The Relationship between Anterior Disc Displacement without Reduction and Development of Anterior Open Bite

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The purpose of this paper is to evaluate if there is a relationship between anterior disc displacement without reduction and development of anterior open bite, and a relation between occurrence of open bite and occlusal appliance therapy.

In general, the statistically significant differences were found between the Group 1 and 2 and normal mean group. The variables that represent mandibular size and form, showed a statistical significance in all 3 groups. Also 3 groups patients had a smaller ANB, a larger FMA than normal mean group.

When we compared the 3 groups with respect to all cephalometric measurements by One-way analysis of variance (ANOVA), group 1 and 2 patients had a larger FMA, a larger SN to mandibular plane angle, a larger maxillomandibular plane angle, a larger occlusal plane to mandibular plane angle, a smaller total posterior facial height/total anterior facial height(%), and a larger gonial angle than group 3. The statistically significant differences were not found between the Group 1 and 2, and skeletal patterns were similar.

Thus, morphologic features of patients with vertical discrepancies may represent a risk factor for the development of anterior open bite with or without occlusal appliance treatment. In case of patients with vertical discrepancy, we may have to be more careful when inducing a change of the vertical dimension.

Key words : Anterior disc displacement, Occlusal appliance, Open bite, Vertical discrepancies

I. INTRODUCTION

Temporomandibular disorders (TMDs) have become an important topic in the field of dentistry. One of the most common TMDs is a disc derangement related to the anterior disc displacement. Among these patients, we can occasionally find patients who develope anterior open bite before or during the occlusal appliance treatment. Although anterior open bite is an unusual complication of temporomandibular disorders, it poses a challenge to clinical practitioners due to its difficulty of management and poor prognosis.

Many researchers have reported cases of developed anterior open bite following severe TMJ destruction.[1-5] Most of these open bite cases belong to progressive and more rapid destructive diseases of the TMJ, including rheumatoid arthritis (RA), juvenile RA, and other rare connective tissue diseases. In severe cases with loss of condylar support, acute malocclusion can result in heavy posterior contacts and an anterior open bite.

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Chen *et al.*[6] examined MR images of the temporomandibular joints (TMJs) at 13 acquired or developed open bite patients, which means that the noncontacting anterior teeth of these patients used to be in contact. This fact was confirmed by the existence of wear facets and the absence of mamelons on the incisal edges. They reported that some of them have developed the bite changes following the insertion of a flat-surface splint for treating the TMJ internal derangement and all affected TMJs had anteriorly displacement disc and degenerative changes. They suggested that the development of acquired anterior open bite could be related to bilateral horizontal condylar degeneration, which is associated with nonreducing displaced discs. Finally, less than half of their open bite patients had received a bite splint for treating the TMD before open bite occurred. Therefore, They believed that splint wearing dose not seem to be the cause of the acquired anterior open bite.

I have already reported that the open bite relating to disc dislocation can develop even without occlusal appliance wearing in patients who have non-reduced anterior disc dislocation but no condylar resorption.[7] The fore-mentioned patients experienced sudden occurrence of centric relation/centric occlusion discrepancy.

Researches on reasons for development of open bite in patients of anterior disc displacement without reduction are rare. According to Chen *et al.*,[6] the development of acquired anterior open bite could be related to bilateral horizontal condylar degeneration, which is associated with nonreducing displaced discs. However, there were instances that exhibited no morphologic changes. Therefore, I thought the claim that open bite is induced by condylar destruction is in error, because open bite occurs without any exchanges in ramus height. Then, how dose open bite associated with TMD occur suddenly? It was hypothesized that the skeletal characteristics may have effect on occurrence of open bite, and was devised a method of cephalometric analysis of 3 patients groups with anterior disc displacement without reduction to validate the fore-mentioned hypothesis. Also, present study was to find out if there is a relation between occurrence of open bite and occlusal appliance therapy.

