

Differences of temporomandibular joint condyle morphology with and without clicking using digital panoramic radiograph

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ABSTRACT

Introduction: Clicking is the most common clinical symptom in patients with temporomandibular disorder (TMD). Lacking attention by either the patient or dentist, many patients were found to have suffered from morphologic alteration of the condyles seen in the panoramic radiograph inadvertently. The purpose of the study was to determine the differences of condyle morphology of the temporomandibular joint (TMJ) with and without the existence of clicking by means of digital panoramic radiographs. **Methods:** This study was based on an analytic descriptive research, whereas subjects are digital panoramic radiographs taken from clicking and non-clicking patients at the Radiology Installation of Dental Hospital Universitas Padjadjaran. 16 samples of each group were chosen in a non-random purposive sampling manner. **Results:** The research showed the mean of condyle morphology, HOC height on clicking (6.31 mm) was shorter than the non clicking (7.63 mm), the width of HOC on clicking (10.38 mm) was higher than the non clicking (10.22 mm) and height of the processus condylaris on clicking (19.70 mm) was shorter than non clicking (20.04 mm). Ratio of the high of HOC, width of HOC and high of processus condylaris were 12.13 (clicking), and 12.63 (non-clicking). **Conclusion:** There was no significant difference between the morphology of the TMJ condyle between clicking and not clicking group, except on high of HOC.

Keywords: Condyle morphology, temporomandibular joint (TMJ), clicking, digital panoramic radiograph

INTRODUCTION

Temporomandibular Disorders (TMD) is a disorder that can degrade a person's quality of life because temporomandibular joints or temporomandibular joints (TMJ) are part of the stomatognathic system, which is important as it relates to the holistic body functions, growth and development of the jaw and face.^{1,2}

Based on the research of Luciana³, the prevalence of TMJ disorder in patients who visited RSGM UNPAD had a rate of 84.33%. This shows

that the prevalence of TMJ disorders in patients who came to RSGM UNPAD is considered high. TMJ disorders occur as much as 70% asymptotically and 30% symptomatically. These data indicated that this joint disorder were not complained or may not realised by patients until the TMJ is examined thoroughly by the dentist or specialist, which consequently many patients were found to be in a progressive or severe condition.³ Early symptoms of TMJ disorder may be clicking that can be accompanied by pain or sensitivity in the condyle or chewing muscle.⁴⁻⁶ Patimah⁷ mentioned

in her research that in Bandung, the TMJ disorder with symptoms of clicking were fairly high, 55.65%.⁷

Clicking occurs due to alterations of the location, shape and function of the TMJ component due to the burden on the excess mastication muscle resulting in the incoordination of the condyle and disc. The disc displaces anteriorly, therefore when the condyle passes through the posterior part of the disc it produces a joint sound. If this condition is left untreated and the adaptive response of the cartilage is poor and the remodeling is unbalanced on the bone tissue^{8,9} there will be damage done to the condyle.¹

The condyle is one of the most active parts of the human body that can move more than 200 times a day. The condyle undergoes complex movement during the opening and closing of the mandible.⁸ Therefore the anterosuperior portion of the mandibular condyle is assumed to bear the greatest load during the mandibular function. Functional and parafunctional load may result in adaptive and degenerative changes in the load receiver including the condyle bone.¹⁰

This is supported by the study of Pontual et al.¹¹ which shows that when compared with the other bone anatomy of the TMJ, the condyle is the most frequently altered anatomy at 91%, the articular eminence 1%, condyle and articular eminence 7%, and Condyle, articular eminence and glenoid fossa 1%.¹¹

Panoramic radiography has proven to be the first, simple and useful technique for assessing the condyle abnormalities, as well as assessing the morphology of the condyle such as erosion, sclerosis, osteophyte formation and resorptions.¹²

The purpose of this research is to determine the differences condyle morphology of the TMJ with and without clicking using digital panoramic radiographs in the Dental Radiology Installation of RSGM UNPAD.

