Innovations

Assessment of Condylar Subluxation and Dislocation using TMJ tomography: A Retrospective Study

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Abstract: Introduction*: Temporomandibular joint is a diarthrodial joint, allowing a hinge-like movement, combined with an arthrodial, gliding motion. TMJ mobility disorders include subluxation and dislocation of the joints. They occur when the mandibular condyles displace anterior to the articular eminence. The main aim of this study is to assess the prevalence of dislocation and subluxation using TMJ tomography.* ***Methods:*** *Study was conducted using 67 TMJ tomographs obtained from the Department of Oral Medicine and Radiology, Saveetha Dental College, Chennai. This study was retrospective analysis of radiographs, taken during the period of January 2019- February 2021 of patients who reported with TMJ mobility disorders.* ***Results:*** *Position of condyle at the level of articular eminence was 24 (35.8%), anterior to the articular eminence was 37 (55.2%), behind the articular eminence was 6 (8.5%). Among them the prevalence of dislocation was high than subluxation. The total number of dislocation and subluxation cases were 33 and 4.* ***Conclusion****: Findings of this study conclude that prevalence of condylar dislocation is more common than condylar subluxation.*

Keywords: *1.TMJ, 2.tomography, 3.dislocation, 4.subluxation,5. prevalence, 6.TMJ tomography*

Introduction:

Temporomandibular joint is a diarthrodial joint which is capable of both rotationaland translational movements[1]. It is a synovial joint and formed between the mandibular condyles and the mandibular fossa of the temporal bone. The joints, one on each side, allow opening and closing of the mouth and complex chewing or side to side movements of the mandible[2]. Unlike most other synovial joints, the

articular surfaces of the TMJ are covered by fibrocartilage and it is completely divided by a fibrous articular disc. The mobility disorders of TMJ include subluxation and dislocation. Subluxation is the anterior displacement of the condyle which is self-reducing[3]. It refers to movement of condyle less than 5mm from the articular eminence. Dislocation is the anterior displacement of the condyle which is not self-reducing. It refers to movement of condyle more than 5 mm from the articular eminence. It is the maximum opening position the condyle is in relation to the posterior slope of the articular eminence [4]. It may be displaced anteriorly, posteriorly, superiorly, medially or laterally to the glenoid fossa. It is characterized by inability to close the mouth after wide opening[5].

For the diagnosis of TMJ disorder, it is important to note that radiological diagnosis is undoubtedly an enhancement of clinical diagnosis[6]. The evaluation of the TMJ joint requires a complete three-dimensional analysis of the joint structures. There is a wide choice of imaging modalities to determine changes in joint morphology and function. Since cost as well as clinical effectiveness must always be considered, conventional radiographic methods are recommended, at least initially, and sophisticated methods should be limited to selected cases. The most common baseline technique for identifying gross bony changes is probably TMJ (temporomandibular joint) tomography since it is simple, widely available and offers both low cost and low radiation burden [7]. The method has been used to assess the TMJs in different diseases. Image and motion distortion and projection artefacts are limiting factors.

A conventional panoramic radiography (orthopantomogram/ OPG) has limited significance for the diagnosis of subluxation and dislocation of TMJ[7,8,9].Blair and Chalmers (1970) compared the radiographic findings of circular tomography with Orthopantomography and lateral transcranial oblique radiograph. The study concluded that circular tomography appeared to be the best technique available for the study of the TMJ structures[10].The standard orthopantomogram results in a degree of distortion and magnification in the region of the mandibular ramus and the condyle. There are only limited studies in evaluating the subluxation and dislocation using TMJ tomography. Therefore, the main aim of the study was to assess the prevalence of condylar subluxation and dislocation using TMJ tomography.

Materials and Methods:

This retrospective study was conducted using 67 tomographs obtained from the Department of Oral Medicine and Radiology, Saveetha Dental College, Chennai. These radiographs were taken during the time period of January 2019- February 2021. They comprise patients reported clinically with TMJ mobility disorders. The radiographs were acquired using the scale tool in Tirana software. This study was approved by Saveetha Institutional Human Ethical committee with reference number of IHEC/SDC/OMED/2001/TH-1.

