



## Radiographic Evaluation In Two Dimensions Of Condylar Fracture In The Presence Of Mandibular Third Molar: A Retrospective Study

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### Abstract

#### Introduction:

Maxillofacial trauma is more common due to road traffic accidents, interpersonal violence or due to fall. In the maxillofacial region, mandible being the most common facial bone that tends to fracture. Fracture of the mandible due to subtle impact forces tend to fracture at different Anatomical locations. The aim of the study was to evaluate the pattern of condylar fractures in presence of mandibular third molar using radiographic assessment.

**Material and methods:** In this retrospective study from a period of November 2021 to August 2022, the patients with mandibular condylar fractures were evaluated radiographically. The sample consists of 40 orthopantomogram (OPG) with condylar and other concomitant fractures. The different anatomical locations of condylar fractures were assessed condylar neck (40%), condylar head (24%) and base of the condyle (36%). The presence of fully erupted lower third molar will influenced the condylar fracture. Among the condylar fracture, the subcondylar fracture being the most common.

**Conclusion:** Mandibular condyle is the weak bone next to angle that tends to fracture more common. Cortical bone thickness and continuity will influence the condylar and angle fracture occurrence.

**Keywords:** OPG (orthopantomogram), Condyle, Mandibular third molar

#### Introduction

Description of facial fractures began as early as seventeenth century B.C., in the Edwin Smith papyrus<sup>1</sup>. The tendency of mandibular fracture at the subcondylar region was first described by Desault a French surgeon<sup>2</sup>. Facial skeleton which is connected to cranial vault and cranial base is divided into three parts for our convenience into upper, middle and the lower thirds. The upper thirds of the facial skeleton consist of frontal bone; the middle third consist of midfacial bones: the maxilla, the nasoethmoidal and the zygoma, the lower third facial bone which is rigid

and bent like a horse shoe- the mandible with the condyle articulating to the cranial base. Mandible being the movable and strongest bone in the maxillofacial region, condylar fractures the most common next to angle and parasymphysis<sup>3, 4, 5</sup>. The different anatomical locations of mandible are Symphysis (the strongest region), Parasymphysis, Body (weakest region in edentulous mandible), Angle, Ramus, Condyle (weakest regions in dentulous mandible) and the coronoid<sup>3</sup>. Ellis reported that when compared to other facial bones mandible has the highest tendency to fracture due to its peculiar

characteristics such as mobility and limited bone body to the lateral flare of the ramus, thus increasing the risk of fracture. Which in contrast the presence of third molar weakens the condylar region<sup>12,13</sup>. Neff et al. (2014) proposed a classification system for mandibular condyle fracture based upon specific fracture location occurring in support. These fractures are influenced by various factors such as direction and application of force,<sup>11</sup> occlusal loading biochemical factors such as bone density and anatomic structures creating weak areas<sup>6-9</sup>. Etiological factors for mandibular fracture include motor vehicle accidents, assaults, fall and sports activity like cycling<sup>10</sup>. Retizik postulated that, as sharp angulation concentrates stress, the angle of the mandible becomes a weak area and certain injuries deform the mandible beyond its yield points. The presence of the impacted third molars weakens the mandibular angle region; the anticipating reason for this fracture is the quality and amount of corticocancellous framework. Anatomically, the mandibular angle is at a transition zone from the dentate the head, neck or base of the condylar process<sup>15, 21</sup>. The purpose of the study is to evaluate the condylar fractures in the presence of mandibular third molar.

### Material And Methods:

Retrospectively designed study using radiographs OPG (orthopantomogram) from November 2021 to August 2022. The study comprise of 40 Orthopantomogram. The data were analyzed based on the following parameters: genders distribution, etiology, presence of third molar, unilateral and bilateral condylar fracture along with other concomitant fractures. The study did not undertaken the pediatric trauma OPG's. Mandibular Condyle is defined as fracture with the fracture line superior to sigmoid notch. According to Neff et al (2014) condylar head fracture was defined as a fracture when the fracture line involved the area above the condylar head Reference line. A condylar neck fracture was indicated when more than a third of the fracture line lied above the sigmoid notch line and remained below the condylar head reference line. Condylar base fracture was defined as a fracture when more than two-thirds of the fracture line ran below the sigmoid notch line. For analysis, mandibular condylar neck and base fractures were defined as subcondylar fracture. In other words, subcondylar area was the area below the condylar head.

