The Patterns of Mandibular Movement in Relation to Maxillofacial Skeletal Structure

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CONTENTS

Ⅰ. INTRODUCTION

Dentists often contact patients who have a limitation on mouth opening when they are treated their oral disease. The limitation on mouth opening can be accompany with an infection including temporomandibular disorders, muscle disease, soft tissue scar, tumor, trauma. In those cases, just limited amounts of mouth opening can be measured by the interincisal distance. In the case of normal skeletal structure which has no temporomandibular disorders, movement to open and closing the mouth is composed of translation and rotation of the condyle. The Condyle is placed in a little forward from articular eminence at the maximal mouth opening[1,2] and three fingers could be put between the upper and the lower jaws. Clinicians regard the amount of mouth opening as the very important barometer of tempor-omandibular movement[4]. The method to measure the distance between the jaws while the mouth is open is very simple and reliable. Therefore, dentists were used to take this method to evaluate the degree of temporomandibular disorder and the effects of treatment[5,6]. Sheppard and Sheppard[4], Nevakari[7] have defined the vertical amount of mouth opening as an interincisal distance and Ingerval[8] has also defined it as an interincisal distance in addition to overjet. Berrett[9] and Dumas et al.[10] reported that the amount of mouth opening is increasesed as the anterior movement of condyle increases.

The amount of mouth opening had been studied by Sheppard and sheppard[4], Nevakari[7], Ingervall[8] and Agerberg[11,15]. They reported that the amount of mouth opening in young children under 13 years is 40mm to 50mm wide and is getting increased as they grow up and there is no difference between that of male and female. The results of Travell's study[16] on men aged 21.7 and women aged 19.6 on the average, Nevakari's study[7] on men and women aged 20 to 25 on the average, and Agerberg's study[12] on men aged 20.5 years old on the average reported that the maximum amount of mouth opening of male is larger than that of female. Agerberg[11,12,15] measured the change of opening amount which is increased by age

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and reported that the average maximum amount of opening in the average age of 18 months is 37.1mm and in the average age of 6, it is 44.8mm and in the average age of 13, it is 51.2mm and in the average age of 20.5, it is over 56.0mm. But Agerberg's and Oesterber's study[17] suggested that the maximum amount of mouth opening among men in their seventies is decreased to compare with that of men in their twenties.

The study to find a relationship among factors affecting the maximal amount of mouth opening between anthropological measurements and the maximum amount of mouth opening has been performed. Ingervall[14,18], Ageberg[11,12,15], Westling and Helkimo[19] had made an effort to find a relationship of the body index (height or weight) and the maximum amount of opening.

There are many studies that the maximal amount of opening is affected by the flexibility and the border movement of mandible. Westling and Helkimo[19], and Pullinger et al.[20] also reported a way to measure the amount of temporomandibular joint movement with the rotational angle of mandible. Pullinger et al.[20] reported that the maximum amount of opening of male is larger than that of female in the passive opening but the difference between the rotation angle of mandible and the passive and active mouth opening of female is larger than that of male and the joint movement range of female is wider than that of male and the joint flexibility of female is better than that of male[21]. But Westling and Helkimo[19] reported that there is no significant relationship between the maximum amount of opening and the capacity of joint movement in the active or passive mouth opening and the maximal mouth opening rotation angle of mandible has more influence on the facial skeletal structure than the igamental flexibility does. Wright and Hopkins[22], Muto and Kanazawa[23,24] reported that the maximum amount of opening is influenced by mandibular length. Ingervall[14,18] reported that the range of mandible movement has individual differences and in part it is affected by a facial figure and the capacity of mouth opening has a relationship with the mandible and cranial base length, the ramal length and the length of mandibular inferior border. In order to measure the amount of temporomandibular movement which is not connected with the mandibular length, Dijkstra[25,26] and Gerhardt[27] defined the angular change of mandible to cranial base as the angle of mouth opening and compared the amount of joint movements of other subjects with the use of goniometer.

As mentioned above, many studies on the amount of mouth opening, mandibular movement, physical characteristics and skeletal structure observation had been proceeded. But most of them are under normal conditions of skeletal structure and studies on different skeletal structures in each were rare. The purpose of this study is to figure out a relationship among the amount of mouth opening, the vertical movement of mandible and skeletal structures in each.