Ⅱ. MATERIALS AND METHODS

1. Subject

A total of 58 patients were evaluated. All patients were clinically diagnosed with one or both side anterior disc displacement without reduction. Those with immune disorders such as RA and macrotrauma like condylar fracture were excluded from this research. All patients were treated in the Department of Oral Medicine, Kyungpook National University Hospital, between July 2004 and June 2006. Basic clinical examination, panoramic, lateral transcranial and lateral cephalometric radiographs were conducted on 58 patients. These patients were divided into 3 groups. :(1) Group 1 with patients who had anterior open bite before the first visit to our clinic, and those that developed spontaneous open bite during follow-up without occlusal appliance therapy (n=22), (2) Group 2 with patients that open bite developed during occlusal appliance therapy, and the follow-up group of patients with pre-occurrence of open bite during research period is also included (n=16), and (3) Group 3 with patients that does not develop open bite even after occlusal appliance (n=20).

2. Cephalometric analysis

Lateral cephalometric radiographs were traced on acetate tracing film to consult our orthodontic department. The tracings were digitized using a digitizer interfaced with a desktop computer. Cephalometric landmarks (Fig. 1), planes (Table 1) and angular and linear dimensions (Table 2) used in this study are listed. 20 cephalometric variables including cranial base, maxillomandibular relation ships, vertical skeletal relationships, and size and form of mandible were calculated (Table 3).

Differences in skeletal structural features were investigated among three study groups.

3. Data processing

Statistical analysis was performed using SPSS version 11.0. The t-test was used for comparison between 3 patients groups and established Korean adult mean normal values.[8,9] A difference with a P value less than .05 was considered significant.

Table 1. Planes used in the study

1. Sella-nasion: the plane from sella to nasion
2. Frankfort horizontal plane(FH plane): the plane from porion to orbitale
3. Palatal plane: the plane from anterior nasal spine to posterior nasal spine
4. Occlusal plane: the plane from occlusal surface of L6 molar to midpoint of incisor tip U1 and L1
5. Mandibular plane: the plane from menton and tangent to the lower border of the mandible
6. Nasion-point A: the line constrcted from nasion to point A
7. Nasion-point B: the line constrcted from nasion to point B
8. Articulare-gonion: the plane from articulare to gonion

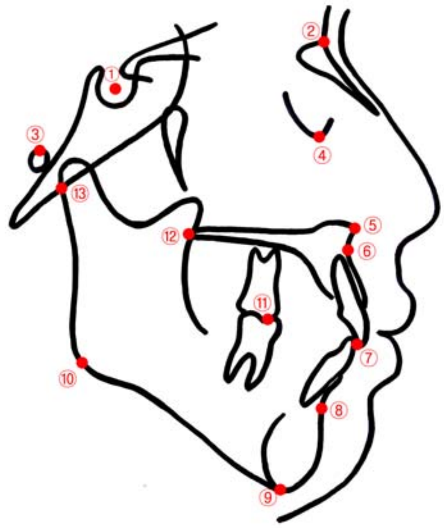

Fig. 1. Cephalometric landmarks and abbreviationss: ① sella (S), ② nasion (N), ③ porion (Po), ④ orbitale (Or), ⑤ anterior nasal spine (ANS), ⑥ point A (A), ⑦ midpoint of incisor tip U1 and L1, ⑧ point B (B), ⑨ menton (Me), ⑩ gonion (Go), ⑪ occlusal surface L6, ⑫ posterior nasal spine (PNS), ⑬ articulare (Ar)

Table 2. Angular and linear dimensions used in the study

Angular dimensions
Saddle angle: the angle between of the sella-nasion plane and sella-articulare line
SNA: the angle between of the sella-nasion plane and the Nasion-A point line
SNB: the angle between of the sella-nasion plane and the Nasion-B point line
ANB: the angle between of the Nasion-A point and the Nasion-B point planes
Frankfort mandibular plane angle(FMA): the intersection of the FH and the mandibular plane
SN to mandibular plane angle: the intersection of the SN and the mandibular plane
FH to palatal plane angle: the intersection of the FH and the palatal plane
Maxillomandibular plane angle: the intersection of the palatal and the mandibular plane
Occlusal plane to mandibular plane angle: the intersection of the occlusal and the mandibular plane
Ramus inclination: the angle between of the the sella-nasion plane and articulare-gonion line
Gonial angle: the intersection of the articulare-gonion plane and the mandibular plane
Linear dimensions
Anterior cranial base length (S-N)
Posterior cranial base length (S-Ar)
Total anterior facial height(TAFH) (N-Me)
Total posterior facial height(TPFH) (S-Go)
Lower anterior facial height(LAFH) (ANS-Me)
Ramus height(Ar-Go)
Mandibular body length(Go-Me)