METHODS

This study was based on an analytic descriptive research, whereas subjects are digital panoramic radiographs taken from clicking and non-clicking patients at the Radiology Installation of Dental Hospital Universitas Padjadjaran. Sixteen samples

of each group were chosen in a non-random purposive sampling manner.¹³ Data collection was taken between June and September 2014. The morphological analysis of the condyle according to Zane Krisjane, Ilga Urtane, Gaida Krumin, Anvita Bieza, Katrina Zepa, Irena Rogovska approved by Rigas Stradins of the University Ethical committee are as follows¹⁴:

High Head of Condyle (HOC) is the linear distance between the most superior point of the condyle and the cross-sectional line drawn from the outermost point of the condyle and perpendicular to the mandibular ramus line is the line connecting the outer point of the condyle head and the mandible angular (Fig. 1).

HOC width is the linear distance between the anterior and posterior outer points of the condyle head (Fig. 2). Elevation of condylar process is the linear distance between the highest point of the condyle and the line passing through the mandible incisura and perpendicular to the tangent of the mandibular ramus (Fig. 3).

The morphological description of the condyle with and without the clicking of the TMJ was presented in tables and graphics. Analysis of the difference in the morphology of the condyle ratio with clicking and without the clicking of the TMJ is statistically analysed with the parametric t-test (t test) of differences uncorrelated homogeneous variance to test the equality of two mean.^{14,15}

RESULTS

Descriptive research results can be seen in the Figure 1-5. Statistical test results are shown in Tables 1 and 2. Based on Table 1 the following results are obtained: 1. High HOC: Ho is rejected, it can be concluded that there is a high HOC difference between TMJ clicking and not clicking; 2. HOC Width: Ho accepted, it can be concluded that there is no difference HOC width between J clicking and not clicking; 3. High process of condylaris: Ho accepted, it can be concluded that there is no difference of high process of condylaris between TMJ clicking and not clicking.

Based on Table 2 it can be concluded that there is no significant difference in the ratio of HOC height, HOC width and high process of condylaris between TMJ clicking and not clicking.

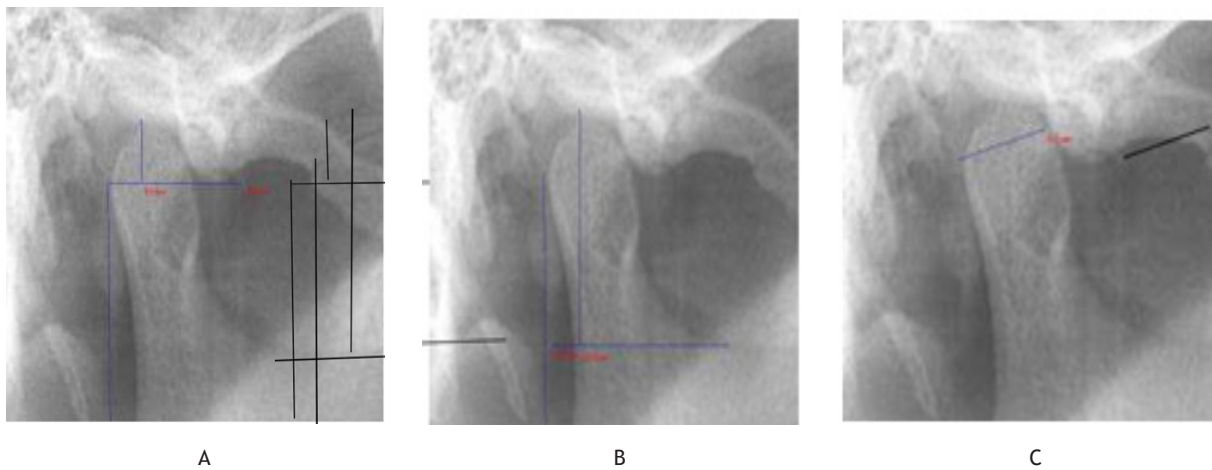


Figure 1. A. Height measurement; B. Width measurement of the HOC; C. Height measurement of the condyle process.¹⁴