Approval for the study obtained from the Institutional Ethical Committee of Saveetha University. The study group consisted of 67 patients. The demographic data were retrospectively collected from the institutional data records.

Inclusion criteria: Patients reported with TMJ pain, jaw locking and increased jaw movements

Exclusion criteria: Patients with a history of fracture of the TMJ, TMJ surgeries, distorted images.

Two investigators interpreted the images. Any disagreements were settled by discussion and consensus.The distance between the tip of the condyle and the articular eminence were measured using the scale tool. If the distance between the condyle and the articular eminence was more than >5mm, then they were classified under dislocation category. If the distance between the condyle and the articular eminence was less than <5mm, it was said to be subluxation.

Figure 1 represents dislocation of right and left TMJ

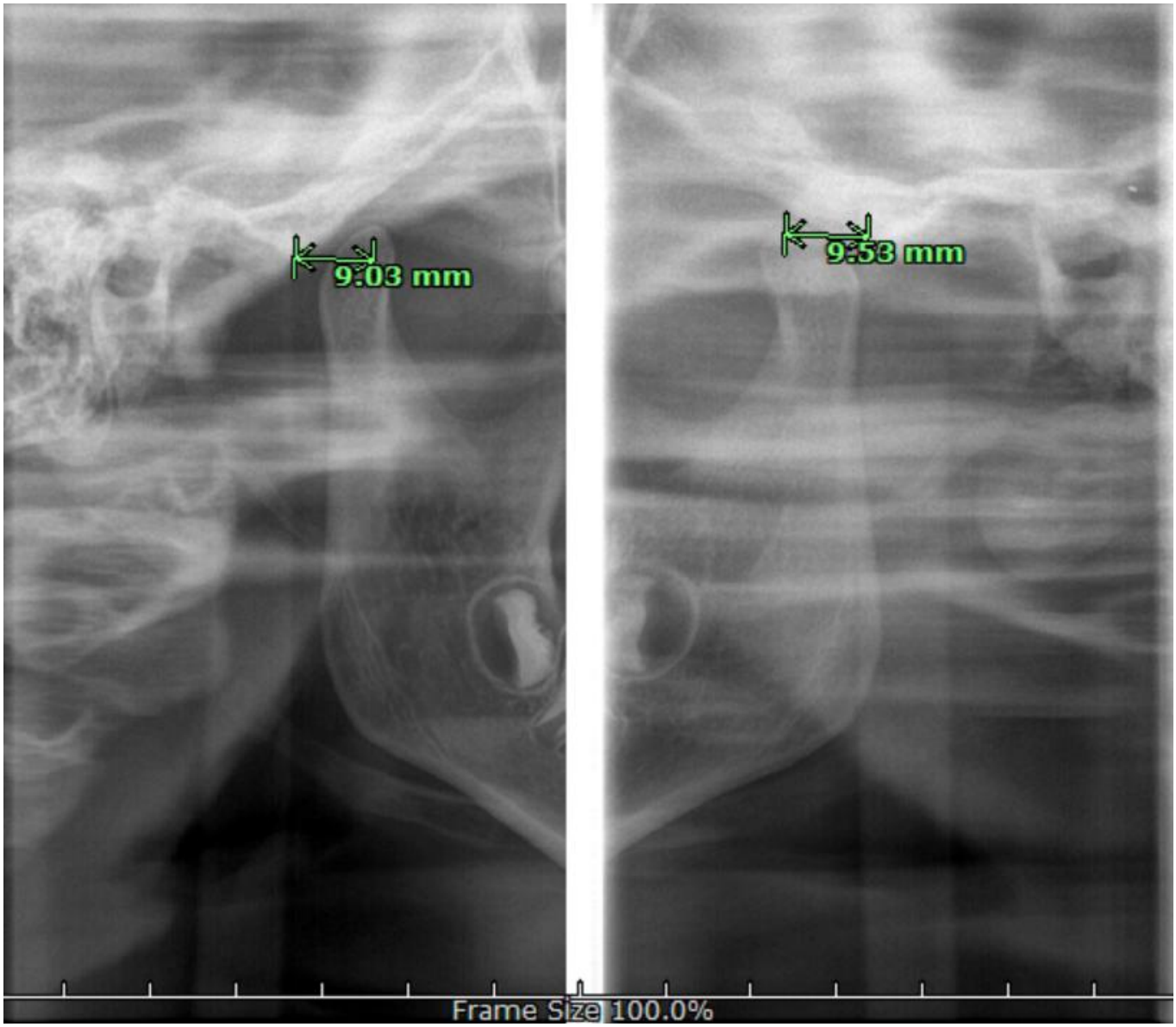
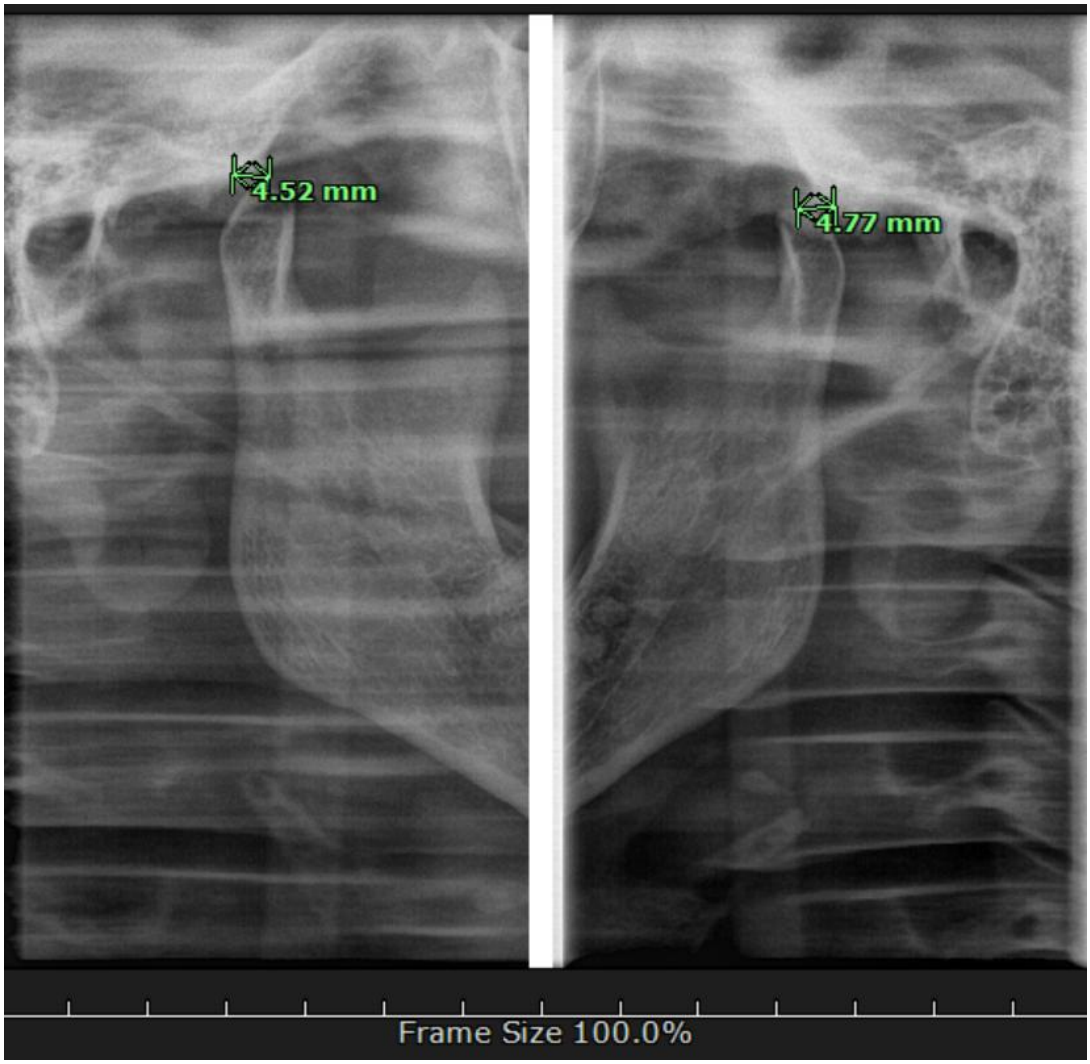


Figure 2 represents subluxation of right and left TMJ



Statistical analysis:

The collected data were subjected to statistical analysis using SPSS software version 24, IBM Corporation, SPSS Inc. Age and sex distribution were tabulated. Frequency of dislocation and subluxation were given.

