

A comparison of condyle in malocclusion patients using 3D program

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ABSTRACT

The purpose of this study was to assess condylar size in volumetric 3D imaging in patients with class I, class II, class III malocclusions. To evaluate the differences among the three experimental groups, the condylar values of men were analyzed. There was a significant difference in the measured values of height. Among the three experimental groups, the condylar measurements in women showed significant differences in height and width. This study is expected to be used for determining the connection between malocclusion and condyle as a base line data.

Key Words : 3D, Condylar size, Malocclusions, Measurements of condyle, Mimics.

I . Introduction

The condyle is an important part of the temporomandibular joint (TMJ), and its shape and size are related to the development and treatment of temporomandibular joint disorders[1]. Several studies that used computed tomography (CT) images to measure the condyle were limited in the transparency of the experiment due to uncertain information obtained from the planar measurements and angular limitations[2,3]. In contrast, 3-dimensional (3D) modeling of the condyle using cone beam CT (CBCT) allows the observation of small and narrow areas of the TMJ at multiple angles and provides more accurate measurement results[4]. In this study, we reconstructed the CBCT data obtained from patients with classes I, II, and III malocclusion three-dimensionally and measured the sizes of the condyles.

II . Materials & Methods

The CBCT data of 60 patients with malocclusion, who were examined at the Dankook University Dental College Hospital, were obtained from the Department of Oral and Maxillofacial Radiology. The subjects were classified into class I, class II, and class III experimental groups according to the type of malocclusion. The CBCT data of subjects who met the

criteria were obtained in the DICOM format from the CBCT Scanner (Alphard 3030, Asahi, Kyoto, Japan). After importing the corresponding DICOM file from Mimics (version 17), a skull 3D model was created, based on the uploaded CBCT image. The condylar size was measured by observing the created condyle at various angles (Fig 1). This study was analyzed at 95% significance level using SPSS Version 20.0 (statistical package for the social science, IBM, USA). The one-way ANOVA was performed to compare the measured values among the three experimental groups.

III . Results

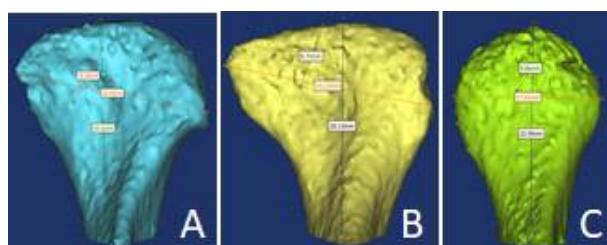
To evaluate the differences among the three experimental groups, the condylar values of men were analyzed. There was a significant difference in the measured values of height. To confirm the significant difference among the experimental groups, a post-hoc Turkey analysis was performed; it showed that there was a significant difference in the height values (between classes I and II). Among the three experimental groups, the condylar measurements in women showed significant differences in height and width (Table 1).

IV. Discussion and Conclusion

In this study, we used the Mimics software to check the occlusal state of the patient and measure the size of the condyle by creating a 3D model. In addition, via 3D virtual simulations of the Mimics software, morphological structures of the upper and lower mandibles, that are difficult to observe with the naked eye, were reproduced. Through this process, a more accurate classification of malocclusion was possible, and the surface area and volume (typically very difficult to measure) were measured. These measurements are useful basic data in various research fields related to the TMJ.

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▶▶ Figure 1. Condyles' 3D model; A : Class I , B : Class II , C : Class III

Table 1. Mean values of condylar measurements of subjects in three subgroup

measurements		N	Mean	SD	F	p
Male	Height	Class I	20	22.28 ^a	2.23	
		Class II	20	18.81 ^b	2.68	10.107
		Class III	20	21.72 ^b	2.90	<.000*
	Width	Class I	20	21.75	1.77	
		Class II	20	21.27	2.56	0.514
		Class III	20	21.95	2.18	0.601
	Length	Class I	20	11.09	1.58	
		Class II	20	11.45	1.54	1.273
		Class III	20	10.76	0.88	0.288
Female	Height	Class I	20	19.49 ^a	2.03	
		Class II	20	17.89 ^{ab}	2.99	8.308
		Class III	20	20.81 ^b	1.53	.001**
	Width	Class I	20	19.04 ^a	2.27	
		Class II	20	18.00 ^{ab}	3.09	5.909
		Class III	20	20.97 ^b	2.88	.005**
	Length	Class I	20	10.15	1.15	
		Class II	20	10.26	1.13	0.445
		Class III	20	9.90	1.42	0.643

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