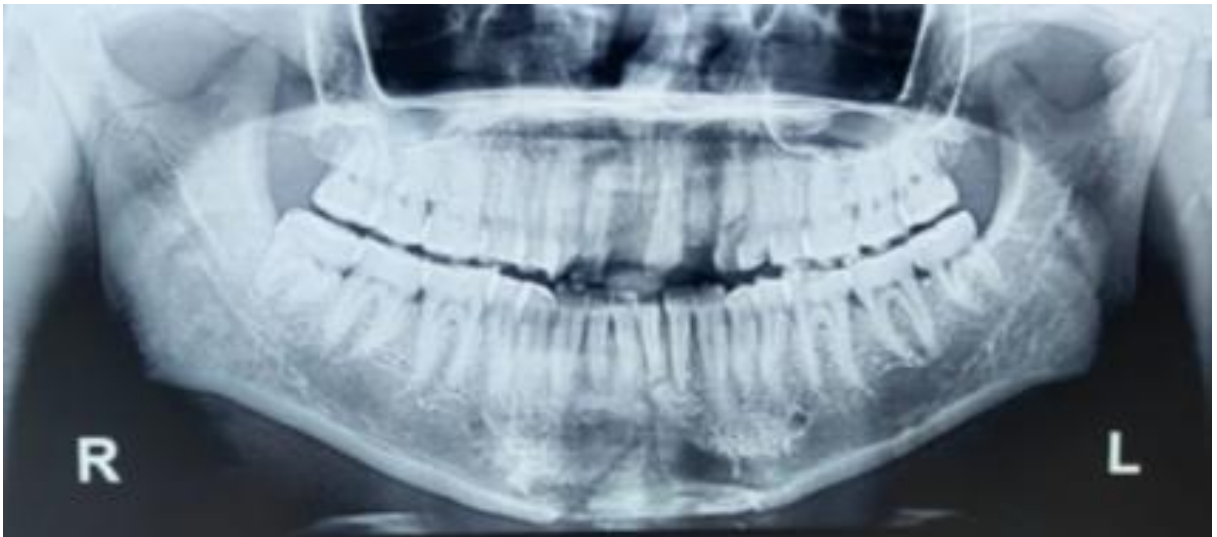
**Fig 1: orthopantomogram showing fracture of head of right condyle and neck of left condyle**



