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To evaluate and compare the depth of curve of Spee in different individuals by using lateral cephalogram- an in vitro study.

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Abstract

AIM: To evaluate and compare the depth of Curve of Spee in different individuals by using lateral cephalogram- "An invitro study"

Objective: The objective of this study is to cephalometric ally determine the depth of anteroposterior curve of occlusion in different age groups and gender types and to establish the relationship between the Center of Curve of Spee and the depth of Curve of Spee at occlusion with the condylar position in different age groups and different gender types.

Material and method: Two hundred subjects were involved in the study. For each subject a lateral cephalogram was obtained. Using a single-side tracing sheet (50 µm), tracings was made for each subject. To evaluate the relationship of curve of occlusion to the condylar axis, the depth of curve of occlusion was measured and Acord was drawn between incisal and

distal points. For all the 200 individuals, measurements were made from the centre of Antero posterior curve of occlusion to the Nasion, Lachryma, and Orbitale. The distance from the distal point of curve of occlusion to the condylar axis was calculated for each individual and males and females were divided on the basis on the depth ranging from 0 mm to 10 mm.

Results: By performing analysis of variance (ANOVA) across three age groups group 1(18-20), group 2 (21-25), group 3 (26 -30), there is significant variance observed across all age groups, indicating that morphological changes occur as age related changes occur in the face. Upon overall comparison of the data, average values of Nasi on are found to be 16.2 mm, lachryma14.29 mm and orbit ale 21.31 mm.

Mean distance from distal interocclusal point to condylar axis was evaluated and upon overall comparison of data between different age groups it was 55.41 for (18-20), 55.31 for (20-25) and 54.03 for (26-30) respectively. Student t-test was performed and statistically non-significant variance was noted among the different groups. No statistically significant difference was seen between both genders.

Conclusion: Centre of Curve of Spee was an important factor as it helped in determining the depth of Curve of Spee which helped in the future prognosis of full mouth rehabilitation cases. As depth of Curve of Spee increased the distance from distal interocclusal point to condylar axis is decreased.

It is concluded that the depth of the curvature of Spee is dependent on the radius length of the rotatory/ masticatory movement of the mandible, thereby indicating that posterior restorations should follow and reproduce the depth of Curve of Spee.

Keywords: Curve of Spee, Condylar Axis, Lateral Cephalogram, Nasion, Lacryma, Orbitale.

Introduction

Dental occlusion is more than the physical contact of the occluding surfaces of opposing teeth in the oral cavity or prosthesis.[1]

Charles Mc Neil

Comprehensively defined occlusion as the biologically synchronized functional interaction between the various cell populations forming the masticatory system as they differentiate, model, remodel, fail, and repair. Morphologic variations are quite common and often represent the norm.[1] The configuration of the occlusal plane is one of the most beautiful examples of design that can be found in nature. The form of occlusal plane is directly related to specific functional requirements. In addition to alignment of teeth in relationship to the arc of closure which provides the best resistance to loading, it is permitting ease of access for positioning of food on occlusal surfaces. If these two function al requirements are met, an occlusal plane is acceptable if it permits the anterior guidance to do this job.[2]

According to Glossary of Prosthodontic sedition 9antero posterior curve is the anatomic curve established by the occlusal alignment of the teeth, as projected on to the median plane, beginning with the cusp tip of the mandibular canine and following the buccal cusp tips of the premolar and molar teeth, continuing through the anterior border of the mandibular ramus, ending with the anterior most portion of the mandibular condyle. [3]

The Curve of Spee plays an integral part in the restoration of dental arches. This curve was first described by Ferd in and Graf v on Spee in 1890 and had a diameter of 2.5 inches. The Curve of Spee, icon junction with posterior cusp height, Condy larinclinati on, and anterior guidance, plays an important role in the development of the desired occlusal scheme. More recently, it has been also suggested that it has a role to

play in bio mechanical function during food processing by increasing the crush shear ratio between the posterior teeth and the efficiency of occlusal forces during masticate on.[4] The Curve of Spee may be pathologically altered in situations resulting from rotation, tipping, and extrusion of teeth. Restoration of the dentition to such an altered occlusal plane can introduce posterior protrusive interferences. Such interferences have been shown to cause ab normal activity in mandibular elevator muscles, especially the masseter and temporalis muscles. This can be avoided by reconstructing the Curve of Spee to pass through the mandibular condyle, which has been demonstrated to allow posterior disocclusion on mandibular protrusion. As the angle of condylar guidance is greater than the Curve of Spee, posterior disocclusion is achieved.[5]