Table 3. Comparison of cephalometric variables of 3 groups and normal mean values

variables	group 1 mean (SD)	group 2 mean (SD)	group 3 mean (SD)	normal group mean (SD)
Cranial base				
anterior cranial base length	68.04(3.08)***	69.57(4.27)	71.50(4.58)	71.12(3.52)
posterior cranial base length	35.18(3.61)***	35.81(3.64)**	39.05(11.0)	39.05(4.07)
saddle angle	125.3(6.17)	123.7(5.68)	123.4(7.56)	124.9(4.74)
Maxillomandibular relationships				
SNA	80.95(4.31)	79.93(3.83)**	81.91(3.41)	82.05(3.22)
SNB	75.65(3.91)***	76.06(3.74)***	77.53(2.81)**	79.79(3.12)
ANB	5.30(2.16)***	3.87(2.12)**	4.38(2.10)***	2.26(1.79)
Vertical skeletal relationships				
FMA	34.44(4.00)***	32.03(5.29)***	26.42(3.98)**	23.50(5.01)
SN to Mandibular plane angle	45.22(4.98)***	42.31(5.47)***	36.72(5.12)***	31.80(5.53)
FH to palatal plane angle#	0.42(3.56)	0.22(3.04)	0.89(2.97)	1.05(3.12)
Maxillomandibular plane angle#	34.02(4.70)***	31.80(4.81)***	25.53(5.14)	24.70(5.60)
Occ. plane to Mn. plane angle	21.02(2.67)***	19.72(4.05)***	16.17(3.18)	15.19(3.81)
total anterior facial height	132.2(7.61)	132.2(9.11)	132.2(8.61)	131.7(7.08)
total posterior facial height	76.19(5.36)***	79.30(6.64)***	85.73(7.31)*	90.24(7.82)
lower anterior facial height#	75.14(6.07)	75.20(7.33)	74.39(5.50)	73.19(5.14)
TPFH/TAFH	57.69(3.47)***	60.00(3.65)***	64.82(3.67)**	68.52(4.78)
LAFH/TAFH	56.79(2.12)**	56.77(2.36)**	56.52(2.05)	55.54(1.87)
Size and Form of mandible				
ramus height	43.60(4.00)***	46.20(4.80)***	49.96(10.1)***	54.61(5.67)
ramus inclination	96.54(5.56)***	95.02(5.57)***	94.33(6.15)***	81.19(4.96)
mandibular body length	76.75(5.16)**	76.65(6.29)**	76.68(4.73)**	80.19(4.96)
gonial angle	128.6(4.48)***	127.2(4.90)***	122.3(5.38)**	117.9(6.38)

normal mean : mean of Korean adult with normal occlusion[8,9]
#: comparison of longitudinal data of craniofacial growth from lateral cephalometrics in korean with normal occlusion[9]
*p<.05, **p<.01, ***p<.001

One-way analysis of variance (ANOVA) was used to compare the 3 groups with respect to all cephalometric measurements (Table 4). A difference with a P value less than .05 was considered significant. Tukey's multiple comparisons were performed to identify differences between the groups.

Duplicate determinations were performed on 10 cephalometric radiographs, from which the measurement error was calculated by intraclass correlation coefficient. The reliability of tracing, landmark identification, and analytical measurements had intraclass correlation coefficients between 0.87 and 0.99.

