"درجة انحناء مستوى الإطباق في مختلف أصناف سوء الإطباق ونماذج الوجه"

فايز صالح*

الملخص

هدف البحث: صمم هذا البحث لدراسة مدى ارتباط التغيرات العامودية لمستوى الإطباق، والعلاقة السهمية بين الفكين ونماذج الوجه لدى مختلف أصناف سوء الإطباق.

المواد والطرائق: تكونت مادة الدراسة من (100) صورة سيفالومترية جانبية (50 ذكوراً و50 إناثاً) ليافعين متوسط أعمارهم 13.5. وزعت العينة على 4 مجموعات حسب تقسيم آنجل: 40 صورة شعاعية لأشخاص بإطباق سليم، 20 صورة لأشخاص إطباقهم صنف ثانٍ نموذج أول، 20 صنف ثانٍ نموذج ثانٍ، وعشرون صنفاً ثالثاً.

رُسِمَت الإحداثيات على جهاز خاص متصل بكومبيوتر يعمل على برنامج خاص لقياس وحساب الإحداثيات بدقة. كل القياسات الطولية والزّاوويّة ذات الأهمية تم تبويبها ووضعت في جداول خاصة. عولجت المعلومات إحصائيّاً ودرس معامل الارتباط بين زاوية ANB كممثل للعلاقة السهمية بين الفكين وبين زاويتي مستوى الإطباق العلوية والسفلية كتعبير عن البعد العامودي للوجه والإطباق وذلك على مستوى الدلالة ($P<0.05$).

النتائج: لم تظهر النتائج أية فروق إحصائية يعتد بها بين المتغيرات، فقط حالات الصنف الثالث عند الذكور وحالات صنف 2 نموذج ثانٍ عند الإناث أظهرت ارتباطا قوياً.

الاستنتاجات: من هذه الدراسة تبين أن عوامل متعددة تدخل في تشكيل مستوى الإطباق، وعليه يمكن الاستنتاج أنّ مستوى الإطباق المستخدم (Downs) غير صالح لإيجاد معامل ارتباط بين مستوى الإطباق وحالات سوء الإطباق ونماذج الوجه؛ وربما يكون مستوى الإطباق الوظيفي أو الخلفي أكثر اعتمادية في مثل هذه الدراسات.

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"The Cant of Occlusal Plane in Different Malocclusion Groups and Facial Types"

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Abstract

Objective: This study aimed to correlate the vertical changes in the cant of the occlusal plane and that of the sagittal maxillomandibular relationship among different malocclusion groups.

Materials and Methods: The material for the study consisted of 100 lateral cephalograms (50 males and 50 females) for early adult subjects. The average age of participants was 13.5 years (12-15 years range). The sample was assigned into four groups: 40 cephalograms for subjects with acceptable normal occlusion; 20 Class II Div 1; 20 Class II Div 2; and 20 Class III malocclusion. Tracing and digitizing of cephalograms were performed using a computer assisted program. Planes and angles of interest were constructed and the necessary measurements were computed and tabulated. ANB angle and the two occlusal plane angles were statistically related by means of Pearson correlation with a predetermined level of significance at $p< 0.05$.

Results: The findings demonstrated that no significant correlation was noticed between variables. Only limited Class III in male subjects and Class II Div2 in female subjects were significantly correlated.

Conclusions: In view of this outcome one might conclude that the bisected occlusal plane of Downs is not a valid parameter to correlate the cant of occlusal plane and the occlusal classification. Posterior or functional occlusal plane could be more reliable for such research projects.

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Introduction

There is a growing awareness among orthodontists and maxillofacial surgeons that the occlusal plane is a key factor in the diagnosis and treatment planning of most cases with dentofacial deformities. Low or high anterior occlusal plane may impair facial esthetics and functional occlusion of the arches. The severity of occlusal plane distortion dictates the treatment modality and therefore, evaluating the relationship between the cant or inclination of occlusal plane and the sagittal inter-arch relationship was justified.