The lateral cephalometric radiograph is a standard component of clinical records taken for orthodontic diagnosis and treatment planning. Radio graphic cephalometry was introduced in 1934 by Hofrath in Germany and by Holly Broadbent in the United States. Al though it's original intent was to long it ordinally assess row than development in the craniofacial complex, the cephalometric radiograph was adopted by clinicians to diagnose any skeletal imbalances underlying the dental features of a malocclusion. Cephalometric analyses were developed to characterize a patient's dental and skeletal relationships relative to population norms. Cephalometric radio graphs also evaluate the relative position of the teeth as a result of orthodontic movement and the overall effects of the growth of the craniofacial complex, although not recommended as a screening tool, cephalometric radio graphs have on occasion revealed anomalies or degenerative changes in the cervical vertebrae as well as pathology conditions within the cranium.[6]

The use of Cephalometric in prosthodontics h as gain m mentum in the last the decade into prosthetic, treatment planning for the same. Attempts have been made to establish cephalometric norms. In addition, cephalometric studies are extremely useful in the long-term evaluation of prosthetic reconstructive procedures. Recent research has helped to clarify certain aspects of oral function and indicates the relationship which exists between the dimension soft he maxillo mandibular space and the movement patterns of various oral and pharynx geal structures during speech.[7]

This study conducted in Department of prosthodontics and crown & bridge considers lateralcephalo graphs as tool for analysing the depth of Curve of Spee and its relation to condylar axis and made an attempt to identify the centre of Curve of Spee and its relation to nearest cephalometric landmarks.

AIM

To evaluate and compare the depth of Curve of Spee in different individuals by using lateral cephalogram-"An in-vitro study"

Objectives of this study

- The objective of this study is to cephalometrically determine the depth of Antero posterior curve of occlusion indifferent age groups and gender types.
- Along with determining the depth of the curve, this study will make an attempt to establish the relationship between the Center of Curve of Spee and the depth of Curve of Spee occlusion with the condylar position in different age groups and different gender types.

The findings of this study will help to clinically determine the Antero posterior curve and identifying the closest and marks that should be followed for determination of the same.

Method

Source of data

lateral cephalograph data is collected from the department of oral medicine and radiology and there search project was initiated after the approval of institute Onal ethics committee.

Sample size

This is an observational study using lateral cephalograms, consisting sample size of 102 males and 98 females.

Procedure

For all 200 individuals, lateral cephalograms was made. Those were developed using an automatic processor, to these radio graph films, a single - side tracing sheet (50 µm) was attached with the help of paper clips. Tracings was made by a single operator for all the lateral cephalograms, and the following anatomic all and marks was identified in males and females. The X-axis was the Frankfort horizontal plane, and the Y-axis was drawn perpendicular to the Frank fort through the nasion (Mc Namara line). Initially, a tentative arc was sketched from the point on the lower incisor to the anterior border of the condyle which was determined as a tangent to the condyle, parallel to the anterior limit of the mandibular canal within the ascending ramus. Two cords were drawn. One from the tip of the lower in cisor to the mesial/ distal inter-occlusal point and the second one from mesial/distal inter occlusal point to the anterior border of the condyle. Midpoints of cords were identified and perpendicular lines were drawn from the midpoint. The point where the two perpendicular lines met was identified as the Center. For all the 200 individuals, measurements were made from the Center of Antero posterior curve of occlusion to the Nasion, Lachryma, and Orbitale. To evaluate the relationship of curve of occlusion to the condylar axis, the depth of curve of occlusion was measured for all the 200 individuals. Once the curve was determined, Acord was drawn between incisal and distal points. The distance was measured from the cord to the deepest point of the curve of occlusion. The deepest point was determined by measuring the distance between cord a teach milli meter and the curve. Point with maximum distance was the deepest point of curve. The distance from the distal point of curve of occlusion to the condylar axis was calculated for each individual and males and females were divided on the basis on the depth ranging from 0 mm to 10 mm.

Figure 1: Armamentarium

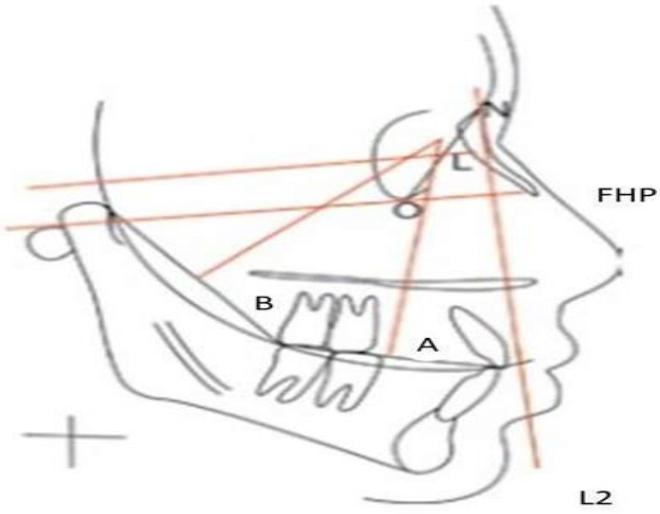


Figure 2: Lines drawn during tracing.

