

COMPARATIVE EVALUATION OF CURVE OF SPEE USING BROADRICKS FLAG: VIVO STUDYTanvi Jaiswal¹, A. J. Pakhan², S. R. Godbole³, Seema Sathe⁴**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: Occlusion and occlusal plane is the primary criteria in fabrication of posterior restorations. In natural dentition, curve of Spee allow the harmony between the anterior tooth and condylar guidance. The simplest method of establishment of occlusal plane is through use of Broadrick occlusal plane analyzer. This study aims to evaluate and compare the curve of spee in natural dentition using broadricks flag between male and females. To compare these study include 10 males and 10 females with completely dentate patients (Control group) and 10 males and 10 females with few missing posterior teeth (Study group). Interocclusal records were made and cast was articulated in semi adjustable articulator. Paired t test were used to compare the findings between subject and control groups. Results: - A statistically difference found between the study group and control group patients and deviation from broadrick curve was not found to be significant between male and female patients.

KEYWORDS: Broadrick's flag, Curve of spee, Occlusal plane analyzer.

INTRODUCTION: Occlusion and occlusion plane is the primary criteria in the fabrication of posterior restorations. Usually, the term, plane, is related to a flat surface. However this is not the case with the occlusal plane. Instead of a flat surface, the plane of occlusion represents the average curvature of the occlusal surface. The position of the anterior teeth is determined by the esthetics, the demand for anterior guidance, and phonetic considerations. Posterior teeth positions are defined by 2 curves, an anterioposterior curve, referred to as the curve of spee, and the mediolateral curve, referred to as the curve of Wilson.^(1,2,3)

In normal natural dentition, there exists an anteroposterior curve that passes through the cusp tip of the mandibular canine and the buccal cusp tip of the mandibular premolars and molars, and that extends in a posterior direction to pass through the most anterior point of the mandibular condyle, originally described by Ferdinand Graf Spee in 1890.^(4,5) Spee located the center of the curve along "A horizontal line through the middle of the orbits behind the crista lachryma posterior".^(5,6) Spee idea was advanced in 1920 by George Monson.⁽⁵⁾ Monson proposed that the anteroposterior curve forms part of a 3 dimensional sphere, the Centre of rotation of which is located in the region of the glabella.^(3,7) The radius of this curve is reported to be an estimated 4 inches (10.4cm), as proposed by monsoon.⁽³⁾

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 abnormal activity in mandibular elevator muscles, especially the masseter and temporalis muscle. 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.^(8,9)

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The Broadrick's flag permits construction of the curve of Spee in harmony with anterior condylar guidance allowing total posterior tooth disocclusion on mandibular protrusion.⁽⁵⁾

METHODOLOGY: A total number of 40 subjects were examined, diagnostic impressions and study models of maxillary and mandibular dentition were made.

Inclusion Criteria: The study included 10 males and 10 females with completely dentate patients (Control group) and 10 Males and 10 Females with partially dentate patients with few missing posterior teeth (Study group).

Exclusion Criteria:

1. Teeth that were used as RPD or FPD abutments.
2. Weak periodontal status of teeth, such patients were excluded.

PROCEDURE: Irreversible hydrocolloid material (Alginate) impressions of the maxillary and mandibular dentition for all 40 subjects were made and subsequently study model were prepared. Orientation jaw relation was recorded and relation was transferred on Hanau H2 articulator. Later, interocclusal records were made and mandibular cast was articulated. The adaptation of occlusal plane analyzer to the upper member of the semi adjustable articulator was done using the Broadrick flag method to create the ideal occlusal plane. (Fig. 1) The anterior survey point, posterior survey point, and central survey point were located as follows. The anterior survey point was located on the distal slope of the lower canine tooth, from which a long arc with a four-inch radius was drawn on the flag with a compass, as anterior survey line. (Fig. 2) The posterior survey point was located on the distal slope of the distobuccal cusp of the lower second molar and a short arc was drawn on the flag to intersect the anterior survey line. (Fig. 3) Anterior and posterior survey lines bisect at central survey point. The point of the compass was placed at the centre of anterior and posterior survey lines (central survey point), and a 4-inch radius was drawn through the buccal surfaces of the mandibular teeth. (Fig. 4) Where the deviation was outside, the existing curve a positive notation was given; if the deviation was inside the curve, a negative notation was given. (Fig. 5 & 6)