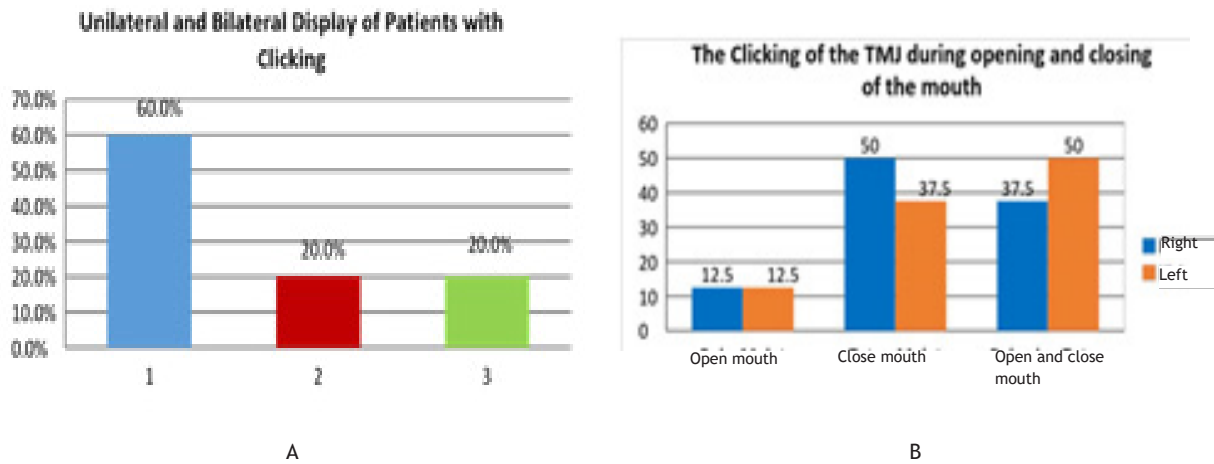


Figure 2. A. Unilateral or Bilateral display of patients with clicking; B. The Clicking of the TMJ during opening and closing of the mouth.

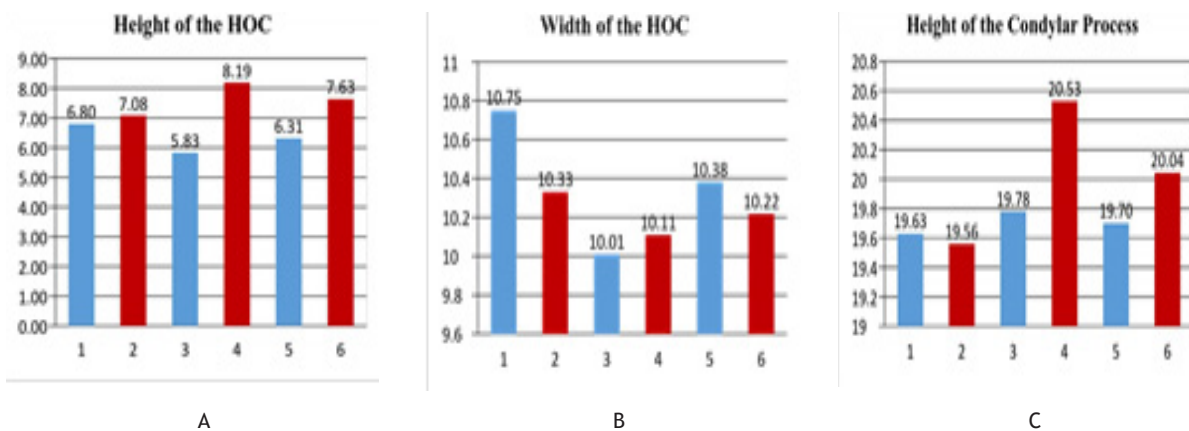


Figure 3. A. Height of the HOC of the TMJ with and without Clicking; B. Width of the HOC of the TMJ with and without clicking; C. Height of the condylar process of the TMJ with and without clicking.

Table 1. T variabel test result

	Group	Mean	t-count	df	t- table	p-value (sig)	Notes
HOC Height	TMJ Clicking	6.313	-2.905	30	2.042	0.007	Ho rejected
	TMJ No Clicking	7,631					
HOC Weight	TMJ Clicking	10,381	0.300	30	2.042	0.766	Ho accepted
	TMJ No Clicking	10,219					
Condylar Process Height	TMJ Clicking	19,700	-0.265	30	2.042	0.793	Ho accepted
	TMJ No Clicking	20,044					

*P-value (sig) = 0,05

Tabel 2. Test of average differences for two independent samples

Group	Mean	t count	df	t table	p-value (sig)	Notes
TMJ Clicking	12.131	-0.916	30	2.042	0.367	Ho accepted
TMJ No Clicking	12.631					

