undergo CR.

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