Table 4. Comparison of cephalometric variables of subjects among the 3 groups

variables	group 1 mean (SD)	group 2 mean (SD)	group 3 mean (SD)	significance	Multiple comparisons
Cranial base					
anterior cranial base length	68.04(3.08)	69.57(4.27)	71.50(4.58)	NS	
posterior cranial base length	35.18(3.61)	35.81(3.64)	39.05(11.0)	NS	
saddle angle	125.3(6.17)	123.7(5.68)	123.4(7.56)	NS	
Maxillomandibular relationships					
SNA	80.95(4.31)	79.93(3.83)	81.91(3.41)	NS	
SNB	75.65(3.91)	76.06(3.74)	77.53(2.81)	NS	
ANB	5.30(2.16)	3.87(2.12)	4.38(2.10)	NS	
Vertical skeletal relationships					
FMA	34.44(4.00)	32.03(5.29)	26.42(3.98)	***	1=2>3
SN to Mandibular plane angle	45.22(4.98)	42.31(5.47)	36.72(5.12)	***	1=2>3
FH to palatal plane	0.42(3.56)	0.22(3.04)	0.89(2.97)	NS	
Maxillomandibular plane angle	34.02(4.70)	31.80(4.81)	25.53(5.14)	***	1=2>3
Occ. plane to Mn. plane angle	21.02(2.67)	19.72(4.05)	16.17(3.18)	***	1=2>3
total anterior facial height	132.2(7.61)	132.2(9.11)	132.2(8.61)	NS	
total posterior facial height	76.19(5.36)	79.30(6.64)	85.73(7.31)	**	1<3
lower anterior facial height	75.14(6.07)	75.20(7.33)	74.39(5.50)	NS	
TPFH/TAFH	57.69(3.47)	60.00(3.65)	64.82(3.67)	***	1=2<3
LAFH/TAFH	56.79(2.12)	56.77(2.36)	56.52(2.05)	NS	
Size and Form of mandible					
ramus height	43.60(4.00)	46.20(4.80)	49.96(10.1)	*	1<3
ramus inclination	96.54(5.56)	95.02(5.57)	94.33(6.15)	NS	
mandibular body length	76.75(5.16)	76.65(6.29)	76.68(4.73)	NS	
gonial angle	128.6(4.48)	127.2(4.90)	122.3(5.38)	**	1=2>3

NS, Not significant
*p<.05, **p<.01, *** p<.001
Tukey's multiple comparisons were performed at level of α=0.05

Ⅲ. RESULTS

Table 3 listed the differences in cephalometric measurements between 3 groups and normal mean group (t-test). The most statistically significant differences were found between the Group 1 and the normal mean group. In cranial base relationship, the anterior cranial base length showed a significant decrease in the Group 1 open bite patients, and the posterior cranial base length presents significant differences in the Group 1 and Group 2, compared against the normal group.

Regarding the relationship between the maxilla and the mandible, all 3 groups had a significantly lower SNB angle than the normal mean, and a greater ANB angle.

In vertical skeletal relationship, FMA, SN to mandibular plane angle, maxillomandibular plane angle, and occlusal plane to mandibular plane angle were significantly larger in group 1 and 2. This indicates that group 1 and 2 patients had steeper mandibular planes. This was caused by the smaller total posterior facial height, because total anterior facial height and lower anterior facial height in the three groups were similar compared against the normal group.

Among the variables that represent mandibular size and form, all variables showed a statistical significance in all three groups. All three groups of patients had a smaller ramus height, a smaller mandibular body length, a larger ramus inclination, and a larger gonial angle.

ANOVA demonstrated many statistically significant differences among the 3 groups in Table 4. Group 1 and 2 patients had a larger FMA, a larger SN to mandibular plane angle, a larger maxillomandibular plane angle, a smaller total posterior facial height/total anterior facial height(%), and a larger gonial angle than group 3. Skeletal patterns between group 1 and group 2 were similar. While group 3 was skeletally different.

Ⅳ. DISCUSSION

The most statistically significant differences were found between the Group 1 and the normal mean group. Group 1 showed lowest value of anterior and posterior cranial base length, the largest ANB and ramus inclination, the largest FMA as well as the shortest ramus height. This indicates that group 1 patients had the most mandibular retrusion in relation to maxilla, had the biggest vertical discrepancy, and had hyperdivergent skeletal pattern.

