

Original Research

Assessment of association of Occlusal-Plane-Inclination with Functional Condylar Displacement in Different Skeletal Classes: An observational study

Dr. Mohd Ali¹, Dr. Udfer Hameed², Pro. Dr Shabir Ahmed Shah³, Dr Hilal Ahmed⁴

^{1,2,3,4}MDS, J and K

ABSTRACT:

Abstract

Background: To study the correlation of occlusal-plane-inclination with condylar displacement in different skeletal classes.

Materials & methods: A total of 50 subjects were enrolled. They were divided into different skeletal classes as - Class I- 27 subjects (54%), Class II-16 subjects (32%), Class III-7 subjects (14%). The results were analysed using SPSS software.

Results: A total of 45% of patients showed condylar displacement while the remaining 55% did not show any condylar displacement. The majority of patients in the skeletal class II (n=8/50%) had condylar displacement. The degrees of occlusal displacement in the upper anterior occlusal plane in all patients were from 66.8 to 92.6 and for the upper posterior occlusal plane in all patients from 58.6 to 94.2. **Conclusion:** Correlation between anterior occlusal plane and posterior occlusal plane with condylar displacement is highly significant (Class II>I>III).

Keywords: condylar displacement, occlusal plane, skeletal classes.

Received: 23 Dec, 2022

Accepted: 28 Dec, 2022

Corresponding author: Dr. Mohd Ali, MDS, J and K

This article may be cited as: Ali M, Hameed U, Shah SA, Ahmed H. Assessment of association of Occlusal-Plane-Inclination with Functional Condylar Displacement in Different Skeletal Classes: An observational study. J Adv Med Dent Scie Res 2023;11(1): 77- 79.

INTRODUCTION

The correct orientation of the occlusal plane plays a vital role in optimal esthetic achievement. In the natural smile, the incisal tips follow the curve of the lower lip. This effect is an expression of a correctly oriented occlusal plane; if the occlusal plane hangs posteriorly, the lip-line viewed from the front will appear straight and contribute more than any other factor to the so-called 'denture look'. With the occlusal plane correctly oriented, however, the natural anterior curve will be achieved almost automatically and contribute a proper sense of perspective to the dental composition.¹ The plane of occlusion, forms an essential part of the concept of mechanically balanced articulation.² The position of occlusal plane in denture wearers should be as close as possible to the plane, which was previously occupied by the natural teeth.³ Such position of the occlusal plane provides normal function of the tongue and cheek muscles, thus enhancing the denture stability.^{4,5} It is believed that teeth oriented on an occlusal plane in harmony with the individuals physiognomy is

responsible, in part, all conditions being equal, for stable, retentive full dentures.⁶

Skeletal class III malocclusion is one of the most difficult problems faced by orthodontists.⁷ Aesthetics is always the primary complaint in patients with class III malocclusions. Skeletal class III malocclusion is caused by undergrowth of the maxilla, overgrowth of the mandible, or a combination of both.^{7,8} The highest prevalence of class III malocclusion in the population of East Asia 16.59% and Southeast Asia (Javanese ethnic included) 15.69%.⁹

The form and inclination of the OP hold individual characteristics and are connected not only with the function of the stomatognathic system but also with the esthetics of dentofacial appearance. A functional correlation between the inclination of OP and the masticatory closing path has been observed. This is an important determinant in occlusion and one of the contributing factors to masticatory movement.¹⁰ The upper smile arc is the relationship of the curvature of the maxillary incisal and canine edges to the curvature of the lower lip during the social smile, which is

influenced by the OP angle. By producing a computerized prediction of the appearance of the smile at differing OP angles, Batwa et al. concluded that changing the OP angle does affect relative smile attractiveness.¹¹ Hence, this study was conducted to study the correlation of occlusal-plane-inclination with condylar displacement in different skeletal classes.

MATERIALS & METHODS

A total of 50 subjects were enrolled. They were divided into different skeletal classes as - Class I- 27 subjects (54%), Class II-16 subjects (32%), Class III-7 subjects (14%). The subjects with age above 18 years was included. The data was collected. Complete history was taken and analysed. Panoramic radiography and lateral cephalometric views were recorded. The results were analysed using SPSS software.

