Comparison of condylar height symmetry and temporomandibular disorder symptom in the subject with complete teeth: a preliminary study

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Abstract. The proper diagnosis of the dentocraniofacial symmetry is a major step in modern orthodontics. Mandibular condyle is the most likely region of temporomandibular joint with the most advanced post-pubertal growth rate. The asymmetrical function of the mandibular that has developed differently, is a naturally occurring phenomenon. However, the dysfunction of temporomandibular joint that related to condyle may lead to some symptoms that can become chronic and difficult to manage. This study aims to compare condylar height symmetry and temporomandibular disorder symptom in the subject with complete teeth. This is a descriptive analytic study with cross sectional approach of the subject with complete erupted teeth until the second molar, except the third molar. Early detection of temporomandibular disorder (TMD) symptoms using Temporomandibular Disorder Diagnostic Indexes (TMD-DI). Based on Habets’ method, the difference of 6% between right and left condylar height was categorized as asymmetry. This study found that 17.7% (n=12) of patients with symmetry height condylar and 38.2% (n=26) showed asymmetry had TMD symptom. On the other hand, 39.7% (n=27) of patients with symmetry height condylar and 4.4% (n=3) with asymmetry had no TMD symptoms. There was a significant difference (p=0.00). In conclusion; condylar height symmetry should be considered in the occurrence of TMD symptoms in order to understand the development of mandibular asymmetry and multifactorial of TMD.
1. Introduction

The proper diagnosis of the dentocraniofacial symmetry is a major step, particularly when differential diagnosis between dental and skeletal problems is required. Since the asymmetry is an occurring phenomenon, determination of the clinicians' sense of balance and the patient's sense of imbalance leads to the point at which normal asymmetry becomes abnormal cannot be easily defined [1]. Previous studies reported that panoramic radiography could provide information on vertical and sagittal dimensions of mandibular symmetry [2,3]. More than half of 327 caucasian subjects between 8 to 12-year old that came to Marquette University Pediatric Dental Clinic showed moderate to severe mandibular asymmetry for the linear dimensions of the ramus and corpus mandibular height and length based on panoramic radiograph [4]. The degree of asymmetry in the vertical dimension based on postero-anterior radiography indicates there was a significant relationship between temporomandibular disorder (TMD) symptoms and patients with mandibular asymmetry [5].

Mandibular condyle is the most likely region of temporomandibular joint (TMJ) with the most advanced growth rate postpubertal and influences the development of malocclusion in orthodontic patients [6, 8]. The disturbances of TMJ seem to be direct consequences of inflammatory and/or mechanical damage to the condylar cartilage that influence the mandibular growth [9]. The complex movements of TMJ as the unique articulation in vertebrae body and simultaneous movement on both sides improve the development of occlusion. The imbalance occlusion of mandibular asymmetry patients may result from abnormal pressure distribution on the joint surface and remodeling process in the condyle. This condition may refer to a temporomandibular joint disorder (TMD) that culminates in osteoarthritis [10,11].

The asymmetrical function of the mandibular that has developed differently is a naturally occurring phenomenon. However, the dysfunction of TMJ that related to condyle may lead to some symptoms that can become chronic and difficult to manage. Some studies suggested that the comparison of vertical mandibular symmetry that focused on condylar and ramus height from both sides is valid for clinical tests of TMD diagnosis and has been widely used [12,13]. In the mixed dentition study, panoramic radiograph utilizing Habets’ method in mandibular symmetry assessment has been reported as early diagnostic thereby reducing the number of 3D cone beam computerized performed [14]. This study aims to analyze the condylar height symmetry with Habets’ method and TMD symptom in the subject with complete teeth.