RESULTS: Deviation from the Broadrick curve was not found to be significant between male and female in completely dentate patients and partially dentate patients (Graph 1 & 2), but it was found to be significantly different in subjects who had missing posterior teeth, while fairly minimal in the control group. The result shows that there is a statistically significant difference in the deviation from the Broadrick curve between patients who have lost posterior teeth and the control group. (Graph 3 & 4)

DISCUSSION: The Broadrick flag is a useful tool in prosthodontic and restorative dentistry, as it identifies the most likely position of the centre of the curve of Spee. However, this position should not be regarded as fixed or immutable. Esthetics and function place a considerable demand on the design of the occlusal plane. Compromise can be achieved by altering the length of the radius of the curve. In patients with a retrognathic mandible, a standard 4-inch curve would result in a flat posterior curve, causing posterior protrusive interferences. Such "low" mandibular posteriors would also lead to extrusion of the opposing maxillary teeth.

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If the maxillary posterior teeth were to be restored to this low occlusal plane, the crown-to-root ratio would be less than ideal. Hence, a 33/4-inch curve is more appropriate when a class II skeletal relationship exists. Conversely, a 4-inch curve would create a steep posterior curve in patients with a class III skeletal relationship, leading to further posterior interferences. A 5-inch radius would be more suitable in this situation.⁽⁵⁾

The centre of the curve also may be varied to achieve the same effect. The centre should always lie along the arc drawn from the anterior survey point, but it may be moved in an anterior or posterior direction from the intersection of these arc with that drawn from posterior survey point. This alteration will not affect the position of the anterior survey point, an important fact when the position of the mandibular anterior teeth is esthetically and clinically suitable.^(3,8,10)

Deviation of teeth adjacent to edentulous space is present in the patients with loss of posterior teeth due do pathological migration of teeth, so early restoration of missing dentition is required.

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Fig. 1

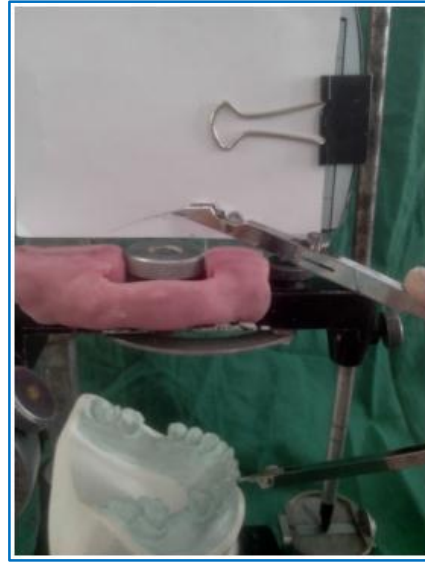


Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6

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Sr. No.	Dentate Patients (M1)				Partially Dentate Patients (M2)			
	2 nd premolar	1 st molar	2 nd molar	Mean	2 nd premolar	1 st molar	2 nd molar	Mean
1	0.5	1	0.5	0.6	3	1	0.5	1.5
2	1	1.5	1	1.2	1.5	1	0.5	1
3	1	1	0.5	0.8	1	1.5	0.5	1
4	1.5	1	1.5	1.3	-2	-1	-1.3	-1.4
5	1.5	1	1	1.2	-1	-1.5	-0.8	-1.1
6	0.5	0.5	0.5	0.5	1	1.5	0.5	1
7	1	0.5	1	0.8	3	1	0.5	1.5
8	1.2	1	0.8	1	1.5	1	0.5	1
9	0.7	1	1	0.9	1	1	0.5	0.8
10	1	0.5	0.5	0.6	1.7	2	2	1.9