RESULTS

A total of 50 subjects were enrolled. They were divided into different skeletal classes as - Class I- 27 people (54%), Class II-16 people (32%), Class III-7 people (14%). A total of 45% of patients showed condylar displacement while the remaining 55% did not show any condylar displacement. The majority of patients in the skeletal class II (n=8/50%) had condylar displacement. Amongst the patients classified in skeletal class I and skeletal class III there was an approximately equal percentage of patients with (w/d) and without (wo/d) condylar displacements (Class I: w/d n=12/44.5%; wo/d n=40/55.5%) (Class III: w/d n=3/42.8%; wo/d n=4/57.2%). The patient distribution for the condylar displacement related to the upper posterior occlusal plane and upper anterior occlusal planes respectively in all three skeletal classes were combined from the patients' collected data.

The degrees of occlusal displacement in the upper anterior occlusal plane in all patients were from 66.8 to 92.6 and for the upper posterior occlusal plane in all patients from 58.6 to 94.2.

DISCUSSION

The occlusal plane forms following the establishment of occlusion. In a growing facial skeleton, the position of OP is determined largely by the vertical growth of the maxillary teeth, and the inclination of the OP is determined largely by the growth of the dentoalveolar bone.¹² Besides the growing factors mentioned above, the maintenance or changing of the OP during orthodontic treatment depends on mesial molar movement, vertical control of the maxillary and mandibular molars, and extrusion and intrusion of incisors.¹³ Hence, this study was conducted to study the correlation of occlusal-plane-inclination with condylar displacement in different skeletal classes.

In the present study, a total of 50 subjects were enrolled. They were divided into different skeletal

classes as - Class I- 27 people (54%), Class II-16 people (32%), Class III-7 people (14%). A total of 45% of patients showed condylar displacement while the remaining 55% did not show any condylar displacement. The majority of patients in the skeletal class II (n=8/50%) had condylar displacement. Amongst the patients classified in skeletal class I and skeletal class III there was an approximately equal percentage of patients with (w/d) and without (wo/d) condylar displacements (Class I: w/d n=12/44.5%; wo/d n=40/55.5%) (Class III: w/d n=3/42.8%; wo/d n=4/57.2%). A study by Greven M et al, investigated the correlation between different skeletal classes, functional condylar displacement and the inclination of the upper posterior and upper anterior occlusal planes. 150 patients out of a total of 700 were selected for the study based on recorded occlusal parameters, both genders from 18 years. The majority of patients show an aboveaverage steepness of occlusal plane (upper posterior occlusal plane more than the anterior one). Over average steep Anterior Occlusal Plane (AOP) and Posterior Occlusal Plane (POP) is significantly correlated with retrusive mandibular/condylar displacement in all skeletal classes, whereas in Skeletal class II the correlation is highly significant (Class II>I>III).¹⁴

In the present study, the patient distribution for the condylar displacement related to the upper posterior occlusal plane and upper anterior occlusal planes respectively in all three skeletal classes were combined from the patients' collected data. The degrees of occlusal displacement in the upper anterior occlusal plane in all patients were from 66.8 to 92.6 and for the upper posterior occlusal plane in all patients from 58.6 to 94.2. Another study by Li JL et al, studied the inclination of the occlusal plane (OP) is related to facial types and experiences physiological growth-related changes. A sample of 90 Caucasians patients was skeletal-classified into three (n = 30), and pre- and post-treatment cephalograms were digitized. Six linear and 8 angular cephalometric measurements were selected. The changes of OP inclination within each group and the differences among the three groups pre- and post-treatment were compared with paired t test and ANOVA test, respectively. The comparison and correlation between BOP and FOP were analyzed with paired t test and coefficient of correlation, respectively. The BOP angle increased in all of the three groups but only had statistically significant differences in skeletal class II patients in a mean of 1.51° (p < 0.05). The FOP-SN angle showed stability (p > 0.05) in all three groups. The inclination of FOP was closely related to that of BOP (p < 0.001) but revealed discrepancies in each group.¹⁵ Moreover, in the majority of cases a steep posterior occlusal plane provides a significantly higher chance for the occurrence of laterotrusive and mediotrusive or even retrusive posterior interferences,¹⁶ again making an avoidance-which in turn will lead to more compensatory necessity of the system to increase the

activity of the neurological system, enhanced muscle activity and condylar displacement.¹⁷ According to Sato's concept¹⁸ about the skeletal class II pattern with a steep posterior occlusal plane and also reiterating the rapid historical increase of the class II incidence, we conclude that it is highly important to determine the upper posterior and anterior occlusal planes for a complex and detailed diagnosis.¹⁹

CONCLUSION

Condylar displacement was found in majority of patients with different skeletal classes. Correlation between anterior occlusal plane and posterior occlusal plane with condylar displacement is highly significant (Class II>I>III).