2. Method

This descriptive analytic study with cross-sectional approach was approved by Research Ethics Committee of Universitas Sumatera Utara Medical Faculty and conducted in Dental Hospital, Universitas Sumatera Utara. Early detection of TMD symptom was conducted through questionnaires from TMD-DI [15]. The pre-treatment panoramic radiograph of orthodontics patients with fully erupted teeth until the second molar, except for the third molar who were above 18 years old was analyzed with Habets’ method. The exclusion criteria are with previous orthodontic treatment, traumatic facial injury, and congenital disease. The panoramic radiograph was taken from the same x-ray machine and traced manually on tracing paper. The condylar height symmetry used 6% as a reference in condylar asymmetry index based on Habets’ method from the highest point of the the condylar head (B) to the most lateral point of condylar head (O₁) (Figure 1). The symmetry between the right and left condylar height was estimated using the following formula:

\[
IA = \frac{|CH \text{ right} - CH \text{ left}|}{CH \text{ Right} + CH \text{ Left}} \times 100\%
\]
Due to the usage of likert-type scale ordinal data, the data were treated as non-parametric data. Prevalence and amount of TMD symptom in both groups of vertical mandibular symmetry were evaluated and compared by using Chi-square test (SPSS software, version 18.0 for Windows; SPSS, Chicago IL).

3. Results and Discusions

Figure 1. Condylar height symmetry from point B to O₁ [12]

Figure 2. The Distribution of TMD Symptom-based on Condylar Height Symmetry
Table 1. The Characteristic of TMD symptom based on Condylar Height Symmetry

| Condylar Height | TMD symptom | p      |
|-----------------|-------------|--------|
|                 | Negative    | Positive | 0.000 * |
| Symmetry        | 27          | 12      |        |
|                 | 39.7%       | 17.7%   |        |
| Asymmetry       | 3           | 26      |        |
|                 | 4.4%        | 38.2%   |        |

* P < 0.05 : significant difference

From 68 orthodontic patients, TMD symptom was positive in 17.7% (n=12) of patients with symmetry height condylar, while it was 38.2% (n=26) of patients with asymmetry height condylar. On the other hand, 39.7% (n=27) of patients with symmetry height condylar and 4.4% (n=3) with asymmetry height condylar had no TMD symptoms (Figure 2). There was a significant difference (p=0.000) of TMDs based on vertical mandibular asymmetry (Table 1).

3.1. Discussion

The radiograph tools used in the assessment of condylar morphology are computed tomogram (CT), cone beam computed tomography (CBCT), panoramic radiograph, and lateral cephalogram. Respectively, there were 55.2% relative mandibular symmetry, 27.2% moderate asymmetry, and 17.6% severe asymmetry which were observed in 1178 individuals aged 19 through 60 years with complete dentitions using 3D CBCT [16]. However, the panoramic radiograph is a common radiograph in daily dental practice and provide bilateral vertical posterior mandibular analysis. The basic of vertical mandibular symmetry is the 6% difference according to Habets’ method as an aid diagnosis in the temporomandibular joint problem and was studied in further researches [7,12,17-20].

The mandibular asymmetry involves a disharmony of skeletal and muscular structures on one side of the face related to developmental or functional disorder [Annison]. Condylar asymmetry can overload the TMJ articular surface, affecting soft and hard tissue components, and can increase the thickness of tissue on TMJ articular surfaces. This condition can develop into osteoarthritis in the temporomandibular joint. The previous study on Brazilian women suggested that anamnestic index has adequate validity and reliability in TMD symptom investigation [21]. This condition relates to various factors that influence the morphology of condyle including sex, shape, occlusal factor, malocclusion, and skeletal type [22]. The study on 8-30 years old sub-population in Jakarta based on questionnaires and posteroanterior radiograph reported that the primary risk factor of mandibular asymmetry is TMD sign [23]. The physiological management related to TMD and mathematical analysis, connected to condylar morphology development particularly in the movement disorders, are part of evidence-based pain management which remains to be very common in the society and have impacts on the disease intercourse and patients’ quality of life [24].

Our study showed a significant difference of TMD symptom only based on condylar symmetry height using Habets’ method in the panoramic radiograph of the subject above 18-year-old with complete teeth (p=0.000). Thus with previous studies that reported about vertical, sagittal and transversal condylar asymmetries as a common feature of TMD patients in comparison with asymptomatic individuals [25]. However, there were more symmetrical ramus length in younger age according to Habets’ method in study of development of TMD in 12 till 65 years old patients although there was no significant difference that
might be related to wider disparity in the values variance of the most lateral point of condyle is in the Habets’ method [20,26]. Thus the detection of TMD symptoms with questionnaires can help the clinicians in supporting the development of complex mandibular symmetry.

Conclusions
The condylar height symmetry should be considered in the occurrence of TMD symptoms to understand the development of mandibular asymmetry and multifactorial of TMD.

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