DISCUSSION

Measurements of the morphology of the condyle in TMJ presented with and without clicking showed no statistical significant differences except at HOC heights. This is because majority of the study sample were under 25 years old where they possess a good remodelling ability. The decrease in height of the HOC that occurs can be due to the remodeling that is still progressing at the initial stage of resorption. The anterosuperior portion of the mandibular condyle is assumed to bear the greatest load during the mandibular function¹⁰ so that more resorption occurs. The direction of the force or the load of the muscles perpendicular to the bone and the excessive load will cause a larger resorption.¹⁶

The results of the statistical analysis on the height of the HOC concluded that there is a difference in the TMJ presented with and without clicking. The differences can be interpreted in two possibilities, whereby the height of the HOC in TMJs presented with clicking are shorter than the TMJs that are presented without clicking. The changes that occur in the bone either there is an increase or decrease in height depends on the adaptive response that occurs on the condyle bone, which is either remodeling or resorption. The process of the decrease in height of the bones appears to be in two possibilities, which is either resorption or remodeling of the early stages while the process of bone lengthening are due to the remodeling process is complete.

There is no difference in HOC width on clicking and non clicking TMJ, this may be due to measurements using horizontally panoramic radiographs that are less accurate and not be used as a reference as suggested by most researches.¹⁰ This may also be due to resorption in the outer regions being fewer than the reduction in the superior region of the condyle as the largest load receiver having a fast remodeling process, so the HOC on TMJs presented with clicking are wider than TMJs without clicking. The fast remodeling process can also be completed due to the attachment of the superior lateral pterigoid muscle on the anterior condyle that promotes remodeling.^{16,17}

There is no difference in the height of condylar process on the TMJs presented with and without clicking, which can be caused by the result of statistical test of the variance of the two populations which is not homogeneous means that the variation of data is too diverse, resulting in improper calculation. The decrease in height of the HOC that is not accompanied by the decrease in height of condylar process according to Enlow explained that the condyle functions as a regional growth plane that provides adaptation for the local field it self.¹⁸

There is no morphological difference in the condyle on TMJs presented with and without clicking statistically. Morphological changes of the TMJ presented with clicking at a young age can be seen if remodeling is still at its early stages (resorption) and not visible if remodeling

process is completed as no morphological changes are displayed if the study is not longitudinal. The absence of statistically significant difference does not mean that there are no bone changes. Remodeling process allows no visible difference in bone if the process is complete.

The distinctiveness of the anatomy of the condyle makes each individual different in its shape and size. The condyle profile has many variations in age and sex groups for each individual. It is estimated that both the condyle and the angulations are highly individualized and there is often a difference between the right and left.^{19,20,21} Another factor that affects the condyle shape under normal conditions are the facial shape, occlusal force, and functional load.⁴ The insignificant differences can also be attributed to the insufficient and unbalanced samples.

The Temporomandibular joint is an area that is difficult to investigate radiographically. Research on the TMD are still presented with different results, caused by many factors that influence the occurrence of TMD or it could be due the research has been done only to examine one cause or symptom alone.³ The process of clicking until there is a change in the morphology of the condyle goes through long process, ranging from changes in the morphology of the disc, the position of the disc until finally morphological changes condyle. In this study it can be assumed that TMJ clicking samples that have not undergone morphological changes of the condyle have not experienced TMD for a long period of time yet not long enough for the morphology to be altered, or it has been so long that the remodeling process is over which makes the length of time of the TMD important to know.

Samples without clicking can actually happen in two possibilities whereby TMD patients without symptoms of clicking and normal patients whereby bias results is obtained throughout the study. Not all TMDs have symptoms of clicking, and not all of the clicking symptoms are followed by condyle changes such as a myofascial dysfunction.

Measurement of the condyle as one of the centers of the mandibular growth requires precision, accuracy, and equipment compatibility in the determination of its morphology, because the center of the condyle growth has a high adaptive flexibility response capability suggesting

the variations in such ways.¹⁷ The condyle resorption, especially the anterosuperior, the center of the anterior condyle growth complicates the conclusion of the morphological changes when the study is not longitudinal.

CONCLUSION

Based on the results of the morphology of the condyle, it can be concluded as follows, the HOC and condylar process of the TMJs presented with clicking are shorter than TMJs presented without clicking, moreover the HOC with clicking are wider than the ones' without clicking. The results of hypothesis tested showed no significant difference in the morphology of the condyle on TMJs with and without clicking except on the height of the HOC.

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