Bjork (1947)[(1),] studied the facial pattern of 600 Swedish boys and adult individuals. He concluded that there was a correlation between the depth of bite and the inclination of the occlusal plane and there was no correlation between the inclination of the occlusal plane and the horizontal overjet.

Downs (1948)[(2)] and Ballard (1948)[(3)] in two similar cephalometric studies of the facial patterns indicated that class II facial types have a relatively steep occlusal plane; and as the facial type approaches class III pattern, the occlusal plane tends to become more horizontal.

Steiner (1953)[(4)] pointed out to the importance of correlating the sagittal relationship with that of the cant of occlusal plane. In agreement with this, Tovstein (1955)[(5)] investigated the cephalometric changes in the inclination of the occlusal plane accompanied the correction of sagittal maxillo-mandibular relationship of 81 cases. He concluded that the change in the cant of occlusal plane is due to change in the position of the condyle-fossa relationship under different rates of growth.

Schudy (1963)[(6)] in a cephalometric study on 400 individuals with normal and abnormal occlusions, considered the vertical dimension as the most important factor in describing the facial pattern. Disharmonies in the vertical growth are reflected in the S-N/ MP angle and the OM (Occlusal plane / Mandibular plane) angle. This was also recommended by Jarabak and Fitzell (1972)[(7)].

Di Paolo (1987)[(8)] developed a formula to locate the occlusal plane position, he used 35 lateral cephalograms for 18 girls and 17 boys between the ages of 10 and 14 years with normodivergent facial pattern. The quadrilateral analysis was used to identify the skeletal pattern from the ratio between the posterior lower facial height and that of the anterior lower facial height; the sagittal ratio was then identified. Di Paolo

concluded that a relationship exists between the occlusal plane position and the patient's lower facial skeletal pattern.

Dawson (1989) [9], reported that the cant of the occlusal plane is influenced by the sagittal inclination of the Condylar guidance and the incisal path of the lower anterior teeth on the lingual cingula of the maxillary incisors.

Chiche and Pinault (1994)[10] focused on the important role of the orthodontist in creating the proper orientation of the incisal and posterior occlusal planes in order to achieve ideal lip-teeth relationship and create esthetic smile. Moderate supraeruption of maxillary incisors (gummy smile) can be corrected by intrusion of maxillary incisors together with their gingival margins in order to reduce gingival display.

Fushima et al., (1996)[11], studied the relationship between the cant of occlusal plane and the dentofacial patterns. Their sample consisted of adult females (35 with normal occlusion and another 50 with class II division 1 malocclusion). The results revealed that the cant of occlusal plane is correlated to the vertical position of the maxillary buccal segment and the sagittal position of the mandible. Saleh (1996)[12], in a similar study on 40 participants with normal dentofacial pattern (20 males and 20 females with 13.5 years as an average age) yielded similar results of correlation between the angulation of occlusal plane and the vertical facial pattern.

Braun and Legan (1997)[13], reported that the angulation of the occlusal plane has a profound effect on the occlusal relationship and facial esthetics, and as a general guide, for each degree of occlusal plane angular change, a half millimeter change in occlusion results. This was again confirmed by Creekmore (1997)[14]

Burstone and Marcotte (2000)[15], correlated the cant of the treatment occlusal plane with the sagittal maxillo-mandibular relationship and concluded that the vertical position of the occlusal plane determines the horizontal components of points A and B. Shallow or steep occlusal plane will definitely influence the occlusion and the facial profile.

In view of the above review, there is a large variation in the inclination of the occlusal plane between normal and different types of malocclusion. This study aimed to correlate the vertical changes in the occlusal plane inclination and the sagittal maxillo-mandibular occlusal relationship in different malocclusion groups.