Ⅱ. MATHRIALS AND METHODS

1. subjects

172 college students whose age is ranged from 20 to 30 were selected for this study and classified into class I(male:30, female:49), class II(male:18, female:24) and class III(male:18, female:33), according to Angle's molar relationship. The subjects had not had any experiences of temporomandibular disorder, extraction and orthodontic treatment.

2. method

To measure the maximum interincisal opening (MIO) and the maximum intermolar opening(MMO) and to calculate a ratio between MIO and MMO, a measuring scale was used in the Dept. of Oral Medicine, Chonnam National University Hospital. The Subjects were taken to be in their upright position and open their mouths as wide as possible.

Impressions of both arches from subjects were taken with alginate and made into light gypsum diagnostic models. An arch length was measured as

a distance when a line was drawn vertically on lingual gingival crest between right and left incisors to a line connecting distal surface of the 2nd molar in the right and the left. An arch width was measured as the length of line connecting convex point of lingual surface of the 1st molars in the right and the left side.

Cephaometrics were taken on the maximum opening and centric occlusion by using Verview(J. morita co., Kyoto, Japan). Conditions were 70-75kvp and 80mmA. Exposing time is 1.2-1.7sec. TMG/RA-1 film(Kodak, U.S.A.) is used. While the radiograph of the maximum mouth opening was taken, the amount of maximum opening of an interincisal distance was being maintained with a ruler. Distance from a source to film was 150mm and distance from objects to film cassette was 12.5cm. Cephalometrics were taken and then traced. Landmarks were identified and analyzed.

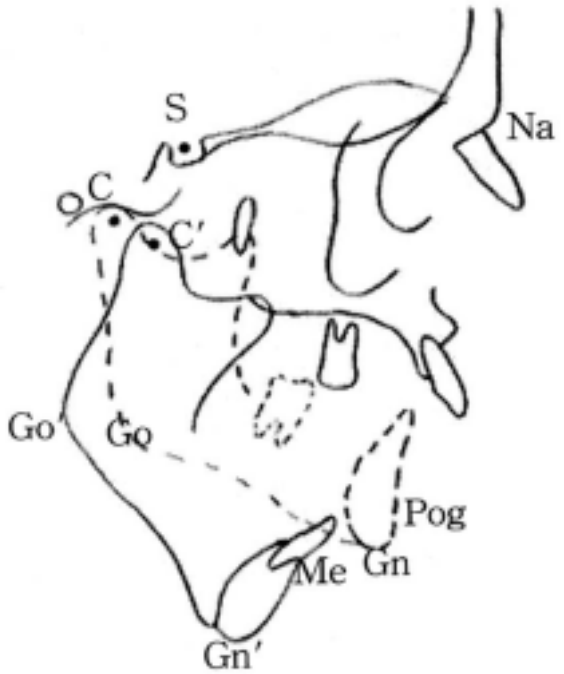
Three examiners were taken to a clinical examination, a mandibular movement analysis, the tracing and analyzing of cephalometrics and then finally an average number was considered as the result.

Radiographical landmarks of cephalometrics used in this study were as follows(fig. 1)

1. C : An intersection of perpendicular planes to most anterior, superior and posterior point of condyle
2. C′ : A C point of opened mandible
3. GO(Gonion) : An intersection of the posterior border of ramus and the inferior border of mandible
4. Go′ : Go′: A Go point of opened mandible
5. Gn(Gnathion) : An intersection of Me-Go and N-Pog
6. Gn′ : A Gn point of opened mandible
7. Na(Nasion) : A junction of frontonasal suture
8. Me(Menton) : The most inferior point of symphysis
9. S(Sella) : The center of pituitary fossa
10. Pog(Pogonion) : The most anterior point of symphysis

Linear and angular measurements of cephalometrics used in this study were as follows

1. Go-Gn : A mandibular inferior border length
2. C-Go : A ramal length
3. C-Gn : The total mandibular length
4. Na-Me : An anterior facial length
5. C-C′ : A distance of condylar movement
6. C-S-C′ : An angle of condylar movement
7. Go-Gn to Go′-Gn′ : An angle of mouth opening(AMO)



