Türk Ortodonti Dergisi
16 (1) 37-40 Nisan 2003

SUBMENTOVERTEX CEPHALOMETRIC ANALYSIS IN CLASS II SUBDIVISION MALOCCLUSIONS

DDS, Ph. D. Münire Ece SABAH*

ABSTRACT. Submentovertex cephalometric analysis was used to assess mandibular symmetry between 28 patients with Class II subdivision malocclusion and 20 controls with Class I malocclusions. Using the condylar line and the condylar axis, the relative differences were measured between mandibular landmarks in both anteroposterior and transverse dimensions. Anteroposterior and transverse differences between left and right mandibular positions and transverse position of the dental midline showed a statistically significant difference between the groups. Position of the coronoid process also showed a difference between the two groups. The present study has concluded that the entire mandibular dentition is rotated in Class II subdivision malocclusions.

INTRODUCTION

Class II subdivision malocclusions, account for approximately 50 % of all Class II maloccusions (1). Many studies have tried to describe many characteristics of Class II subdivison malocclusions, but the origin and etiological factors of unilateral malocclusions are still questioned (2). These patients present difficulties in orthodontic treatment because of the asymmetric occlusal relationship and the underlying factors responsible for the malocclusion (3). There are questions as to whether the origin of the asymmetry is dentoalveolar, skeletal or a combination of the two (3).

Skeletal and dental asymmetry have been studied in persons exhibiting normal occlusions and various malocclusions. Patients with no obvious facial and dental asymmetry have been found to show skeletal size differences when comparing left and right sides of the maxilla and mandible (4), although Letzer and Kronman could not find a definite relationship between malocclusion and symmetry (5) .

The different results found in previous studies can be related to the type of radiographic analysis performed (6). Comonly used skull radiographs to assess skeletal asymmetry include the posteroanterior (PA) and submento vertex (SMV) radiographs. Studies that compared the effects of head rotation and positioning in the determination of asymmetry by using PA and SMV revealed that 50 of side-to side rotation for a PA radiograph caused the side of asymmetry to switch where as SMV radiographs were found not be subject to these effects (6). The problem of selecting a valid midsagittal reference plane associated with the PA has led to the use of SMV radiograph (7) . Others have used the SMV radiographs a means of obtaining accurate TMJ laminagraph (7). This head film allows for investigation of transverse and anteroposterior relationships. In addition, the SMV radiograph are superior with regard to clarity of reference points, and allow for differentiation of skeletal and/or dental asymmetry (8) .

The purpose of this study is to determine the differences that exist with regard to dental and skeletal asymmetries between subjects with Angle Class II subdivision malocclusions, and Angle Class I malocclusions using submentovertex radiograms.

MATERIALS AND METHOD

The study group consisted of 20 Class II subdivision patients (11 females, 9 males) with a mean age of 18.4 (standard deviation 2.12). In the selection of the patients full dentition in maxillary and mandibular arches, Class I molar relationship on one side of the dental arch with a full Class II relationship on the other side, were taken into consideration. The malocclusion group had no history of

* *Ege Üniversitesi, Dişhekimliği Fakültesi, Ortodonti Anabilim Dalı öğretim Üyesi.*

facial travma. These criteria were evaluated by means of clinical history and examination. The control group consisted of 20 dental students (10 females and 10 males) with Class I occlusions with a mean age of 22.3 (standard deviation 4.67).

Submentovertex radiographs were obtained for the 40 patients with OP 100 (Instrumental Imaging, Findland) at 85 kv and 12 mA. The SMV radiographs were taken with the patients Frankfort plane positioned perpendicular to the floor and in maximum intercuspation.

On the SMV films, the outlines of the mandible were traced onto matte acetate. The tracings include the condyles, coronoid processes, gonial angles, first molars, central incisors and lateral and medial borders of he mandibular body and ramus.

The landmarks for submental vertex radiographs are seen in Figure 1. The mandibular dental and skeletal asymmetry was assessed using the intercondylar line and its perpendicular the intercondylar axis which was drawn perpendicular to the intercondylar line as coordinate systems (ICL, ICA). The asymmetries were determined by measuring the differences between the right and left bilateral mandibular skeletal and dental landmarks, (Go, CP, MCM, DMP), both in the transverse and anteroposterior dimensions and MM and DM in the transverse dimension. The skeletal and dental points used in the assessments are defined as follows:

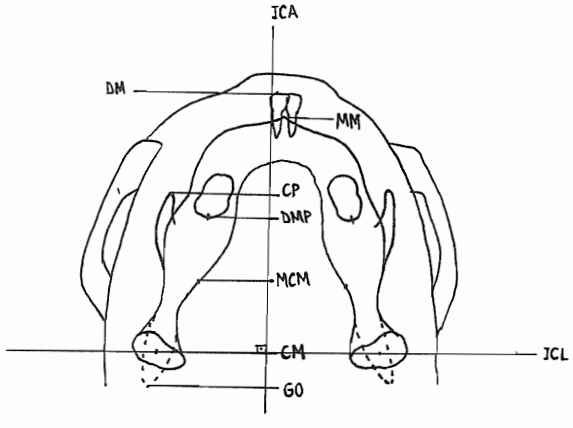

Figure 1: Landmarks and coordinate system on the SMV radiographs.

Go: Gonion point,the most posterior point of the gonial angle.

CP: Coronoid process point.The most anterior point on the coronoid process.

MCM: Medial contour of the mandible, the most medial and posterior point on the medial outline of the body of the mandible.

DMP: Distal molar point. The midpoint on the distal outline of the lower first molar

MM: Mandibular midline point-most anterior point of midline of mandible.

DM : Dental midline point-point between mesial contacts of mandibular central incisor crowns.

