

CLINICAL AND RADIOGRAPHIC CHARACTERISTICS OF UNILATERAL MANDIBULAR CONDYLAR FRACTURES

Nguyen Hung Thang¹, Dinh Thi Hong Hanh^{2*}, Huynh Van Duong³

¹103 Military Hospital - 261 Phung Hung, Phuc La Ward, Ha Dong Dist, Hanoi City, Vietnam

²Military Hospital 175 - 786 Nguyen Kiem, Ward 3, Go Vap Dist, Ho Chi Minh City, Vietnam

³The Department of Maxillofacial Surgery, National Hospital of Odonto-Stomatology at Ho Chi Minh city - 201A Nguyen Chi Thanh, Dist 5, Ho Chi Minh City, Vietnam

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ABSTRACT

Objective: To describe the clinical and radiographic characteristics of patients with unilateral mandibular condylar fractures.

Subjects and Methods: This prospective descriptive study included 40 patients aged 16 years and older with unilateral mandibular condylar fractures who underwent open reduction and internal fixation. Participants were recruited using convenience sampling from July 2024 to April 2025 at the Department of Maxillofacial Surgery, National Hospital of Odonto-Stomatology, Ho Chi Minh City, and Military Hospital 175.

Results: Among the 40 patients with unilateral mandibular condylar fractures, males accounted for 75%, with traffic accidents as the leading cause (92.5%). Clinically, preauricular tenderness was present in 85% of cases, limited mouth opening in 80%, and malocclusion in 70%. Radiographically, fractures on the posterior condylar process (52.5%) and subcondylar region (55%) were most common. Isolated condylar fractures represented 15% of cases, while the majority (85%) had associated mandibular fractures, most frequently involving the symphysis (52.5%). According to displacement classification, 52.5% of fractures were classified as type II, and 35% were classified as type III.

Conclusion: The study highlights the predominance of traffic-related trauma and the high incidence of type II and III displacements in unilateral mandibular condylar fractures. These findings enhance current understanding of injury distribution patterns and provide a basis for selecting appropriate treatment approaches tailored to fracture characteristics.

Keywords: Unilateral mandibular condylar fracture, Radiographic features, Mandibular trauma.

1. INTRODUCTION

A mandibular condylar fracture is one of the more complex injuries in the maxillofacial region. Among all trauma cases, facial injuries account for 7.4% to 8.4% and represent a type of trauma that often results in significant adverse consequences affecting patients' quality of life, ranging from functional impairment to aesthetic deformities. The mandible is the most vulnerable bone in this region, with fracture rates ranging from 31% to 64.7% of all facial fractures [1]. In patients with mandibular condylar fractures, adverse outcomes frequently

have a direct impact on mandibular movement, occlusion, the function of the masticatory muscles, and chewing efficiency. Accurate assessment of clinical features and preoperative radiographic imaging is a crucial step in determining the extent of injury and fracture classification, thereby guiding the selection of appropriate treatment methods to optimize functional and aesthetic outcomes. Previous studies conducted both in Vietnam and internationally have reported some common

*Corresponding author

Email: honghanh200187@gmail.com Phone: (+84) 386556778 <https://doi.org/10.52163/yhc.v66ienglish.2774>

characteristics of condylar fractures; however, there remains a lack of in-depth analysis regarding the clinical and radiographic features specifically in patients with unilateral mandibular condylar fractures, especially in the context of variations in injury mechanisms, population characteristics, and the application of modern imaging diagnostic techniques. Therefore, this study was conducted to comprehensively investigate the clinical characteristics and radiographic features of patients with unilateral mandibular condylar fractures, contributing additional data to support accurate diagnosis and more effective treatment strategies in clinical practice.

2. SUBJECT AND METHOD

2.1. Subject

All patients aged 16 years and older with unilateral mandibular condylar fractures who underwent open reduction and internal fixation at the Department of Maxillofacial Surgery, National Hospital of Odonto-Stomatology in Ho Chi Minh City, and the Department of Maxillofacial Surgery, Military Hospital 175, from July 2024 to April 2025.