--: closing position of mandible
—: opening position of mandible

Figure 1. Reference points and planes used for cephalometric analysis
S:center of pituitary fossa, Na:junction of frontonasal suture, Me:most inferior point of symphysis, Pog:most anterior point of symphysis, Gn:intersection of Me-Go and N-Pog, Go:intersection of posterior border of ramus and inferior border of mandible, C:intersection of perpendicular planes to most anterior, superior and posterior point of condyle, C′:C point of opend mandible, Gn′:Gn ponit of opened mandible, Go′:Go point of opened mandible

3. Statistics

In order to confirm differences between male and female on maxillofacial skeletal factors and vertical movement of mandible, the student's-t test or Mann-Whitney rank sum test was taken. To confirm differences among Angle's classifications, a pairwise multiple comparison procedures, Kruskal-Wallis one way analysis of variance on ranks were taken

Ⅲ. RESULTS

1. Facial skeletal structure(Table 1 to 4)

On measuring skeletal structure, Go-GN and C-GN of male were larger than those of female in Angle's Class I, Class II($p<0.001$) and Class III($p<0.05$). Na-Me of male was larger than that of female in Class II($p<0.01$) and Class III($p<0.05$). C-Gn and Na-Me were the largest in Class III among each class and there was no difference between Go-Gn and C-Go. The arch length of mandible and maxilla measured by a diagnosis model was the longest in Class I($p<0.01$) and there was no difference between male and female among Class I, II, and III. The arch width of mandible and maxilla was the widest in Class III. The arch with of mandible and maxilla among male was wider than that of female in Class II($p<0.01$). The arch with of mandible and maxilla of female was wider than that of male in Class III($p<0.05$)

2. Change of the mandible in maximal mouth opening(Table 1 to 4)

The average maximum interincisal opening of male was larger than that of female in Class I($p<0.05$), Class II($p<0.01$), and Class III($p<0.05$). The average maximum interincisal opening among Class I, Class II and Class III was the largest in Class III($p<0.05$) and was 53.58±0.88 mm in Class III. On maximum intermolar opening, male was larger than female in Class I($p<0.001$), Class II($p<0.05$), and Class III($p<0.01$) and there was no difference among classes. In ratio of the maximum interincisal opening and intermolar opening, there was no difference between male and female and among all classes.

Condyle moves toward anterior and inferior according to articular fossa. The distance of condylar movement was 19.5±0.89 mm in male of Class I and was 17.5±0.43 mm in female of Class and there was no difference. In Class II($p<0.01$) the distance of condylar movement of male and female was 23.8± 1.01 mm and 16.5±0.38 mm individually. In Class III($p<0.05$) male and female were 21.8±0.17 mm and 14.7 mm ±0.52 individually. The average distance of condylar movement is 18.09±0.41 mm, 18.92±0.92 mm, and 18.33±051 mm each in Class I, Class II and Class III and there was no difference among classes. There was no difference between the angle of condylar movement of male and female in Class I. The angle of condylar movement was 37.3±23.9° and 29.6±1.05°in each male and female of Class II($p<0.01$). The angle of condylar movement was 37.7 ±21.7°and 28.4±1.89°in each male and female of Class III($p<0.01$). In condylar movement, in Male was larger than that of female in Class III. Average angles of condyle movements were 32.46±0.83°, 32.28±1.35°and 31.84±1.72°in each Class I, II and III and there was no difference in classes.

The angle of mouth opening was defined as an intersection angle of mandibular inferior border on the maximal opening and the mandibular inferior border on an centric occlusion. There was no difference between male and female in Class I. Angles of mouth opening were each 37.75±0.70°and 27.43±2.75°in male and female of Class II($p<0.01$). Angels of mouth opening were 37.42±2.87°and 27.79±0.74°individually in male and female of Class III($p<0.01$) and male was larger than that of female. Average angles of mouth opening were each 31.16± 0.61°, 30.87±2.17°, and 30.27±0.94°in Class I, Class II and Classs III and there was no difference among classes

Table 1. Linear(unit:mm) and angular(unit:degree) measurements for facial skeletal factors and mandibular positional changes in Angle's class I

