



Reliability of Broadrick Flag in Determination of Curve of Spee in Indian Population

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ABSTRACT

Introduction: Occlusion and occlusal plane is the primary criteria in fabrication of posterior restorations. The simplest method of establishment of occlusal plane is through the use of Broadrick occlusal plane analyzer.

Aims: This study aims to know the reliability of Broadrick flag in determination of curve of Spee with different proposed radii in different skeletal relation in Indian population.

Materials and methods: Male and female dentulous subjects were selected randomly. Maxillary and mandibular full arch impressions were made; casts were prepared and mounted in semiaadjustable articulator using face bow transfer. Broadrick occlusal plane analyzer was mounted on upper member of articulator. Analysis was done using the proposed radii of curvature. The same procedure was repeated by taking different radii with variations of $\frac{1}{4}$ inch, difference was measured by metal caliper, tabulated and subjected to statistical analysis.

Results: Results showed that Indian subjects show minor variations in radii, but most of the subjects confirmed the radii, which was proposed by the Lynch CD and McConnell RJ.

Conclusion: Statistical analysis confirmed that proposed radii confirms to existing occlusal plane for different skeletal relationships. Broadrick occlusal plane analyzer is a reliable tool with the proposed radii for Indian population.

Keywords: Broadrick occlusal plane analyzer, Radii of curvature, Curve of Spee.

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INTRODUCTION

Human dentition, i.e. the teeth and their supporting tissues is a mutually protected, organized arrangement of maxillary and mandibular teeth to serve the functional and esthetic

needs of the body.¹ Occlusion is the dynamic biological relationships of components of the masticatory system that control tooth contacts during function and dysfunction. It is essentially the integrated action of the jaw muscles, temporomandibular joints and teeth.² The plane of occlusion refers to an imaginary surface that theoretically touches the incisal edges of the incisors and the tips of occluding surfaces of the posterior teeth.³ In the fabrication of the long span restorations and designing the restorations for posterior teeth, the establishment of occlusal plane is the essential entity.⁴ Broadrick occlusal plane analyzer permits the reconstruction of curve of Spee in harmony with the anterior guidance and condylar guidance, allowing total posterior disocclusion on mandibular protrusion.

It was evident that there was a fundamental racial difference in the craniofacial structures between Saudi Arabians and white Caucasians.⁵ According to the literature it was also evident that there is a racial difference in the dentoalveolar component of Asians which shows more proclined upper incisors compared with Caucasian subjects.^{6,7} Lynch CD and Connell RJ suggested that for skeletal class I, a standard of 4 inches curve; for skeletal class II a $3\frac{3}{4}$ inches curve and for skeletal class III a 5 inches radius curve will be more appropriate in establishing the occlusal plane.⁴

This study aims to know the reliability of the Broadrick flag occlusal plane analyzer in determination of curve of Spee by using the different radii of curvature of the occlusal plane, which were proposed by the Lynch CD and McConnell RJ, in Indian population among the different skeletal relationships.

OBJECTIVES

1. To know the reliability of Broadrick flag in determination of curve of Spee in Indian population having class I skeletal relationships.

2. To know the reliability of Broadrick flag in determination of curve of Spee in Indian population having class II skeletal relationships.
3. To know the reliability of Broadrick flag in determination of curve of Spee in Indian population having class III skeletal relationships.

MATERIALS AND METHODS

In the present study, male and female dentulous subjects ranging from 18 to 25 years of age of Indian origin having skeletal class I, II and III ridge relationship were randomly selected from the students of Bapuji Dental College and Hospital, Davangere, Karnataka, India. Subjects should have completely dentate arch with presence or absence of third molars, completely erupted dentition with full emergence of clinical crowns should be present till the 2nd molars. Subjects undergone class I and II restorations may be included in the study. Subjects with skeletal class I, II and III ridge relationship were selected irrespective of molar relationship.

But orthodontically treated subjects, subjects have undergone any extractions of permanent teeth except III molar, teeth with extensive carious lesions, subjects undergone orthognathic surgery, subjects with ectopic eruption of teeth, subjects undergone any restoration by a complete veneer crown, onlays, partial veneer crowns and crown build-up were excluded from the study.

Subjects were selected randomly with different skeletal relationships. Maxillary and mandibular dentulous impressions were made using alginate irreversible hydrocolloid. Casts were prepared using type III gypsum product and base was constructed with dental plaster by the use of rubber base formers. Face bow transfer was done using Hanau facebow using impression compound and upper cast is mounted in Hanau model arcon semiaadjustable articulator using dental plaster. Mandibular cast was mounted on the articulator after stabilization (Fig. 1). After the mounting plaster sets maxillary cast was detached from upper member of the articulator.