ANOVA demonstrated many statistically significant differences among the 3 groups in Table 4. Group 1 and 2 patients had a larger FMA, a larger SN to mandibular plane angle, a larger maxillomandibular plane angle, a smaller total posterior facial height/total anterior facial height(%), and a larger gonial angle than group 3. Skeletal patterns between group 1 and group 2 were similar. While group 3 was skeletally different. Thus, it indicates that those with skeletal characteristics of group 1 and 2 exhibits possibility of more occurrence of open bite.

I have already studied that the open bite relating to disc dislocation can develop even without occlusal appliance wearing in patients who have non-reduced anterior disc displacement but no condylar resorption.[7] The patients experienced sudden occurrence of centric relation/centric occlusion discrepancy. The sudden occurrence of a centric relation/centric occlusion discrepancy seems to be the result of the clockwise rotation of the mandible related to the anterior disc dislocation without reduction. There was no possibility of the extrusion of posterior teeth, as it was compared with occlusal contacts between study model and present occlusion in case of without occlusal appliance wearing. It was not due to the masticatory muscle spasm by clinical examination. It was not caused by the tongue thrusting but rather, change of thrusting may be the consequence of open bite.

The etiology of downward and backward rotation of the mandible related to the anterior disc displacement without reduction had not been studied that extensively. In a 1964 publication, Sassouni[10] described the skeletomuscular differences between the skeletal deep bite case and the skeletal open bite case. He observed that in skeletal hypodivergence, the vertical chain of masticatory muscles, the masseter and internal pterygoid, the direction of contraction is essentially a vertical path with the short, thick-bellied muscle masses well ahead of molar resistance. Thus, it serves to keep the buccal segments depressed, and promote a horizontal growth of the skeletal pattern.

In the hyperdivergent skeletal type, he visualizes this same sling of vertical musculature as being long and spindly and coursing obliquely downward and backward. The mass of the muscle is well behind the molar resistance thus it dose not serve to keep the buccal segments depressed and hence promotes vertical development. Takada *et al.*[11] analyzed the appropriate orientation of the superficial masseter and temporalis muscles associated with dentofacial morphology using head films by means of anatomic and geometric criteria. They suggested an association between superficial masseter muscle orientation relative to the occlusal plane and mandibular form. Long faced persons with a short posterior face height, a steep mandibular plane, and a large gonial angle have obliquely inclined masseter muscle relative to the occlusal plane and a brachyfacial type with a flat mandibular plane and an acute gonial angle represents a vertically oriented masseter muscle. Haas[12] also maintained that the molars are relatively more anterior to the masseter in hyperdivergent vertical facial patterns, and are posteriorly located in hypodivergent overclosed facial patterns. This arrangement could impart, from a geometrical standpoint, to a more efficient force pattern for accomplishing jaw closure, and presumably for preventing open bite. Throckmorton and associates[13] have shown that the elevator muscles have an increased mechanical advantage when the gonial angle is acute and the mandibular plane is flat.

Therefore, due to the displacement of disc, a condylar collapse effect occurs as much as the thickness of the disc, and since the posterior attachment is a loose connective tissue, masticatory muscle gets easily compressed when it contracts, which in turn brings forth another condylar collapse effect. At such times, in case of the patients with hyperdivergent skeletal pattern, it appears that because the superficial masseter is directed more anteriorly and obliquely, which is more posterior position to the molar, and its attached area is a narrower and smaller volume than that of the hypodivergent type,[14-20] it fails to stabilize the occlusion, and it causes downward and backward rotation of mandible as the masticatory muscle contracts. In the hypodivergent type, it seems that because the masseter is more broadly attached, more anterioly attached to the molar and more vertical direction relative to the occlusal and FH plane, even if the disc get displaced, it stabilizes the occlusion.

Kim and Yeo[21] reported that patients with long face syndrome can develop an anterior open bite following dislocated fracture of the condyle, and those patients having a short face have a little chance to develop the anterior open bite after fracture. They reported those who have a long face can have more difficulties in treating fracture of the condyle compared to with a short face.