- Inclusion Criteria

- + Patients were included in the study if they met the following criteria:
- + First-time unilateral mandibular condylar fracture
- + Extracapsular condylar fracture
- + Presence of at least three pairs of opposing teeth on both sides of the dental arch, allowing for occlusal re-establishment
- + Sufficient general health to undergo surgery under general anesthesia
- + Associated midfacial fractures that do not affect occlusion
- + Associated mandibular fractures at other sites with stable fixation
- + The patient provided informed consent to participate in the study.

- Exclusion Criteria

- + History of temporomandibular joint disorders
- + Pathological fractures
- + Craniofacial developmental abnormalities
- + Pregnancy
- + Presence of neurological or psychiatric disorders
- + Non-compliance with the study protocol.

2.2. Methods

Study design:

This research was conducted using a prospective descriptive approach

Sample size and sampling method

A convenient sampling method was employed, with a sample size of 40 cases, drawn from the Department of Maxillofacial Surgery at the National Hospital of Odonto-Stomatology in Ho Chi Minh City and the Department of Maxillofacial Surgery at Military Hospital 175.

Study Procedures:

Patients admitted to the hospital underwent clinical and paraclinical examinations to confirm the diagnosis of unilateral mandibular condylar fracture requiring surgical treatment, and met the inclusion criteria. The surgical treatment procedure and research protocol were explained to the patients. Patients were provided with an information sheet about the study along with a consent form for participation. Clinical examination, X-ray imaging, and/or CT scan of the maxillofacial region were performed before surgery. Data were collected using a standardized research case record form.

Study Variables:

- Clinical Characteristics: General characteristics including age, sex, chin injury; sharp tenderness in the preauricular region; ipsilateral peripheral facial nerve (cranial nerve VII) palsy; limited mouth opening (< 40 mm); deviation of the mandible toward the injured side; malocclusion.
- Radiographic Characteristics: Assessed on panoramic radiographs, Towne's view, and/or CT scans. Parameters include:
 - + Location of the condylar fracture line according to the AO CMF 2014 classification.
 - + Degree of displacement based on Bhagol's 2011 classification with three levels of displacement.
 - + Relationship of the condyle to the mandibular fossa according to Lindahl's 1977 classification.
 - + Presence of associated fracture lines.

Data collection and analysis

All data were recorded in a standardized data collection form. Data were entered into a computer and analyzed using SPSS version 27.

2.3. Ethical considerations

The Medical Ethics Committee approved the research protocol and study procedures under approval number 3489/GCN-HDDD of Military

Hospital 175, as well as by Decision 1131/QĐ-RHMTW on the implementation of the institutional-level research project in 2024, of the National Hospital of Odonto-Stomatology, Ho Chi Minh City.

3. RESULTS

Table 1. Distribution of patients by age group (n = 40)

Age group (years)	Frequency (n)	Percentage (%)
≤18	9	22.5
19 – 39	28	70.0
40 – 59	3	7.5
≥ 60	0	0.0

Among the 40 patients in this study, the age group from 19 to 39 years accounted for the highest proportion, representing 70% of the total. The lowest proportion was observed in the 40–59 age group, comprising 7.5%, while patients under 18 years of age made up 22.5%. No patients aged 60 years or older were included in this study.

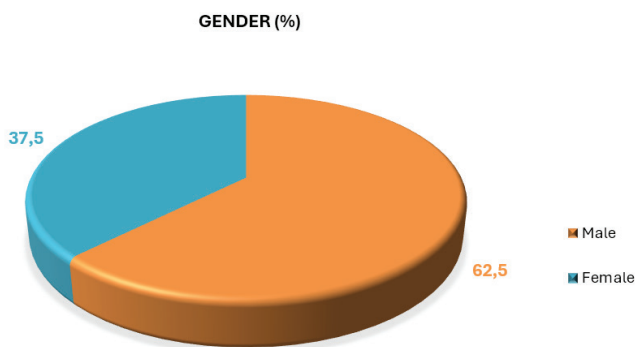


Figure 1. Gender distribution

The proportion of males with condylar fractures was higher than that of females, accounting for 62.5% of the total cases.