Figure 3

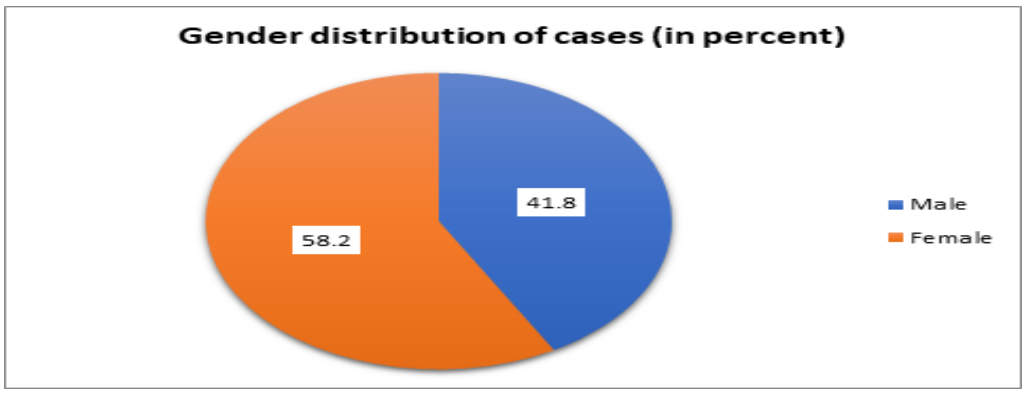


Figure 4 represents Mean age of the patients in years

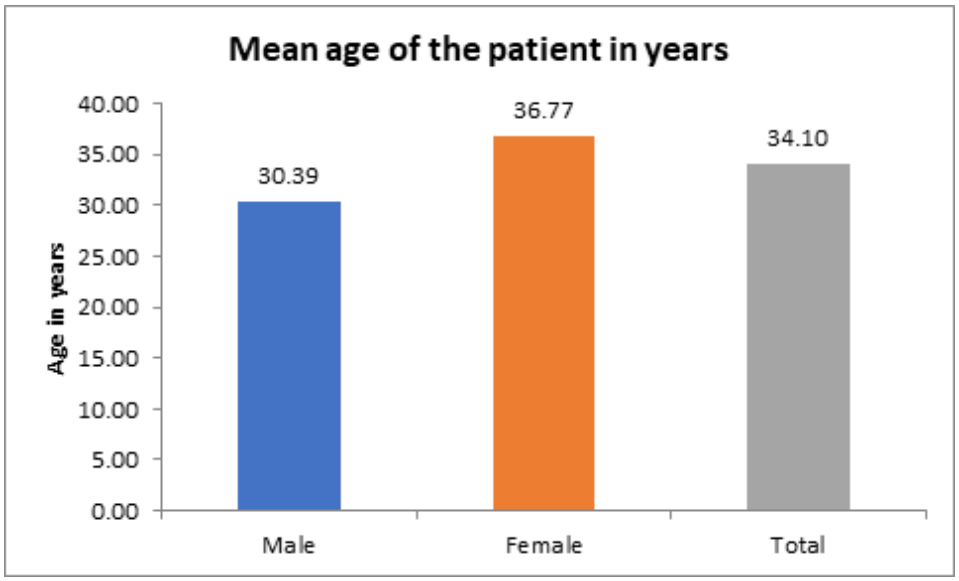


Figure 5: represents the prevalence of subluxation and dislocation

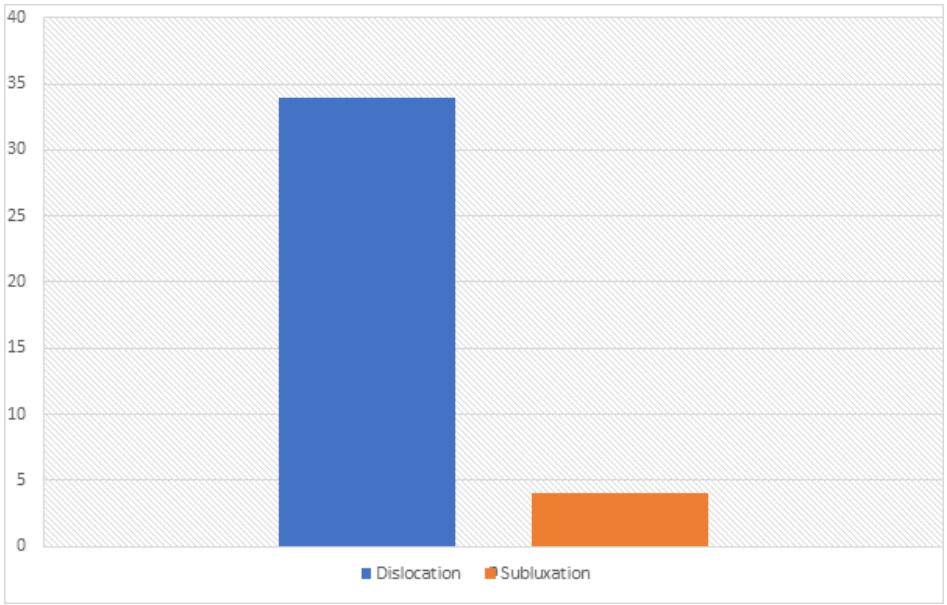


Table 1 Frequency distribution according to gender

Gender	Frequency	Percent
Male	28	41.8
Female	39	58.2
Total	*67*	*100.0*

The table shows the frequency distribution of gender. Among the total 67 cases, 39 (58.2%) were females and the remaining 28 (41.8%) were males.

Table 2 : Mean age of the patients in years

Patients	N	Minimum	Maximum	Mean	Std. Deviation
Male	28	14	66	30.39	13.64
Female	39	17	69	36.77	12.75
Total	*67*	*14*	*69*	*34.10*	*13.40*

Table3 : Frequency distribution according to position of condyle

POSITION OF CONDYLE	FREQUENCY	PERCENTAGE
At the level of articular eminence	24	35.8
Anterior to articular eminence	37	55.2
Behind articular eminence	6	8.5
TOTAL	67	100.0

Table 4 represents the range and number of dislocation and subluxation

	n	Range
DISLOCATION	33	6- 9.55 mm
SUBLUXATION	4	3 -4.7 mm

Results:

On the basis of the TMJ tomographs of 67 patients, condylar position anterior to articular eminence was seen in 37 patients accounting for 55.2% of the cases. It was followed by 24 cases (35.8%) at the level of articular eminence. Dislocation was observed in 33 cases with the range of 6-9.55mm. Subluxation was observed in 4 cases with the range of 3-4.7mm. Table 2 describes the mean age of the patient in years. For the 28 males, the mean age was 30.39 ± 13.64 years with minimum and maximum age of 14 and 66 years respectively. For the 39 females, the mean age was 36.77 ± 12.75 years with minimum and maximum ages of 17 and 69 years respectively. Overall, for 67 patients, the mean age was 34.10 ± 13.40 years with minimum and maximum ages of 14 and 69 years respectively. Table 3 represents the frequency distribution according to the position of condyles in 67 patients. The most common position was anterior to the articular eminence seen in 37 patients accounting for 55.2% of the cases. It was followed by 24 cases (35.8%) of at the level of articular eminence condylar position. Behind the articular eminence and behind the articular eminence on opening and closing was seen in 5 (7.5%) and 1 (1.5%) cases respectively. The table 5 depicts the frequency distribution of dislocation and subluxation. Only cases where condyles anterior to articular eminence were considered (n = 37). Dislocation (deviation >5mm) was seen in 33 cases (22%) and in remaining 4 cases (3%) subluxation (deviation <5mm) was present.