In case of open bite developed following or during occlusal appliance wearing in the Group 2 patients, those had a hyperdivergent skeletal pattern, which can cause open bite by disc displacement, the increases of vertical dimension by the thickness of appliance may have exacerbated the occurrence of open bite. If vertical dimension increase, the direction of superficial masseter muscle becomes more obliquely inclined and open bite seems to develop by causing downward and backward rotation of mandible. It seems that in some of the patients with hyperdivergent skeletal pattern, even with a small change of vertical dimension, occlusion could deteriorate existing open bite or develop a new one. This contradicts Chen's[6] claim that occlusal appliance is not related to open bite. However, although some of group 2 patients did not have appliance therapy, they could have been with observed spontaneous development of open bite. It indicates that intermaxillary traction appliance (modified pivot appliance) needs to decrease the force on the condyle, as well as to prevent the open bite tendency. The further researches on such cases are being prepared for future reports.

In comparing the Group 3 with the normal mean group, there are no severe vertical discrepancies although FMA, and size and form of mandible variables show significant differences, so the mandible can stabilize the occlusion without its rotation despite changes in vertical dimensions. Although three groups need the comparison against the normal mean morphology group without disc displacement, such a comparison has results identical to those of the past researches[22-24] on relationship between disc displacement and morphologic features of the face. Tanne *et al.*[25] investigated stress distributions in the TMJ during clenching in patients with vertical skeletal discrepancies by finite element analysis, and described that stresses increased substantially for the condyle, the glenoid fossa, and the articular disc with greater gonial and mandibular plane angles, and those changes were more obvious in association with the divergent mandibular plane. Thus, they insisted the nature of stress distributions in the TMJ was substantially affected by vertical discrepancies of the craniofacial skeleton. From these findings, it is suggested that biomechanical changes from stresses may be associated with deformation of the hard and soft tissues in the TMJ. There should be further research on reason for occurrence of disc displacement in the future.

Clinically, the incidence of open bite related to disc displacement is probably considered to be higher in Korean people than in Caucasian. It was reviewed previous comparison analyses of Japanese and European-American,[26-28] because those researches between Korean and European-American were not found. Miyajima *et al.*[26] noted that in comparison to the European-American sample, the Japanese sample, in general, was smaller in anteroposterior facial dimensions and proportionately larger in vertical facial dimensions. The facial axis angle was more vertical in Japanese subjects, indicating a more downward direction of facial development. Sakamoto[27] investigated, in comparison to existing European-American standards, the Japanese had longer faces in absolute size and in facial pattern. The Japanese sample also was more retrognathic, with a more vertical direction of facial growth. Engle and Spolter[28] concluded that Japanese patients have more protrusive dentitions and more vertical growth patterns than do their white counterparts. It was thought that Koreans may have similarities to the previous analyses. It is expected that development of anterior open bite with anterior disc displacement without reduction is more profound among Koreans with a stronger tendency of vertical discrepancies than Caucasians.

Pullinger and co-workers[29] evaluated the relationship between occlusal factors and TMD. They said that four occlusal features occurred mainly in TMD patients and were rare in normal subjects: (1) the presence of a skeletal anterior open bite, (2) retruded contact position (RCP) and intercuspal position (ICP) slides of greater than 2 mm, (3) overjets of greater than 4 mm, and (4) five or more missing and unreplaced posterior teeth. They investigated that unfortunately all of these signs are not only rare in healthy individuals, but also in patient populations. However, it is different among Korean population. These patients are more frequently observed in Korean population. One of the reasons of RCP and ICP slides of greater than 2 mm, seems to be due to mandibular clockwise rotation caused anterior disc displacement without reduction in patients with hyperdiverse skeletal patterns. We must realize that occlusion is just an appearance that overshadows a bigger problem that lies with skeletal characteristics that causes occlusal changes.