Table 2. Etiology of Mandibular fracture (n = 50)

Causes of trauma	Frequency (n)	Percentage (%)
Road traffic accidents	37	92.5
Occupational injuries	1	2.5
Assault-related injury	2	5.0

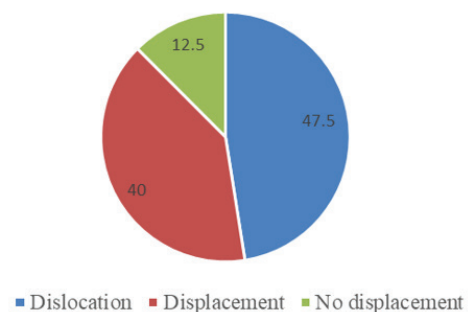
The causes of mandibular condylar fractures included road traffic accidents, occupational injuries, and assault-related injuries, with road traffic accidents being the most common cause, accounting for 92.5% of the cases.

Table 3. Preoperative Clinical Symptoms

Symptom	Number of cases	Percentage (%)
Swelling in the preauricular region	24	60.0%
Tenderness in the preauricular area	40	100.0%
Peripheral facial nerve injury	0	0.0%
Limited mouth opening	39	97.5%
Malocclusion	35	87.5%
Chin area injury	29	72.5%
Mandibular deviation on opening	31	77.5%

All patients (100%) presented with tenderness in the preauricular area, and no cases showed signs of facial nerve (VII) paralysis following trauma. The second most common symptom was limited mouth opening, observed in 97.5% of cases, followed by malocclusion in 87.5% of cases. Other symptoms were reported at rates ranging from 77.5% to 60%.

Lindahl. 1977



Bhagol 2011

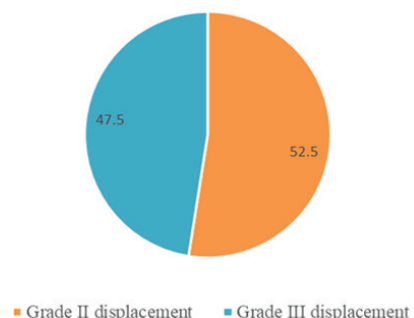


Figure 2. Classification of displacement according to Lindahl and Bhagol

According to Lindahl's classification, the majority of cases exhibited varying degrees of displacement and dislocation, with only 12.5% of cases showing no displacement at all. Patients with temporomandibular joint dislocation accounted for the highest proportion, comprising 47.5% of the total number of patients. According to Bhagol's classification, most displacement cases were categorized as Grade II, accounting for 52.5%, and no cases were classified as Grade I.

Table 5. Characteristics of bone injuries

Classification	Characteristic	n (%)	p-value
Side of injury	Right side	21 (52.5)	0.875
	Left side	19 (47.5)	
Fracture location	Condylar neck	18 (45.0)	0.636
	Subcondylar region	22 (55.0)	
Associated fracture lines	No associated fracture lines	6 (15.0)	0.000
	Symphysis fracture	21 (52.5)	
	Parasymphysis fracture	5 (12.5)	
	Mandibular angle fracture	1 (2.5)	
	Zygomatic fracture	3 (7.5)	
	More than one associated fracture line	4 (10.0)	

In unilateral condylar fractures, the incidence of fractures on the right side (R) was higher than on the left side (L), accounting for 52.5% and 47.5%, respectively; however, this difference was not statistically significant ($p > 0.05$). Similarly, the difference in proportion between condylar neck

fractures and subcondylar fractures was not statistically significant ($p > 0.05$), although subcondylar fractures were more common, occurring at a rate of 55%. The majority of unilateral condylar fractures were associated with other mandibular fracture sites; isolated condylar fractures accounted for only 15%. Among the related fracture patterns, isolated symphyseal fractures were the most prevalent, observed in 52.5% of cases, followed by isolated body fractures at 13.5%. Isolated angle fractures had the lowest incidence, accounting for 2.5% of cases.