Discussion:

Sir Astley Cooper in 1892 had given the principles for diagnosis and treatment strategy for dislocation[11,12]. He used the term complete dislocation and imperfect dislocation for subluxation respectively. The latter differs as the condyle moves anterior to the articular eminence during the mouth opening but reduces to its original position without manipulation. Tasanen A, states that dislocation occurs in up to 7% of people during their lifetime. TMJ dislocation represents 3% of all the articular body luxation[13]. When this condition becomes frequent, it is called habitual dislocation or recurrent dislocation[14,15].This abnormality was uncommon in the 2nd and 3rd decade, apart from this it can affect any age group. Symptoms include inability to close the mouth, spasm in the masticatory muscles, difficulty in mouth opening and difficulty in speech. Trismus is due to the spasm of the masticatory muscles.

Various imaging modalities were used in the diagnosis of TMD. On Orthopantomogram, distortion of the images can occur[11].When the beam passes the joint obliquely, superimposition by the anatomical structures in TMJ region can be avoided. As OPG fails to correct for individual orientation, the distorted images may be mistaken for anatomic changes and superimposition can obscure the pathological changes. Compared to OPG, Tomography provides an unobstructed and anatomically accurate picture of TMJ[14].In our knowledge, limited studies were available in assessing the prevalence of TMJ dislocation and subluxation using TMJ tomographs. The disadvantages of TMJ tomographs includes visualization of only bony elements. Abnormalities of soft tissues and cartilages cannot be detected.

The objective of this retrospective study was to identify the prevalence of dislocation and subluxation. The main findings of this study include prevalence of dislocation (22%) and subluxation (3%). The Temporomandibular joint is a specialized joint between the mandible and the temporal bone of the skull[2].The condyle articulates in the glenoid fossa or the mandibular fossa bilaterally. TMJ comprises muscles of mastication, ligaments and the neural transmission carried by the mandibular division of the trigeminal nerve. The mechanism of dislocation and subluxation is the movement of condyles anterior to the articular eminence. If it is self-reducing, it comes under Subluxation. If there is an inability to descend back to its original position, it comes under Dislocation[16].The etiopathogenesis is due either imbalance in the neuromuscular function or structural deficit. Abnormalities of neuromuscular function occurs due to laxity of the articular disc and the capsular ligament[17].Structural deficient includes arthritic changes in the condyle like flattening of condyles, decrease in height of the articular eminence, morphological alternation involving glenoid fossa, zygomatic arch and squamotympanic fissure. Age changes in dentition also plays an important role in dislocation[18] Other causes include forceful wide opening of the mouth, dental third molar extractions, endodontic treatment, endotracheal intubation, laryngoscopy[16,19].

Previously research was done on prevalence of dislocation using different imaging modalities. Giorgos Papoutsis et al.,(2018) reports Dislocations were mostly bilateral (59.4%) and appeared in a chronic situation and with repetitive events (62.5%). But in this, diagnosis was done based on clinical characteristics. Akhilanand Chaurasia et al.,2020 reported the prevalence of TMDs on the basis of signs and symptoms based on the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). The results of the study include incidence of clicking sound (42.5%) was highest in TMD joint followed by deviation of mandible on mouth opening (40.8%), internal derangement (36.8%), myofacial pain dysfunction syndrome (33.7%), osteoarthritis (29.5%), crepitus (25.8%), joint tenderness (5.8%), and pain on mouth opening (4.8%). But there are only limited studies, reported dislocation and subluxation together using TMJ tomography[20,21]. To overcome this drawback, this study was conducted.

Limitations of the study include small sample size. Direction of the dislocation was not reported. The results of this study have to be considered with some caution, as the study was conducted retrospectively.

Conclusion:

Temporomandibular joint mobility disorders are common nowadays. Accurate diagnosis and correct treatment are necessary. Though there are several imaging modalities available for TMJ. The initial basic radiography will be TMJ tomography for mobility disorders. Based on this study, it is concluded prevalence of dislocation was more common and symptomatic than subluxation.

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