Variables	All	Male	Female	*P*
Maximum Interincisal opening(MIO)	50.37±0.77	54.33±0.73	48.82±0.83	*
Maximum Intermolar opening(MMO)	34.6±0.75	39.1±1.41	32.9±0.56	***
Ratio between MIO and MMO	1.49±0.03	1.49±0.03	1.49±0.04	NS
Upper arch length	45.05±0.22	44.45±0.37	45.28±0.26	NS
Lower arch length	41.20±0.21	41.33±0.42	41.14±0.25	NS
Upper arch width	37.84±0.29	38.77±0.63	37.47±0.31	NS
Lower arch width	34.20±0.29	35.19±0.67	33.81±0.30	NS
Go-Gn	81.28±0.47	84.5±0.57	80.9±0.54	*
C-Go	65.56±0.63	67.8±0.75	64.5±0.68	NS
C-Gn	119.47±0.833	123.00±0.79	118.39±0.20	**
Na-Me	130.27±0.64	130.42±0.87	130.24±0.74	NS
C-C′	18.09±0.41	19.5±0.89	17.5±0.43	NS
C-S-C′	32.46±0.83	31.2±1.48	33.0±0.99	NS
Go-Gn to Go′-Gn′	31.16±0.61	33.65±1.08	30.19±0.70	NS
C-Go-Gn				

The values are mean±SEM
NS : not significant, * : p<0.05, ** : p<0.01, *** : p<0.001

Table 2. Linear(unit:mm) and angular(unit:degree) measurements for facial skeletal factors and mandibular positional changes in Angle's class II

Variables	All	Male	Female	*P*
Maximum Interincisal opening(MIO)	50.33±0.99	53.83±0.88	48.57±1.15	**
Maximum Intermolar opening(MMO)	36.0±1.92	39.8±2.32	32.3±1.55	*
Ratio between MIO and MMO	1.55±0.10	1.43±0.04	1.61±0.15	NS
Upper arch length	44.31±0.70	44.29±0.23	44.33±1.05	NS
Lower arch length	39.13±0.82	40.57±0.56	38.41±1.16	NS
Upper arch width	36.09±0.85	40.18±0.85	34.04±0.64	**
Lower arch width	34.08±0.84	36.9±0.81	32.7±0.97	NS
Go-Gn	79.28±2.18	84.3±3.28	74.8±1.74	***
C-Go	68.47±1.98	71.6±3.09	63.8±0.89	**
C-Gn	117.67±2.43	121.08±1.57	111.96±1.39	***
Na-Me	130.79±2.60	134.2±3.28	124.1±1.03	**
C-C′	18.92±0.92	23.8±1.01	16.5±0.38	**
C-S-C′	32.18±1.35	37.3±2.39	29.6±1.05	**
Go-Gn to Go′-Gn′	30.87±2.17	37.75±0.70	27.43±2.75	**
C-Go-Gn				

The values are mean±SEM
NS : not significant, * : p<0.05, ** : p<0.01, *** : p<0.001

Table 3. Linear(unit:mm) and angular(unit:degree) measurements for facial skeletal factors and mandibular positional changes in Angle's class III

Variables	All	Male	Female	*P*
Maximum Interincisal opening(MIO)	53.58±0.88	56.95±1.33	51.49±1.00	*
Maximum Intermolar opening(MMO)	34.3±1.04	38.8±1.11	32.7±0.98	**
Ratio between MIO and MMO	1.46±0.03	1.46±0.01	1.46±0.04	NS
Upper arch length	43.68±0.42	43.70±1.23	43.60±0.45	NS
Lower arch length	40.68±0.36	44.23±0.50	40.03±0.31	NS
Upper arch width	37.94±0.57	34.63±2.95	38.54±0.37	*
Lower arch width	35.38±0.38	35.2±2.05	35.4±0.29	NS
Go-Gn	82.20±0.77	87.8±1.20	80.0±0.71	*
C-Go	66.49±0.97	77.9±1.65	65.2±1.09	*
C-Gn	121.16±1.05	128.59±1.15	118.25±3.17	*
Na-Me	133.31±1.04	137.4±0.20	131.7±1.23	*
C-C′	18.33±0.51	21.8±0.17	14.7±0.52	*
C-S-C′	31.84±1.72	37.7±2.17	28.4±1.89	**
Go-Gn to Go′-Gn′	30.27±0.94	37.42±2.87	27.79±0.74	**
C-Go-Gn				