It is to be hoped that further researches will compare the direction of masticatory muscles to occlusal and FH planes in case of patients with temporomandibular disorder, and to evaluate whether vertical discrepancies can be a risk factor which cause disc displacement and temporomandibular disorder. Although the temporomandibular disorder is not an actual life threatening disease, it can deteriorate the quality of life in chronic state, especially for the development of anterior open bite, there might occur a high possibility to cause masticatory difficulties, condylar resorption, and degenerative joint disease. It is the wish of this research to prevent open bite by predicting a patient group with possibilities to develop open bite.

Ⅴ. CONCLUSIONS

The purpose of this paper is to evaluate if there is a relationship between anterior disc displacement without reduction and development of anterior open bite, and a relation between occurrence of open bite and occlusal appliance therapy.

In general, the statistically significant differences were found between the Group 1 and 2 and normal mean group. The variables that represent mandibular size and form, showed a statistical significance in all 3 groups. Also 3 groups patients had a smaller ANB, a larger FMA than normal mean group.

When we compared the 3 groups with respect to all cephalometric measurements by One-way analysis of variance (ANOVA), group 1 and 2 patients had a larger FMA, a larger SN to mandibular plane angle, a larger maxillomandibular plane angle, a larger occlusal plane to mandibular plane angle, a smaller total posterior facial height/total anterior facial height(%), and a larger gonial angle than group 3. The statistically significant differences were not found between the Group 1 and 2, and skeletal patterns were similar.

Thus, morphologic features of patients with vertical discrepancies may represent a risk factor for the development of anterior open bite with or without occlusal appliance treatment. In case of patients with vertical discrepancy, we may have to be more careful when inducing a change of the vertical dimension.

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국문요약

비정복성 관절원판변위와 전치부 개교합 발생간의 관계

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목적

비정복성 관절원판변위와 연관되어 전치부 개교합이 발생하는 원인과 교합장치 치료가 개교합 발생과 연관이 있는 지를 살펴보고자 한다.

재료 및 방법

2년간 경북대학병원 구강내과에 턱관절 질환으로 내원한 환자 중에 임상적으로 비정복성 관절원판변위로 진단된 환자를 대상으로 파노라마, 측방 횡두개상 그리고 측방 두부방사선 사진을 촬영하였다. 환자는 3군으로 나누었으며 1군은 처음 병원에 내원할 때 개교합이 있거나 교합장치 치료를 제외한 치료도중에 갑자기 개교합이

유발된 군(22명), 2군은 교합장치 치료 도중에 개교합이 발생한 군과 이 기간동안 예전에 이미 교합장치 치료 도중 개교합이 발생한 후 정기적 관찰 환자를 포함한 군(16명). 그리고 3군은 교합장치 치료 후에도 개교합이 발생하지 않은 군(20명)으로 구성되었다. 측방 두부방사선 계측으로 개교합 발생과 안면부 골격 형태의 연관성을 한국인 정상 교합자들의 평균치와 각 3군 간의 t-test 비교와 ANOVA를 이용해 3군 간의 골격 형태를 비교 조사하였다.

결과

1. 1군과 2군은 정상 교합자들의 평균치와 비교했을 때 대부분의 경우에서 유의한 차이가 있었으며, 1, 2, 3군 모두에서 하악의 크기와 형태를 나타내는 변수들과 더 작은 ANB, 더 큰 FMA 값을 보였다.
2. 세군 간의 비교에서 1군과 2군은 3군에 비해 더 큰 하악하연각 (a larger FMA, a larger SN to mandibular plane angle), 짧은 하악지, 더 큰 하악각을 가졌으며, 1군과 2군 간은 통계학적 유의한 차이가 없어 비슷한 수직적 부조화가 큰 골격형태를 가졌으며, 3군은 1, 2군과는 달랐다.

결론

이상의 결과로 미루어 1군과 2군은 수직적 부조화가 큰 안모 형태를 보여 저작근의 작용 방향과 저작근 부착 위치에 따른 하악의 후하방 회전의 결과로 전치부 개교합이 발생하는 것으로 생각된다. 그리고 수직적 부조화가 큰 경우일 때는 수직 고경의 변화를 일으키는 것은 좀 더 주의가 필요하리라 생각한다.

주제어 : 비정복성 관절원판변위, 교합장치, 개교합, 수직적 부조화