4. DISCUSSION

In a clinical study focusing on unilateral mandibular condylar fractures, a significant proportion of patients (70%) fell within the age bracket of 19 to 39 years, indicating that younger individuals are more vulnerable to such injuries. This demographic trend aligns with other studies highlighting the prevalence of mandibular fractures in younger populations, which may be attributed to greater engagement in risk-taking activities and physical altercations during these life stages [2]. The data also revealed that the 40–59 age group represented only 7.5% of the cases, with 22.5% of patients being under the age of 18. Such findings emphasize the need for preventive measures targeting the younger population, who sustain these injuries at higher rates [3]. Notably, the absence of patients aged 60 years or older in this study suggests that age-related factors might influence the incidence of such fractures, potentially due to increased fragility or reduced engagement in activities that could lead to trauma [4].

The gender distribution observed in this study is consistent with previous research conducted both in Vietnam and globally, with a predominance of males, nearly twice the number of females [5]. The labor patterns can partly explain this disparity; additionally, higher rates of alcohol consumption among males during traffic participation further contribute to this gender difference.

Regarding the causes of trauma, the findings are consistent with other domestic studies, with traffic accidents accounting for the highest proportion at 92.5%, compared to 85.9% reported by Nguyen Quang Duc et al. (2022) [6]. Although the implementation of new traffic laws was anticipated to reduce the incidence of traffic accidents among individuals consuming alcohol while driving, the slight increase in traffic-related injuries observed in this study may be attributed to a significant rise in the proportion of adolescent patients. This trend contrasts with reports from European and American authors, where assault was identified as the

primary cause of condylar fractures [7].

Among the preoperative clinical features, the most frequently observed symptoms included sharp tenderness in the preauricular region, limited mouth opening, and malocclusion. These findings are consistent with other domestic studies, such as the study by Nguyen Hung Thang et al. (2019), which reported a prevalence of 76.8% [8]. Differences in the patient populations surveyed can explain this discrepancy. In this study, we focused exclusively on patients with unilateral condylar fractures, whereas previous studies included patients with both unilateral and bilateral condylar fractures. Cases of malocclusion in our study were primarily observed in patients with combined fractures involving sites other than the condyle.

In the group of preoperative radiographic characteristics, the fracture distribution pattern between the right side (R) and left side (L), as well as between subcondylar and condylar neck fractures, was consistent with both domestic and international studies, with a predominance of fractures on the right side and subcondylar fractures [5], [9]. The highest proportion of condylar fractures was observed in combination with isolated symphyseal fractures, compared to other associated fracture patterns, a trend that aligns with previous reports. This further confirms the typical injury pattern of condylar fractures. The incidence of the condylar fractures related to isolated zygomatic fractures in our study was 7.5%, which is comparable to the 7.7% reported by Maurer et al. (2023). The rate of condylar fractures combined with coronoid process fractures in prior studies ranged from 0% to 1.8% [9]. In our study, one case (case number 35 at the Central Odonto-Stomatology Hospital, Ho Chi Minh City) presented with a condylar fracture combined with an ipsilateral coronoid process fracture, but also accompanied by a contralateral body fracture; therefore, this case was classified within the group with multiple associated fracture lines.

Evaluation of the condylar position within the glenoid fossa on preoperative X-rays and CT scans revealed that 12.5% of cases had non-displaced condylar fractures. To date, no previous studies have reported on the prevalence of this characteristic. The degree of displacement on preoperative radiographs in our study differed slightly from that reported by Nguyen Quang Duc et al. (2022) [6], who documented Grade I displacement at 1.31%; this difference is minimal. Overall, surgical treatment indications for condylar fractures in our study were primarily for Grade II and III displacements according to Bhagol's classification.

5. CONCLUSION

This study provides a comprehensive overview of the clinical and radiographic characteristics of unilateral mandibular condylar fractures in the Vietnamese population. The findings highlight typical symptom patterns and fracture distributions, offering valuable insights for diagnosis and treatment planning. By focusing specifically on unilateral cases, the study fills a gap in the existing literature. These results contribute to improving clinical decision-making and optimizing patient outcomes in the care of maxillofacial trauma.

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