REFERENCES

1. Monteith BD. A cephalometric method to determine the angulation of the occlusal plane in edentulous patients. *J Prosthet Dent.* 1985;54(1):81. doi: 10.1016/S0022-3913(85)80076-7.
2. Posselt V. *Physiology of occlusion and rehabilitation.* 2. Oxford: Blackwell; 1968.
3. Celebic A, Valentic-Peruzovic M, Kraljevic K, Brkic H. A study of the occlusal plane orientation by intra-oral method. *J Oral Rehabil.* 1995;22:233–236.
4. Karkazis HC, Polyzois GL, Zissis AJ. Relationship between ala-tragus line and natural occlusal plane implication in denture prosthodontics. *Quintessence Intl.* 1986;17(4):253.
5. Williams DR. Occlusal plane orientation in complete denture construction. *J Dent.* 1982;10(4):311–316. doi: 10.1016/0300-5712(82)90024-0.
6. Swenson MG. *Complete dentures.* 2. St. Louis: The C. V. Mosby Company; 1947. p. 180.
7. Burns NR, Musich DR, Martin C, Razmus T, Gunel E, Ngan P. Class III camouflage treatment: what are the limits? *Am J Orthod Dentofacial Orthop.* 2010;137:1–13.
8. Mi KB, Kang B, Hong G, Baek S. Prognosis prediction for class III malocclusion treatment by feature wrapping method. *Angle Orthod.* 2009;79(4):683–691. doi: 10.2319/071508-371.1
9. Dwight H. Prevalence of angle class III malocclusion: a systematic review and meta analysis. *Open J Epidemiol.* 2012;2(4):75–82.
10. Ogawa T, Koyano K, Suetsugu T. Characteristics of masticatory movement in relation to inclination of occlusal plane. *J Oral Rehabil.* 1997;24:652–657.
11. Batwa W, Hunt NP, Petrie A, Gill D. Effect of occlusal plane on smile attractiveness. *Angle Orthod.* 2011;82:218–223. doi: 10.2319/050411-318.1.
12. Tanaka EM, Sato S. Longitudinal alteration of the occlusal plane and development of different dentoskeletal frames during growth. *Am J Orthod Dentofacial Orthop.* 2008;134:602.
13. Zenab NRY, Hambali TS, Salim J, Mardiaty E. Changes of occlusal plane inclination after orthodontic treatment with four premolars extraction in dento-alveolar bimaxillary protrusion cases. *Padjadjaran J Dent.* 2009;21:100–103
14. Greven M, Cazacu I, Piehslinger E (2020) Correlation of Occlusal-Plane-Inclination with Functional Condylar Displacement in Different Skeletal Classes. *Int J Dent Oral Health* 6(3): dx.doi.org/10.16966/2378-7090.321
15. Li JL, Kau C, Wang M. Changes of occlusal plane inclination after orthodontic treatment in different dentoskeletal frames. *Prog Orthod.* 2014 Jun 25;15(1):41.
16. Scrivani SJ, Keith DA, Kaban LB (2008) Temporomandibular disorders. *N Engl J Med* 359: 2693-2705.
17. Sheikholeslam A, Holmgren K, Riise C (1993) Therapeutic effects of the plane occlusal splint on signs and symptoms of craniomandibular disorders in patients with nocturnal bruxism. *J Oral Rehabil* 20: 473- 482.
18. Sato M, Motoyoshi M, Hirabayashi M, Hosoi K, Mitsui N, et al. (2007) Inclination of the occlusal plane is associated with the direction of the masticatory movement path. *Eur J Orthod* 29: 21-25.
19. Fushima K, Kitamura Y, Mita H, Sato S, Suzuki Y, et al. (1996) Significance of the cant of the posterior occlusal plane in class II division 1 malocclusions. *Eur J Orthod* 18: 27-40.