Materials and Methods

Materials:

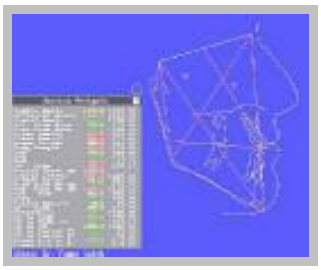
The material for this study consisted of 100 lateral cephalograms for early adult cases with an average age of 13.5 years (range 12-15 years). These were assigned into four groups according to the skeletal and dental classification of occlusion (Ballard, 1948)[3].

The first group comprised 40 cephalograms with an acceptable normal occlusion (20 males and 20 females); the second group was 20 class II division 1 malocclusion (10 males and 10 females); the third group consisted of 20 class II division 2 malocclusion (10 males and 10 females); while the fourth group of class III malocclusion included 20 participants (10 males and 10 females).

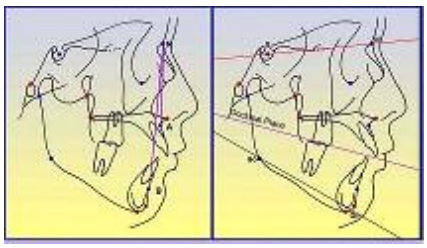
The only criterion for the selection of the cases was a full complement of teeth (no congenital missing or extracted teeth)

Methods:

Because this study was concerned with the occlusal plane and related structures, few anatomic landmarks were chosen and easily identified: N= Nasion, S= sella, Go= Gonion, Gn= Gnathion, A point= Subspinale and B point= Supramentale. Planes of interest were constructed to assess angular measurements that could yield significant results; ANB angle, Occlusal plane/ S-N angle, and Occlusal plane/ Go-Gn angle



(Fig.1) Landmarks and planes of reference used in this study



(Fig. 2)Computer-assisted composite Jarabak chart cephalometric analysi

Reference lines and planes as adopted by Jarabak and Fitzell (1972)[7] from Steiner (1953) [4]are shown in figure 1.

Details of the tracing and digitizing technique of lateral cephalograms were performed according to the computer assisted program described by the author in the Atlas of Craniofacial Growth (Saleh, 1996)[12] where details of the technique and measurement errors can be found. Charts and pictorial display of the computer analysis records are shown in figure 2.

Results:

Evaluating the distribution of different malocclusion groups on the basis of one standard deviation (SD) of the normal sample from table 1, it was demonstrated that the sagittal skeletal pattern represented by ANB angle was of little significance for occlusal plane angles in both sexes.

Table 1 Comparison of the means of different malocclusion groups with normal groups

		Occ Plane/ S-N Angle		Occ Plane/ Go-Gn Angle		ANB Angle	
Group (Occlusion)	N	Males	Females	Males	Females	Males	Females
Normal / Class I	40	Mean SD 16.3 ± 2.05	Mean SD 16.7± 2.711	Mean SD 19.81± 2.943	Mean SD 18.1± 2.834	Mean SD 2.8± 1.18	Mean SD 2.4± 1.088
Class II Div 1	20	16.18 ± 2.943	16.06± 3.026	17.94± 3.014	17.14± 2.943	5.4± 2.08	4.6± 1.291
Class II Div 2	20	16.29 ± 3.043	19.13± 2.761	17.04± 4.126	16.340±2. 870	4.2± 3.11	3.4± 2.39
Class III	20	16.05± 3.741	15.11± 3.087	20.53± 2.342	19.47± 2.180	-2.06± 1.13	-2.47± 1.46

In table 2 correlation coefficient between the variables revealed a significant relation between ANB angle and the angle formed by occlusal plane and mandibular plane (Occlusal plane/ Go- Gn angle) in Class III male subjects (0.712) and in Class II Div2 female subjects (.664), these were significant at 0.05 level.