ICL : Intercondylar line-the line connecting left and right condylar midpoints (CM)s

ICA: Intercondylar axis-perpendicular bisector to ICL.

The measurements obtained thus, for both the study and the control groups were evaluated using the 't ' test.

RESULTS

The reproducibility of SMV variables was determined by making the same measurements one week apart by the same investigator. Only 5 radiographs from each group was chosen for the test. In all cases the differences between the two groups of measurements were not significant ($p>0.05$).

The 't ' test of variables relative to the mandibular skeletal and dental structures are shown in Table 1. The mean and standard deviation for each variable in both groups are reported along with the results of t-tests. For the study group the differences were obtained always by subtracting the left side from the right side. Thus a positive difference value indicates a greater distance between a given landmark and reference line on the right side. There was a significant difference between the groups in the anteroposterior position of the mandibular molars ($p<0.05$), and in the transverse position of the mandibular molar and the dental midline ($p<0.001$ and $p<0.01$ consecutively). On the average the mandibular molar was 1.70 mm relatively more distal and 3 mm more lateral in the study group. Similarly the mandibular incisor was 2.5 mm more lateral. The anteroposterior coronoid process distance also shows a difference between the two groups.

Table 1. t tests of variables relative to mandibular condylar line (ICL) and condylar axis (ICA).

Antero posterior dimension (Relative to the ICL)	Study Group		Control Group		
	mean	SD	mean	SD	P value
Go	0.10	1.88	0.833	0.516	0.37
Cp	0.75	2.21	-2.67	2.16	0.0093
MCM	0.05	3.2	0.58	2.06	0.72
DMP	1.70	2.18	-0.333	0.983	0.049
Transverse Dimension (Relative to the ICA)					
Go	0.2	2.7	-0.25	1.29	0.71
Cp	-1.25	5.07	-0.33	2.27	0.68
MCM	-2.7	3.8	0.08	1.11	0.11
DMP	3.05	1.32	0.5	0.632	0.0006
MM	-0.2	4.61	-0.17	1.69	0.99
DM	2.6	1.43	0.167	0.408	0.0013

DISCUSSION

The present study found that the dentoalveolar segment in Class II subdivision malocclusions was asymmetrical as compared with Class I malocclusions. The distal molar point on the Class II side was found to be located more lateral and posterior relative to the other side. The dental midline also rotated towards the Class II side. The entire mandibular dentition in subdivision cases maybe considered as being rotated within a symmetrical mandible.

Investigators have proposed that Class II malocclusions would result in the subdivision side of the mandible being shorter in length than the opposite side (9). Our study could not demonstrate this assumption. There is no group difference in mandibular skeletal morphology except for the coronoid process ($p < 0.01$). Otherwise left and right size of the mandible in Class II subdivision malocclusions do not differ significantly from Class I malloclusions in either transverse or anteroposterior asymmetry.

Janson et al. (2), have concluded that distal positioning of the mandibular first molars occur more frequently than mesial positioning of the maxillary first molars in Class II subdivision patients. This study has not evaluated the position of the maxillary landmarks.

This study supports the findings of Rose et al. (3) and Alavi et al. (10) concerning the anteroposterior positioning of mandibular molars in Class II subdivision malloclusion. Rose (3) has investigated the mandibular asymmetry relative to the cranial floor and within the mandible, while the present study concentrates on the symetry within the mandible only. The present study has also concluded that not only the mandibular molars, but also the dental midline is deviated in Class II subdision malloclusions, resulting in the entire mandibular dentition being rotated.

REFERENCES

1. Angle EH. Classification of malocclusion. Dental Cosmos 41,248-64,1899.

2. Janson GR , Metaxas A, Woodside DG, de Freitas MR, Pinzan A. Three Dimensional evaluation of skeletal and dental asymmetries in Class II subdivision malocclusions. Am. J Orthod. Dentofacial Orthop. 119(4), 406-18,2001.

3. Rose JM, Sadowsky C, Be Gole EA, Moles R. Mandibular skeletal and dental asymmetry in Class II subdivision malocclusions. Am.J. Orthod. Dentofacial Orthop. 105, 489-95,1994.

4. Vig PS, Hewitt AB. Asymmetry of the human facial skeleton. Angle Orthod. 45,125- 129,1975.

5. Letzer G, Kronman J. A posteroanterior cephalometric evaluation of craniofacial asymmetry. Angle Orthod. 37, 205-11,1967.

6. O'Byrn BL, Sadowsky C, Schneider B, Be Gole EA. An evaluation of mandibular asymmetry in adults with unilateral posterior croosbite. Am. J. Orthod. Dentofacial Orthop. 107, 394-400,1995.

7. Lew KKK , Tay DKL. Submentovertex cephalometric norms in male Chinese subjects. Am. J. Orthod. Dentofacial Orthop. 103, 247-52,1993.

8. Forsberg C, Burstone C, Hanley K. Diagnosis and treatment planning of skeletal asymmetry with submental-vertical radiographs. Am. J. Orthod. 84, 224-37,1984.

9. Subtelny J. The degenerative, regenerative mandibular condyle: facial asymmetry. J. Craniofacial Genetics Devel Biol, Suppl. I, 227-37 (abstract),1985.

10. Alavi DG, Be Gole EA, Schreuder, BJ. Facial and dental arch asymmetries in Class II subdivision malocclusions. Am. J. Orthod. Dentofacial Orhop. 93-38-46,1988.

Correspondence Address

DDS, Ph D Munire Ece SABAH

Ege University, Faculty of Dentistry

Department of Orthodontics

Bornova, 35100 - İzmir / TURKEY

Fax: 90-232- 463 92 93

E-mail: sabah@dishekimligi.ege.edu.tr