The values are mean±SEM
NS : not significant, * : $p<0.05$, ** : $p<0.01$

Table 4. A comparison of linear(unit:mm) and angular(unit:degree) measurements for facial skeletal factors and mandibular positional changes among Angle's class I, II and III and among male and female

Variables	Class I	Class II	Class III	*P*
Maximum Interincisal opening(MIO)	50.37±0.77	50.33±0.99	53.58±0.88*	
Maximum Intermolar opening(MMO)	34.6±0.75	36.0±1.92	34.3±1.04	NS
Ratio between MIO and MMO	1.49±0.03	1.55±0.10	1.46±0.03	NS
Upper arch length	45.05±0.22*	44.31±0.70	43.68±0.42	
Lower arch length	41.20± 0.21*	39.13±0.82	40.68 ±0.36	
Upper arch width	37.84±0.29	36.09 ±0.85	37.94 ±0.57*	
Lower arch width	34.20±0.29	34.08±0.84	35.38±0.38*	
Go-Gn	81.28±0.47	79.28±2.18	82.20±0.77	NS
C-Go	65.56±0.63	68.47±1.98	66.49±0.97	NS
C-Gn	119.47±0.83	117.67±2.43	121.16±1.05*	
Na-Me	130.27±0.64	130.79±2.60	133.31±1.04*	
C-C′	18.09±0.41	18.92±0.92	18.33±0.51	NS
C-S-C′	32.46±0.83	32.18±1.35	31.84±1.72	NS
Go-Gn to Go′-Gn′	31.16±0.61	30.87±2.17	30.27±0.94	NS
C-Go-Gn				

The values are mean±SEM
NS : not significant, * : $p<0.05$, ** : $p<0.01$

Ⅳ. DICUSSION

Many studies had been performed to prove relations of mandibular movements, physical characteristics and facial skeletal structures. But most of them were preformed with normal skeletal structures. Therefore cases with different facial skeletal structures in each were rare. For this reason, this study to define a correlation between the amount of mouth opening and the vertical movement of mandible and skeletal structures in groups by the classification of Angle's molar relationship is performed.

Cephalometrics were taken while the maximal mouth opening was being maintained with a ruler. Interincisal distance of cephalometrics is 1.1 times higher than that of clinical measurements, though this fact was not included in the results.

In the study of position changes in the hyoid bone at the maximal mouth opening, Mutto and Kanazawa[28] reported that the hyoid bone moved to posterior and inferior as the amount of mouth opening increases. They also reported that the inferior drift of hyoid bone on opening and the posterior drift of head were important factors for the maximal mouth opening. So an upright position was being maintained and values were measured in this study.

The amount of maximal mouth opening generally increases until the time of adult and thereafter the amount decreases with age, but reason for that is not clear[4,7,11,12,13,14]. The amount of mouth opening in male is larger than that of female. Accordingly the difference by sex is generally derived from different physical characteristics between men and women[11,12,13]. Mutto and Kanazawa[23,24] reported that the amount of maximal mouth opening was correlated with the mandible size.

In this study, the maximal interincisal opening in male was larger than that of female. The maximal interincisal opening of male in average was 55 mm and that of female is 49.6 mm. This was not the same as of Agerberg[12](male:58.6 mm, female:53.3 mm), Travells[16](male:49 mm, female:53 mm), and Pullinger's et al.[20] reports(male:57 mm, female:55 mm). This result seemed to be caused by different characteristics of skeletal structures between the orientals and the occidentals. Nevakari[7], Agerberg[11,12], and Landtwing[13] also suggested that the difference of the maximal mouth opening between male and female was in the size of skeleton. Westling and Helkimo[19] and Muto and Kanazawa[23,24] reported that the amount of mouth opening had not correlation with the body size but with the mandible size. In this study, there was the difference between Go-Gn and C-Gn of male and those of female in Class I and the difference between the maxillary arch width, Go-Gn, C-Go, C-Gn and Na-Me of male and those of female in Class II. In male and female of Class III, the maxillary arch width, Go-Gn, C-Gn, C-Go and Na-Me were different. It was thought that the size of mandible had a correlation with the mouth opening.