**Fig 2: orthopantomogram showing left condylar fracture.**



**Fig 3: orthopantomogram showing base of the condyle fracture (right side).**



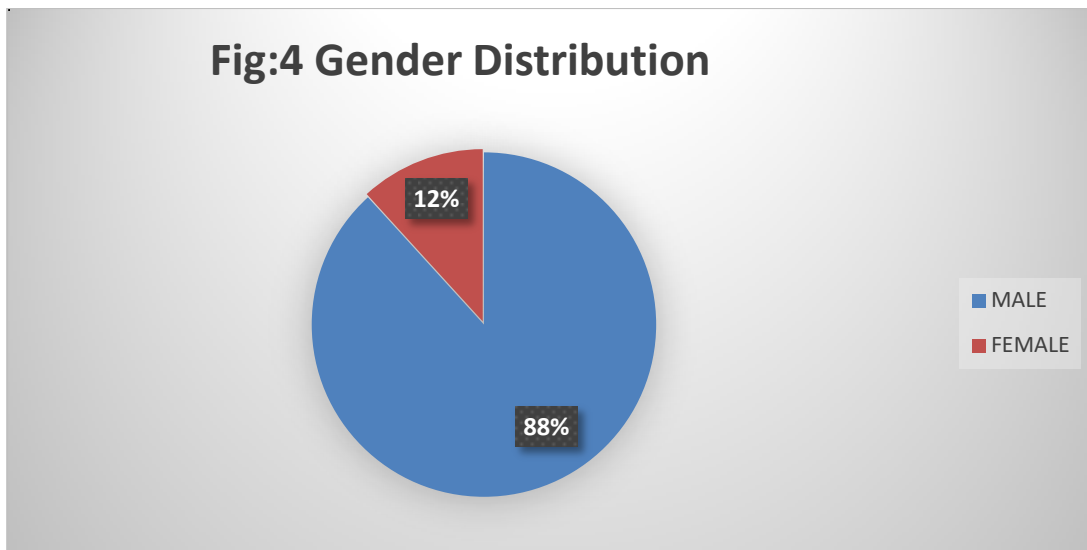
**Results:**

A total of 40 radiographs with mandibular condylar fractures were retrieved, six radiographs were eliminated. Out of six radiographs five radiographs without third molar and one with pediatric trauma OPG were not included in this study.

**Table I: Patient Demographics**

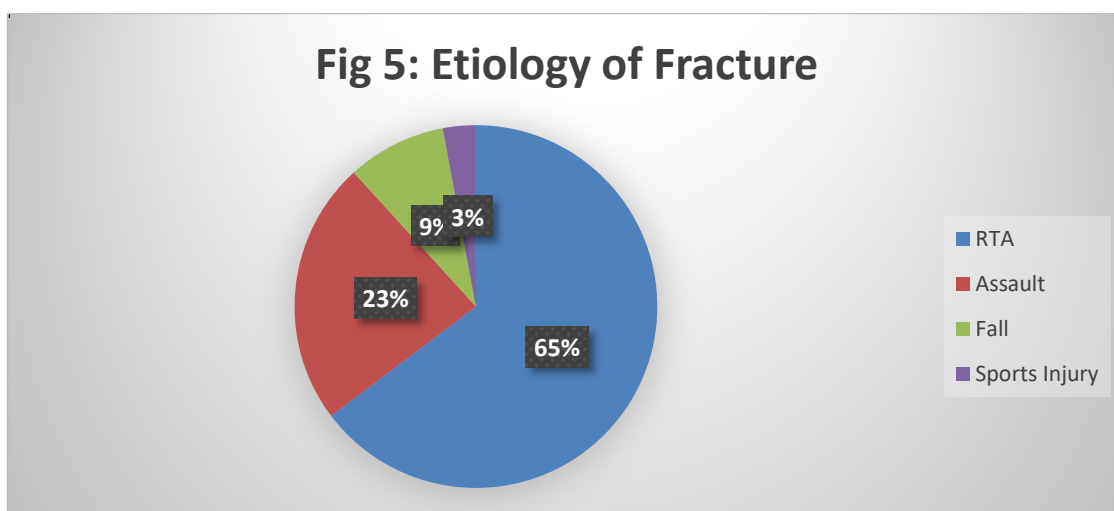
Gender	Number of Patients
Male	30

Female	4
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**Table II: Summary of etiology of the fracture:**