Card index of the Broadrick occlusal plane analyzer is placed on to the upper member of articulator; plastic record cards which are provided with the analyzer are pressed over the dowel on the right side of the card index.⁸ A piece of graphite lead is placed into the bow compass, thumb screw was tightened and the lead was sharpened to a suitable point. Compass is adjusted to a selected radius, i.e. 4, 3¾ and 5 inches radius for skeletal class I, II and III relationships respectively.

Anterior survey point (ASP) was marked with the carbon marker on the mid-distal incisal slope of the canine. Posterior survey point (PSP) was marked on distobuccal cusp tip.

The center point of the compass is positioned on the anterior survey point and an arc is drawn on the plastic index (Fig. 2). Again the center point of compass is positioned on the PSP and an arc is drawn which intersects the previous arc (Fig. 3). The point of intersection is called as the occlusal plane survey center (OPSC). One end of the compass was placed at the occlusal plane survey center and the other end of the compass with the graphite lead point was swept over the occlusal surfaces of the lower posterior teeth to see how the arc conforms to the existing occlusal plane (Fig. 4).

The same procedure was repeated by taking different radius with variations of 1/4 inch (Fig. 5). The difference in the survey lines which were drawn on the cast using different radii of curvature was measured with the standard metal caliper (Fig. 6) and the readings are tabulated for different skeletal relationships and the tabulations were subjected to the statistical analysis. Statistical analysis of the obtained data was done by taking the mean, standard deviations were calculated for each of the four reference points and differences were measured with radius of curve



Fig. 1: Mounted casts and analyzer on articulator



Fig. 2: Arc drawn on card index from ASP



Fig. 3: Arc drawn on card index from PSP



Fig. 4: Arc swept on mandibular cast from OPSC

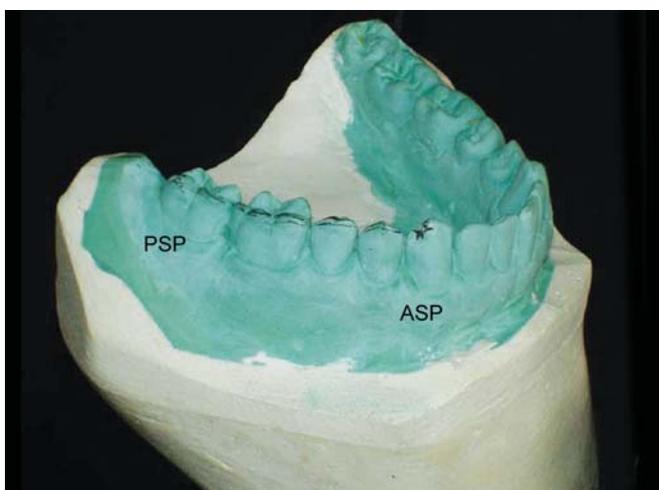


Fig. 5: Various survey lines obtained from different radii of curvature

of Spee which was proposed by Lynch CD and McConnell RJ 2002. Paired t-test was used to find out the significance of the difference from reference points.

A p-value of 0.05 or less was considered for statistical significance.

RESULTS

The study was conducted among dentulous subjects with different skeletal relationships. Results were tabulated by measuring at the different points at first premolar, second premolar, first molar mesial cusp and first molar distal cusp. The buccal cusp tips of premolars and mesial and buccal cusps of the first molar are considered as the reference points for the study. In the statistical analysis mean deviation, standard deviations, paired t-test and probability were measured and the results were tabulated.

In the statistical analysis, mean deviation, standard deviations, paired t-test and probability were measured. After the statistical analysis it was found that a radius of 4 inches for the skeletal class I relation, radius of $3\frac{3}{4}$ inches for the skeletal class II relation and for skeletal class III a radius of 5 inches were found to be more appropriate radii of curvature. It was highly significant that the probability of different variables other than that of the radii of curvature which was proposed by Lynch CD and McConnell RJ being the radius of arc of the plane of occlusion is a rare possibility for different skeletal relationships.