The amount of temporomandibular movement influences on the opening capacity. Westling and Helkimo[19] and Pulinger et al.[20] estimated the amount of condylar movement by measuring rotational angle. Westling and Helkimo[19] reported that the maximal mouth opening rotation angle of female was higher than that of male but there was no significant difference. Westling and Helkimo also reported that the maximal opening had no correlation with other articular movements in passive or active opening and rotation angle of mandible was less dependent on the ligamentous flexibility but was more influenced by facial skeletal structures. Pullinger et al.[20] reported that average range of temporomandibular movement was 33.3°in men and 35.1°in women. Generally, epidemiologic studies showed that the range of temporomandibular movement in female was larger than that in male. There was no significant difference between passive and active opening of male and female. But passive and active opening of female was larger than that of male. That the flexibility of ligament of female was larger than that of male[21] was the reason for this. There was a difference between measuring method of this study and that of Westling and Helkimo[19] and Pullinger et

al.[20]. In this study, C-S-C′ measurement was defined as a value of temporomandibular movement on the maximal opening. There was no difference between C-S-C′ of male and female in Class I. C-S′-C of male was larger than that of female in Class II and Class III. These results were different from those of Pullinger′s et al′s.[20]

The distance and the angle of condylar movement to show the amount of temporomandibular movement had no significant difference among classes and so had no influence on the difference of maximal interincisal opening among classes. But distance of condylar movement was correlated with C-Gn, C-Go, Go-Gn and maxillary arch width in Class I and C-Go, Go-Gn and C-Gn in Class II and the mandibular arch length and the maxillary arch width in Class III.

Dijkstra et al.[25,26] defined the angle of mouth opening(AMO) as an angle displacement of mandible to cranial base to measure the temporomandibular movement which was independent from the mandibular length. Many studies[14,18] on correlations between the amount of maximal mouth opening and the mandibular length had been performed and had meant that the amount of maximal mouth opening was dependent on the mandibular length. Wooten[1] also reported that the distance of condylar movement was not related with the amount of mouth opening. But Dijkstra et al.[25,26] reported that the amount of maximal mouth opening had strong correlation with the mouth opening angle and the amount of condylar movement had affected on the amount of mouth opening. In this study, the mouth opening angle is correlated with the arch length of mandible and maxilla in Class I and the maxillary arch length and the anterior facial height in Class II and the length of mandibular inferior border, the mandibular arch length and the arching width of mandible and maxilla in Class III.

Westling and Helkimo[19] and Pullinger et al.[20] measured the amount of passive and active opening. The amount of active opening was measured in this study. The advantage of this method was to measure the amount of TMJ movement, regardless of the length of mandible. The reason to take this method was that it was difficult for examiners to keep the same force and changes of head position has an effect on the maximal mouth opening.

The maximal interincisal opening showed a significant difference between Class I and III and also a correlation with C-Gn, Na-Me, C-C′, C-Go, and Go-Gn in Class I and C-Gn, Na-Me, Go-Gn, and mandibular arch length in Class III. C-Gn and Na-Me showed a significant difference between Class I and III. Therefore, it was thought that the difference of maximal interincisal distance between Class I and III was due to the total mandibular length and the anterior facial height. It was considered that the opening amount of people who has the long mandible and face was larger than that of people with other shapes. This result was identical with the Agerberg′s report[11,15]. That the difference between maximal mouth opening of Class I and Class II was due to the difference of mandible size was believed to be a reason. This was coincided with the Muto and Kanazawa′s report[23,24].

On clinical examining the temporomandibular disorder which had a limitation on the mouth opening, the amount of mouth opening was used for finding degrees of illness and making plans of treatments as an important diagnostic factor. The maximal amount of mouth opening was used for determining the time to finish treatment. Normal recovery of the maximal amount of mouth opening becomes the purpose of treatment and is more important than the improvement of symptom. On treating patients who has a limited mouth opening, especially patients under growing, skeletal factors affecting the amount of mouth opening and the functional orthopedic device are to be confirmed.