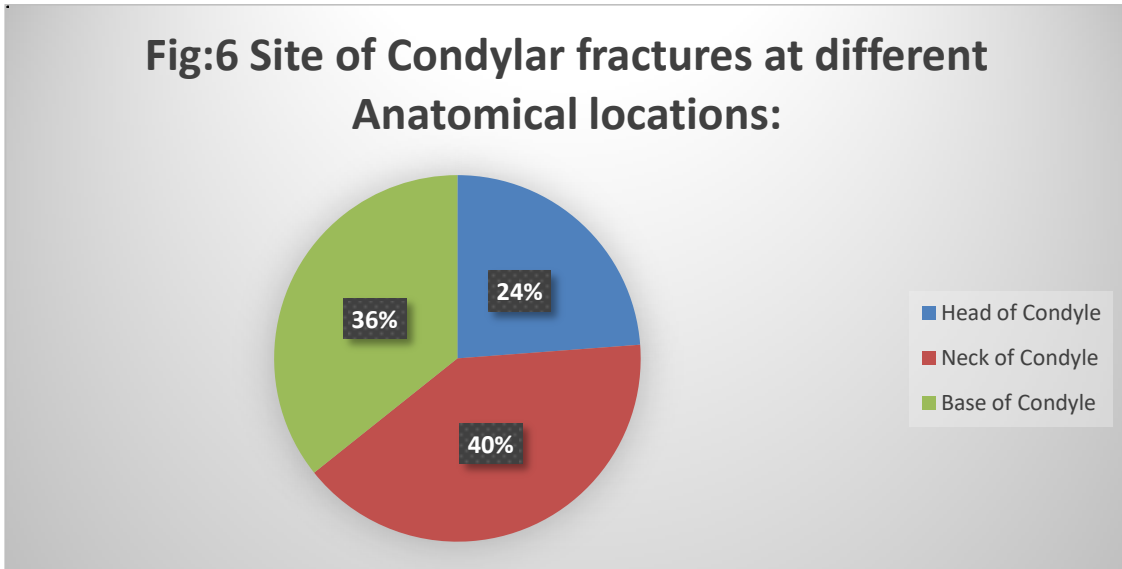
Type of Etiology	Number of patients
Road traffic accident	22
Assault	8
Fall	3
Sports injury	1



**Table III: Summary of Site of condylar fractures at different Anatomical locations:**

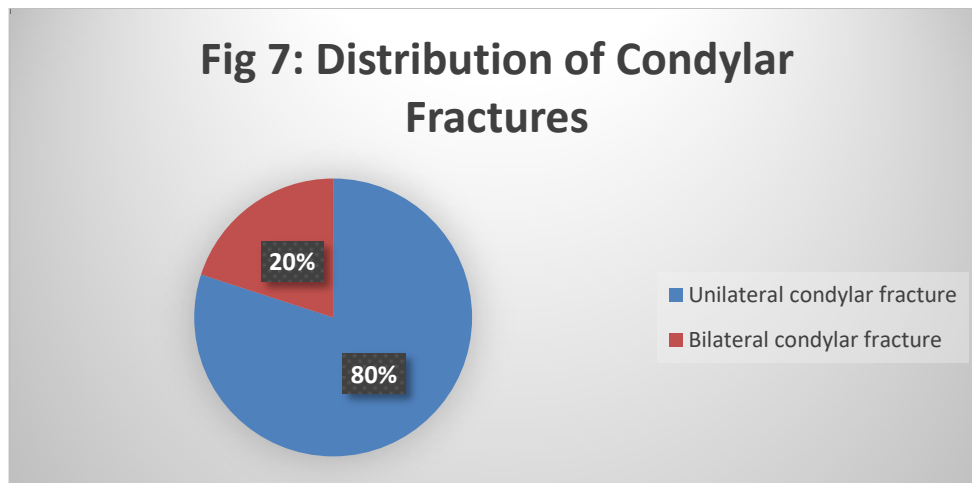
Site of condylar fracture	Number of patients
Head of Condyle	10
Neck of Condyle	17
Base of condyle	15