N=Nasion L= lachrymal O=Orbitale

FHP = Frankfort horizontal lineL2=vertical line to FHP

A= Line from Center of cord 1B = Line from Center of cord2

Results

Age and gender distribution

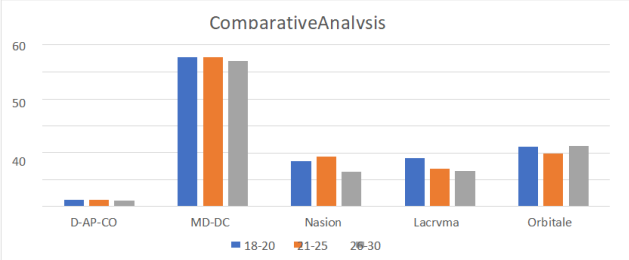
Ninety-eight females and 102 male subjects participated in the study. There were 65 subjects in the age group of 18-20 years out of which 33 were male and 32 females. There were 75 subjects in the age group of 21-25 years out of which 51 were male and 24 females. There were 60 subjects in the age group of 26-30 years out of which 18 were male and 42 females. It was observed that the highest male Participation was in the 21 -25 group (51) and the highest female participate on was in the26-30Group as depicted in table 1.

Age Groups	Numbers	Male	Female
18-20	65	33	32
21-25	75	51	24
26-30	60	18	42
26-30	60	18	42

Table 1: Age and gender distribution

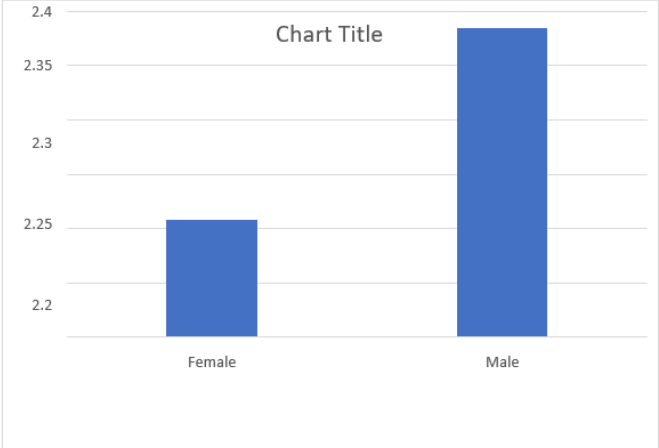
Comparative analysis of Depth of Antero-Posterior Curve (D-AP-CO), Distance from mesial or distal intra occlusal point to condylar axis (MD-DC), Distance measurements were made from the centre of Antero posterior curve of occlusion to the Nasion, Lachryma, and Orbitale each for all three age groups (table 2) and across both genders.

Overall average value for D-AP-CO was 2.3, MD-DC was 54.945, Distance from Nasion, Lacryma and Orbitale was 16.2, 14.92 and 21.31 mm respectively. Mm For females D-AP-CO was 2.20 mm, MD-DC was 55.115 mm, Distance from Nasion, Lacryma and Orbitale was 13.6, 14.44 and 21.45 mm respectively. P value equals 0.0670, hence the result was statistically non-significant.



Graph 2: Comparative analysis among different age groups

Comparison of depth of Curve of Spee in males and females showed values of 2.38 mm and 2.21 mm respectively (table 3). P value equals 0.2159. By conventional criteria, this difference is considered to be not statistically significant among the group.



Graph 3: Comparison of depth of Curve of Spee

Discussion

In existing research several methods have been suggested to determine the centre, radius and the depth of Curve of Spee via Broad rick's occlusal plane analyser, analysis of mounted stonecasts and analysis of lateral cephalograms.