V. CONCLUSION

To identify the skeletal factors that had influences on the vertical movement of mandible and the vertical displacement on maximal mouth opening according to Angle′s classification, 172(age ranged from 20 to 30) subjects of college students in Kwangju city without

any experiences of temporomandibular disorder, extraction and orthodontic treatment were selected for this study. The subjects were classified into class I(male:30, female:49), class II(male:18, female:24) and class III(male:18, female:33) according to the Angle's molar relationship. The distance was measured between the incisal edge of maxillary and the mandibular central incisor and between the bottom of central fossa of maxillary and the mandibular 1st molar with a ruler. The arch length and width were measured on diagnostic casts. Cephalometrics were taken and traced. Landmarks were identified and analyzed.

The following results were obtained;

1. The maximum interincisal opening of male is higher than that of female in class I, class II and class III. In each group, the maximum interincisal distance is the largest in class III. The maximum intermolar distance of male is superior to that of female in class I, class II, and class III, but there is no significant difference among them.
2. On the maximum opening movement of Angle's classification, class I and class II, the total mandibular length, the mandibular ramal length, the madibular inferior border length and the upper arch width were important variables and the facial length, showed a reversed correlation with the upper arch length and the lower arch length. On the maximal opening movement of Angle's class III, the upper arch length, the lower arch length and the anterior facial length were important variables, especially when they are compared with class I and II, and showed the negative relationship with the upper arch width.

These results suggest that the maximum opening movement is affected by facial morphology in all of Angle's class I, class II and class III, but each group is affected by different facial skeletal variables. Accordingly, facioskeletal variables are considered as a diagnosis and a treatment to improve the opening amount of mandible.

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국문초록

악안면부 골격구조에 따른 하악 개구운동 양상

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앵글씨 분류에 따른 최대개구시 하악의 수직 변위에 대한 차이를 확인하고, 수직 하악운동에 영향을 주는 골격 요소를 확인하기 위하여, 측두하악관절 및 저작계 이상에 대한 증상 및 병력이 없으며 발치 및 교정치료의 경험이 없는 광주지역 대학에 재학중인 학생들을 대상으로, 앵글씨 구치부 관계에 근거하여 1급군(남:30명, 여:49명), 2급군(남:18명, 여:24명)과 3급군(남:18명, 여:33명)으로 분류하여 총 172명(연령 범주:20-30세)의 학생을 선택하였다. 전남대학교 병원 구강내과에서 사용하는 계측용자를 이용하여 최대 개구시 상하악 중절치 절단면간의 거리를 측정하였다. 대상자들의 진단모형을 만들어 상하악궁 길이와 폭경를 측정하였다. 대상자들에 대한 두부 규격방사선 사진을 촬영, 작도하고 방사선학적 지표를 계측, 비교분석하였다. 앵글씨 분류 1급군, 2급군 그리고 3급군 절치간 최대개구량은 3급군이 가장 컸으며 모든 군에서 남자가 여자보다 컸다. 구치간 최대개구량은 앵글씨 분류 1급군, 2급군 그리고 3급군에서 각 군간의 유의한 차이는 없었으나, 모든 군에서 남자가 더 컸다. 앵글씨 분류 1급군과 2급군의 하악운동에서 총 하악골 길이, 하악지 길이, 하악 하연부 길이 그리고 상악궁 폭경이 변수로 나타났으며, 상하악궁 길이와는 역상관관계를 나타내었다. 앵글씨 분류 3급군의 하악운동에서 상하악궁 길이와 안면 부길이가 1급군과 2급군과는 다른 중요한 변수로 나타났으며, 상악궁의 폭경과는 역상관관계를 나타내었다.

이상의 결과로 보아 앵글씨 분류 각 군에서 하악개구운동은 안면 골격구조의 영향을 받으며, 각 군간에 영향을 주는 안면 골격 요소들은 차이가 있었다. 따라서 이러한 골격적 요소들은 개구량 개선을 위한 진단과 치료시 고려되어야 할 것으로 사료된다.

Keyword : 하악개구량, 안면골격, 앵글씨 분류