**Fig:6 Site of Condylar fractures at different Anatomical locations:**



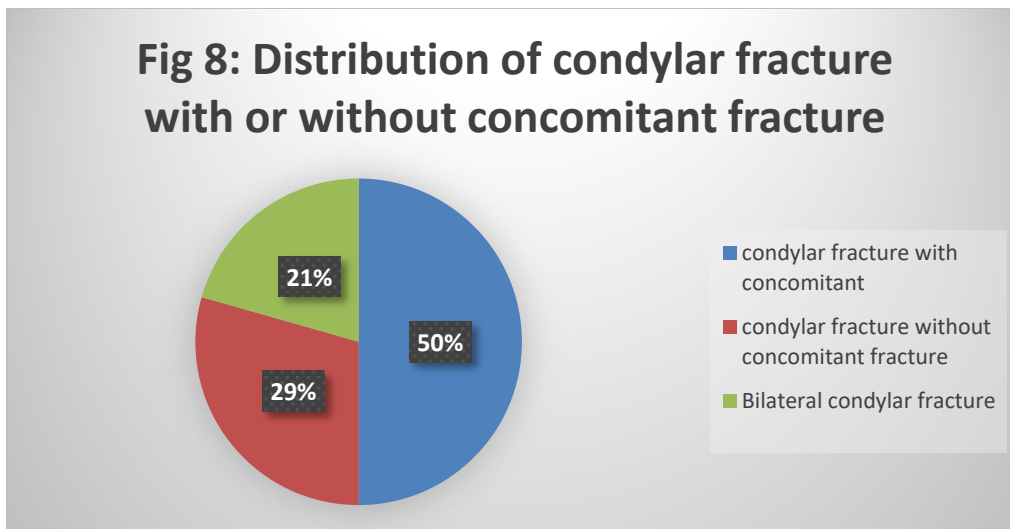
**Table IV: Summary of distribution of condylar fractures:**

Distribution of condylar fracture	No of patients
Unilateral condylar fracture	28
Bilateral condylar fracture	7



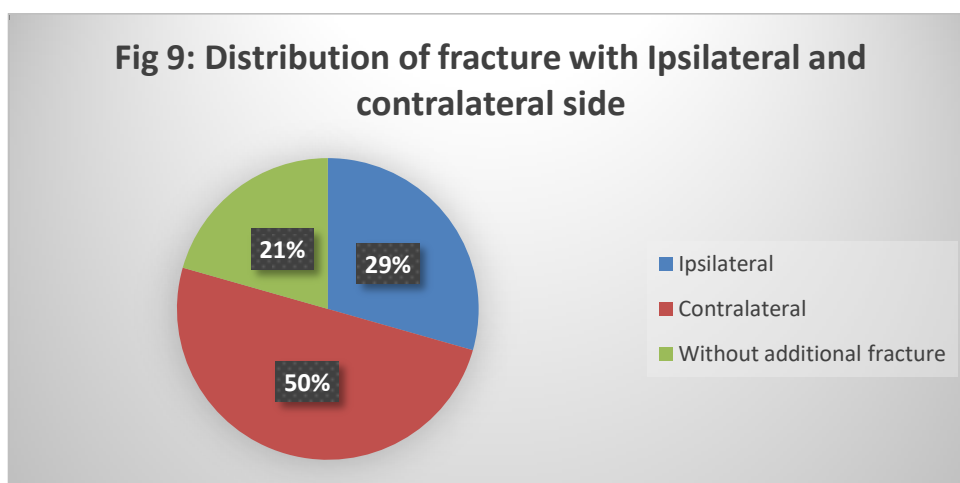
**Table V: Summary of distribution of condylar fracture with or without concomitant fracture:**

Distribution of condylar fracture with or without concomitant fracture	No of patients
Condylar fracture with concomitant fracture	17
Condylar fracture without concomitant fracture	10
Bilateral Condylar fracture	7



**Table VI: Summary of distribution of fracture with ipsilateral and contralateral side with or without other concomitant fractures:**

Distribution of fracture with Ipsilateral and contralateral side:	No of patients
Ipsilateral	10
Contralateral	17
Without additional fracture	7



Out of 34 radiographs enrolled in the current study, 30 were male and 4 were female. The predominated etiological factors reported in this study being the road traffic accident (65%) in both the genders followed by assault (23%), fall (9%) and sports injury (3%). (Table1, Fig-4, Table 2, Fig-5).

Based on the anatomical site in relation to condylar fracture, condylar neck fracture was 17 (40%) were the most common site followed by base of the condyle fracture 15 (36%) and the least being the head of the condyle fracture 8 (24%). (Table3, Fig-6).