(Table 2) Correlation of ANB angle with Occlusal Plane angles in different groups

Malocclusion	Gender	Parameter	Correlation	OCC Plane/ S-N Angle	Occ Plane/ Go-Gn Angle
Class III	Male	ANB Angle	Pearson Correlation Sig. (2-tailed)	-.223 .536	.712* .021
	Female	ANB Angle	Pearson Correlation Sig. (2-tailed)	.127 .727	.413 .236
Class II Div 1	Male	ANB Angle	Pearson Correlation Sig. (2-tailed)	-.103 .777	.363 .303
	Female	ANB Angle	Pearson Correlation Sig. (2-tailed)	.617 .057	.293 .411
Class II Div 2	Male	ANB Angle	Pearson Correlation Sig. (2-tailed)	-.541 .086	.565 .070
	Female	ANB Angle	Pearson Correlation Sig. (2-tailed)	-.077 .821	.664* .026

*Correlation is significant at the 0.05 level (2-tailed)

Scattergrams in Figure 3 depicted the significant correlation between the ANB angle and Occlusal- Mandibular plane angle (0.664) at 0.05 level in Class III malocclusion male sample and Class II division 2 malocclusion female sample.

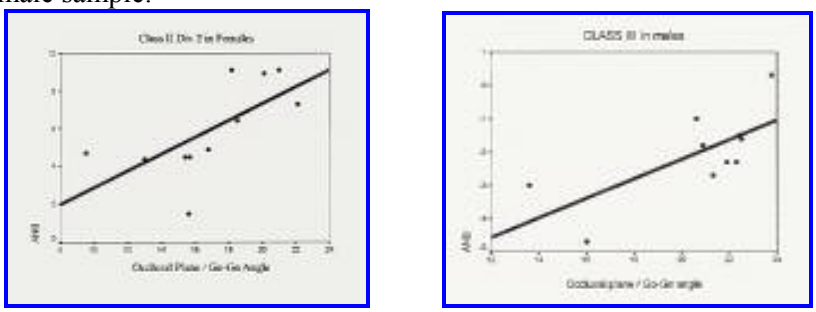


Figure 3. Scattergram depicting the relation between ANB angle, occlusal plane and mandibular Plane angles in Class III and Class II malocclusions

Discussion

The present study aimed to correlate the vertical changes in the occlusal plane inclination and the sagittal maxillo-mandibular occlusal relationship in different malocclusion groups. The results demonstrated that a low correlation exists between the ANB angle and the occlusal plane angles in different malocclusion groups. Since the mandibular position is influenced by the vertical position of the maxillary buccal

segment and the relationship between the occlusal plane of the upper dentition and the inclination of the sagittal condylar path (Dawson, 1989)[9].; the validity of using Downs Occlusal plane (1948)[2]. as representative of the maxillo-mandibular dentition in this study is suspected. Fushima et al. (1996)[11]. in a similar study used two occlusal planes (posterior and anterior) and found that the steep cant of posterior or function occlusal plane was strongly correlated with the distal inclination of maxillary molars and the backward rotation of the mandible developing class II div1 malocclusion.

Another interesting observation in this study to be mentioned is the different rates of growth of the mandible and the inclination of the occlusal plane. Biologic compensation of the dentoalveolar components and the adaptive remodeling of the Temporo-manibular joint could be another factor that influenced the cant of the occlusal plane and the sagittal maxillo-mandibular relationship (Tovstein, 1955[5].; Di Paolo, 1987[8].). Creekmore (1997)[14]. in agreement with the findings of this study found that occlusal plane is not an entity and its cant or angulation has no effect on the anteroposterior relationship of maxilla to mandible represented by ANB angle. The occlusal stability is made possible by different migration of teeth and growth of the jaws known as compensatory mechanism.

Conclusion

Many factors contribute to develop the cant of occlusal plane. Posterior occlusion is not necessarily congruent with the anterior occlusion in different malocclusions. The functional or posterior occlusal plane may be a valid parameter to correlate sagittal and vertical occlusion.

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تاريخ ورود البحث إلى مجلة جامعة دمشق: 2007/12/27.
تاريخ قبوله للنشر: 2008/7/22.