DISCUSSION

Ferdinand Graf Spee conducted and compared anthropological studies on the human skulls and other ruminating species and all specimens except rodents and carnivores showed an upward concave curvature of the occlusal table. The curve continues posteriorly to touch the anterior surface of the condyle.^{9,10,20}

The relevance of recording and maintaining this curve is to minimize posterior protrusive interferences, which in turn prevents abnormal activity of mandibular elevators like temporalis and masseters.^{11,17}

There are various types of occlusal plane analyzers which are used to determine and to establish the acceptable

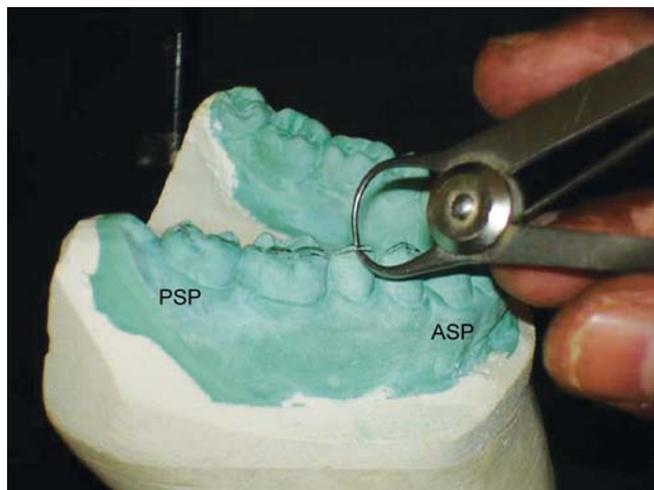


Fig. 6: Measurement of difference between survey lines of different radii of curvature

plane of occlusion. These occlusal plane analyzers are Wynne 2000 occlusal plane analyzer, which is given, by William PD Wynne, simplified occlusal plane analyzer from Denar products and Kois dentofacial analyzer. But Broadrick occlusal plane analyzer is the analyzer, which can be used in conjunction with various types of articulators.^{15,16,19} This study was aimed to know the reliability of the Broadrick flag occlusal plane analyzer in determination of the curve of Spee among different skeletal relationships in Indian population.

But the present study gives the analysis for different skeletal relationship using different radii of curvature instead of measuring the depth of curve of Spee by making use of the proposed radii of curvature for different skeletal relationships.^{21,22}

Davies SJ, Gray RMJ and Whitehead SA suggested the use of Broadrick occlusal plane analyzer in designing the occlusion in a diagnostic wax up to create the proper occlusal plane.^{19,20} They emphasized that use of Broadrick occlusal plane analyzer aids in diagnostic waxing, but not prescriptive. It does not suggest that occlusions should be restored to a sphere that has a radius of 4 inches but it does not suggest that occlusion should be restored to a sphere of 4 inches radius.^{12,14} They also suggested that the use of a flag on the articulator an approximation of the center of the curve of Spee and curve of Wilson could be made.^{13,18,19} But the present study emphasizes radii of 4, $3\frac{3}{4}$ and 5 inches which was proposed by Lynch CD and Connell RJ for different skeletal relationship respectively. But the study is not feasible to locate the center of curve of Spee on the articulator. In patients with retrognathic mandible, a standard 4 inches curve would result in a posterior curve, causing posterior protrusive interferences. Such low mandibular posteriors would lead to extrusion of the opposing maxillary teeth. Hence, a $3\frac{3}{4}$ inches curve is more appropriate when a class II skeletal relationship exists. Conversely 4 inches curve would create a steep posterior curve, patients with a class III skeletal relationship, leading further posterior interferences. A 5 inches radius would be more suitable in class III situations.⁴ The present study supports the proposed radii of curvature for different skeletal relations, which was proposed by Lynch CD and Connell RJ.

CONCLUSION

This study aims to know the reliability of the Broadrick flag occlusal plane analyzer in determination of curve of Spee by using the different radii of curvature of the occlusal plane, which were proposed by the Lynch CD and McConnell RJ, in Indian population among the different skeletal relationships. After the statistical analysis of the study and the correlation with the different studies the following conclusions were made.

- A radius of curvature of curve of Spee of 4, $3\frac{3}{4}$ and 5 inches are more appropriate for skeletal class I, II and III ridge relationship.
- It was found that the occlusal plane of Europeans and the Indians correlates since the radii of curvature of curve of Spee was found to be appropriate to the proposed radii of curvature by Lynch CD and Connell RJ.
- Broadrick flag is a reliable tool in determination of curve of Spee in Indian population.
- The present study was conducted on the face bow-mounted casts and the curve of Spee was analyzed. But it was not feasible to locate the center of curve of Spee among different skeletal relationships using the Broadrick occlusal plane analyzer.
- So further study is recommended to locate the center of curve of Spee among different skeletal relationships using the lateral cephalograms.

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