In the present study, cephalometric analysis of 200 individuals was performed in their corresponding later alcephalo grams to determine the depth and centre of Curve of Spee. Lateral cephalogram is a useful diagnostic tool in analysis of teeth, jaws, and face as it allows determination of certain are as in the base of the cranium which are not altered between certain ages. In

the past, researchers have studied several craniofacial all and marks and have suggested that a predictable relationship exists between certain fixed cranial landmarks and the plane of occlusion. Such findings plays an important role in determining the occlusal plane since similar relationships can be used to establish a plane of occlusion for a dentate patient using cephalometric and marks. The suggested landmarks by Spee for determination of the occlusal curve were – anterior border of the condyle, distal inter occlusal point, mesial inter occlusal point and tip of mandibular incisors. Hitchcock studied Spee's prediction and concluded that, when condyle, mesial inter occlusal, and disdainer occlusal points were used, it generated the radius which is the closest in long than deposition to what Spee originally proposed 4. In the present study the landmarks used in determining the centre and the depth of Curve of Spee were in accordance with Spee's original study. In this study to find out the nearest cephalometric landmarks to centre of Curve of Spee we have considered three crucial and marks they were nasion, Lachryma and orbit ale.

In this study, it was found that the centre of the Curve of occlusion was located at a mean distance of 16.2 mm, 14.925 mm and 21.315 mm from the Nasion, Lachryma, and Orbitale, respectively, in males and 13.604 mm, 14.447 mm and 21.458 mm from the same points in females. Overall comparison between both males and females was located at mean distance of 16.2 mm, 14.925 mm and 21.315 mm. Therefore, Lachryma was determined to be the nearest to the centre of curve of occlusion followed by the Nasion and Orbitale.

On other hand in a study conducted by Jaiswal S, et.al[4]; it was found that the centre of the curve of occlusion was locate data mean distanceof11.15mm,18.68 mm and 33.10 mm from the Nasion, Lachryma, and Orbitale, respectively, in females and 9.71 mm,16.80 mm and 31.22 mm from the same points in males. According to their study Nasion was determined to be the nearest to the centre of curve of occlusion followed by the Lachryma and Orbitale. Therefore, Nasion was determined to be the nearest to the centre of curve of occlusion followed by the Lachryma and Orbitale.

Study conducted by Kiran Kumar et al[2]; found that the centre of the curve of occlusion was located tame and is trance of 6.79 mm to,6.97 mm from Lachryma, 18.25 mm to 18.44 mm fromnasion and 17.75 mm to18.53 mm from Orbitale. Therefore, the authors concluded that Lachryma is closest to the centre of curve of occlusion compared tension and orbit ale, which is formed to be accordance with the present study. During the course of our study, it was found that there was no significant variance based on age groups (p= 0.29, 0.54 and 0.07 respectively) and between the gender groups(p=0.2159).

Farella M et al; in a 2002 multiple regression analysis study suggested that the curve of Spee was not influenced by age and gender of the subjects investigated. These findings are in agreement of our own[8].

Karani J et al; in 2018 suggested that the depth of Curve of Spee is maintained throughout life by suggesting that there exists no statistically significant variance between the two age groups evaluated during the course of their study. These findings indicate that age changes do not affect the depth of Curve of Spee. These findings are also in agreement with ourown.[9]

Xu et al[10]; in 2004 reported that the shape of the Curve of Spee was not influenced by gender. The lack of sexual dimorphism is in agreement with the present study.

Mohan Metal in 2011 suggested that as the age advances, there is a significant change in the Curve of Spee and decrease in posterior dis occlusion during

mandibular protrusion[11]. These findings are not in agreement with present study because inclusion criteria included only younger population age at 18-30yrs. In this study, the mean distance from the distal inter occlusal point to condylar axis indifferent age groups was calculated and significant variance was seen among the different age groups.

Kiran Kumar Tetal; in 2013 calculated median distance from distal inter occlusal point to condylar axis in different groups with depths range from 0 to 6 was calculated and reported that the depth of the curve of occlusion increases, the distance from the distal interocclusal point to condylar axis decreased[2].

Conclusion

In this study we found that the closest cephalometric point to the centre of Curve of Spee was Lachryma followed by nasion and Orbitale in overall samples, although in females nasion was the closest point and males Lachryma was the closest point. There were no significant variances observed between age groups.

Depth of Curve of Spee is evaluated in different age and gender groups resulted as overall no significant variance between age groups and neither in the gender groups. As depth of Curve of Spee increased the distance from distal interocclusal point to condy larax is decreased.

In this study, we calibrated the distance from distalinter occlusal point to condy larax is and there is no significant difference observed amongst different age groups and different gender groups.

Certain limitations of this study were, we excluded the patients who were undergoing orthodontics treatment, patients with severe malocclusion, Class II and Class III cases, age group above30 years.

Centre of Curve of Spee was an important factor as it helped in determining the depth of Curve of Spee which helped in the future prognosis of full mouth Reha bilitation cases.

Within the limitations of this study, we conclude that Lachryma was closest cephalometric point to the centre of Curve of Spee, and it can be concluded that no significant changes occur in the depth of Curve of Spee with increase in age and no significant change s occur among gender types.

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