Among the 34 condylar fractures were assessed 28 OPG (80%) were unilateral condylar fracture which are more common than 7opg (20%) with bilateral condylar fracture. (Table4, Fig-7)

In combination fracture 17 patients (50%) were condylar fracture with parasymphysis, 10 patients (29%) were only condylar fracture and 7 patients (21%) were bilateral condylar fracture without a concomitant fracture. (Table5, Fig-8)

Condylar fractures associated with additional fracture on the ipsilateral side were 10 patients (29.41) and with contralateral side fracture were 17 patients (50%). (Table 6, Fig-9)

### Discussion:

When the anatomy of the mandibular condylar and subcondylar region is understood, pathophysiology of injury can be predicted. When a force strikes the mandible, either directly over the condylar region or anteriorly, the condylar neck and subcondylar regions represent weak points. If the force is great enough to cause a fracture, several events occur spontaneously. The weaker medial capsule and the pull of the lateral pterygoid muscle allow the condylar head to tip medially. The pterygomasseteric sling will contract, shortening the condylar/ramus height. As the muscle contracts and the condylar head tips medially, the distal end of the condylar segment is forced laterally. This is a simplified view of the most common fracture pattern. Fractures can occur at any level (condylar head, neck, or subcondylar region). Unilateral fractures are more common but fractures can occur bilaterally. To some degree the exact location and pattern of fracture are a random event. Mandibular condylar fracture is one of the commonest maxillofacial fractures treated by maxillofacial surgeons. Demography of the patients, causation, and characteristics of the fracture depends on various socio-economic factors. Mandible is susceptible to fracture at different anatomical location, the weaker transitional zone that tends to fracture were condyle followed by angle. Symphysis being the strongest region of the mandible when due to external forces at this region will transmit the forces towards the condylar region. Same as the concept of hunting bow mechanism and any forces at the parasymphysis region will causes the contralateral condylar fracture<sup>15</sup>.

Biomechanically in a finite element analysis by Bezerre et al<sup>16</sup> when in absence of lower third molar or deeply seated third molar would result in allowing higher energy transmission in the posterior- lateral aspect of the study. Our study was in accordance with this study as with the presence of third molar condylar fractures are more and the most common being the lateral aspect of the condyle i.e at the neck region. In the study by Ellis, condylar and subcondylar fractures represented 29% of all mandibular fractures. In 1992 Silvennoinen reported on 382 condylar process fractures<sup>22</sup>. In this study 50% of condylar process fractures were associated with other mandibular fractures. Of the condylar process fractures, 80% were unilateral. Unilateral fracture of the condylar neck in immature subjects might lead to mandible asymmetry and condyle remodelling. In this retrospective analysis the condylar fracture was highest with full erupted tooth which was in accordance with other studies<sup>17,18,19</sup>.

Among the different anatomical fracture location of the condyle. condylar neck being the predominant one followed by condylar head and base of the condyle which was similar to the study performed by Sukewaga et al<sup>20</sup>. The panoramic radiograph is the conventional form of radiography used, giving an overall view of the fractured mandible and showing the displacement of the fractured condylar process in the antero-posterior direction, but not in the latero-medial direction. opg used for the examination of this site. However, the overlap of structures may impair a proper interpretation of images. Intra-capsular fractures of the mandibular condyle and fractures in the high portion of its condylar process are difficult to see in plain films. Contingent on the position, the image may miss the displacement of bone fragments, impairing a correct diagnosis.

However, the tendency of condylar fracture varies the age, as with the age increases the condylar head tends to fracture more often than the condylar neck. This study did not investigate the morphology of the mandible based on their age. Further the bone quality, the occlusal support, the impact of external forces could be required to give more conclusive evidence.

### Conclusion:

Panoramic radiographic based studies are not able to determine position of the third molar and thickness



determines the fracture. Further studies with higher sample size, Causative factors, nature of impact of force to be determined with the presence of third molar. Mandible being the movable and bent at the angle region tend to fracture when there is impacted or deeply seated lower third molar but when fully erupted third molar the transitional forces travel to condylar region and tends to fracture at various anatomical location and the most common being the subcondylar region.

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