Table 1: Male Patients

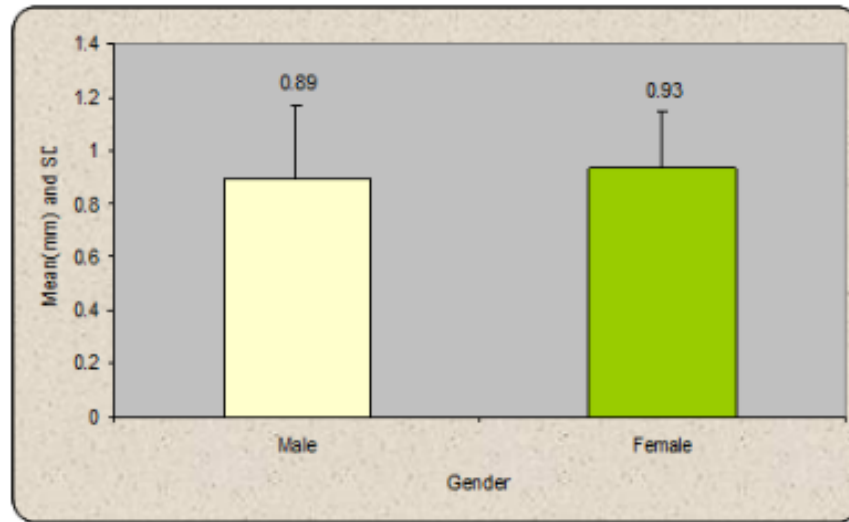
Sr. No.	Dentate Patients (F1)				Partially Dentate Patients (F 2)			
	2 nd premolar	1 st molar	2 nd molar	Mean	2 nd premolar	1 st molar	2 nd molar	Mean
1	1	1	0.5	0.8	-1	-1.5	-1.2	-1.2
2	1.7	1.2	1.2	1.3	-1	1.1	-1.4	-1.10
3	0.5	1	1.2	0.9	1.5	1	0.5	1
4	1	0.5	1	0.8	1	1.3	1.4	1.20
5	1	1.5	1.2	1.2	-2.5	-1	-1.5	-1.70
6	1.5	0.5	0.5	0.8	1.5	1.5	1.5	1.5
7	1	1	1	1	1.2	1.7	1.5	1.40
8	0.5	1	0.5	0.6	1.2	1.5	1.5	1.30
9	1.5	0.5	0.5	0.8	1	1.5	1.2	1.20
10	1	1.2	1	1.1	1.5	1.5	1.5	1.50

Table 2: Female Patients

Gender	N	Mean	Std. Deviation	Std. Error Mean	Range	t-value	p-value
Male	10	0.89	0.28	0.02	0.50-1.30	0.35	NS, p>0.05
Female	10	0.93	0.21	0.06	0.60-1.30		

Table 3: Evaluation of curve of spee in completely dentate patients in males and females

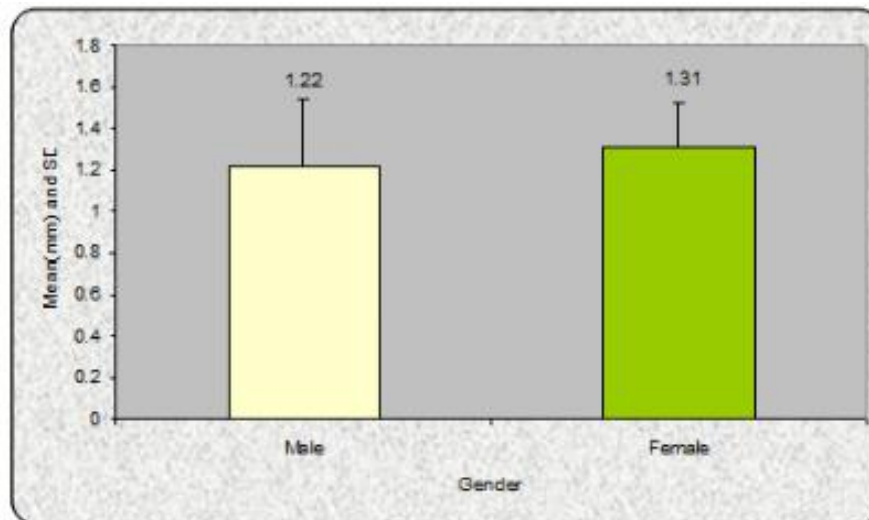
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Graph 1: Evaluation of curve of spee in completely dentate patients in males and females

Gender	N	Mean	Std. Deviation	Std. Error Mean	Range	t-value	p-value
Male	10	1.22	0.33	0.10	-1.40-1.90	0.71	NS, p>0.05
Female	10	1.31	0.21	0.06	-1.70-1.50		

Table 4: Evaluation of curve of spee in partially dentate patients in males and females

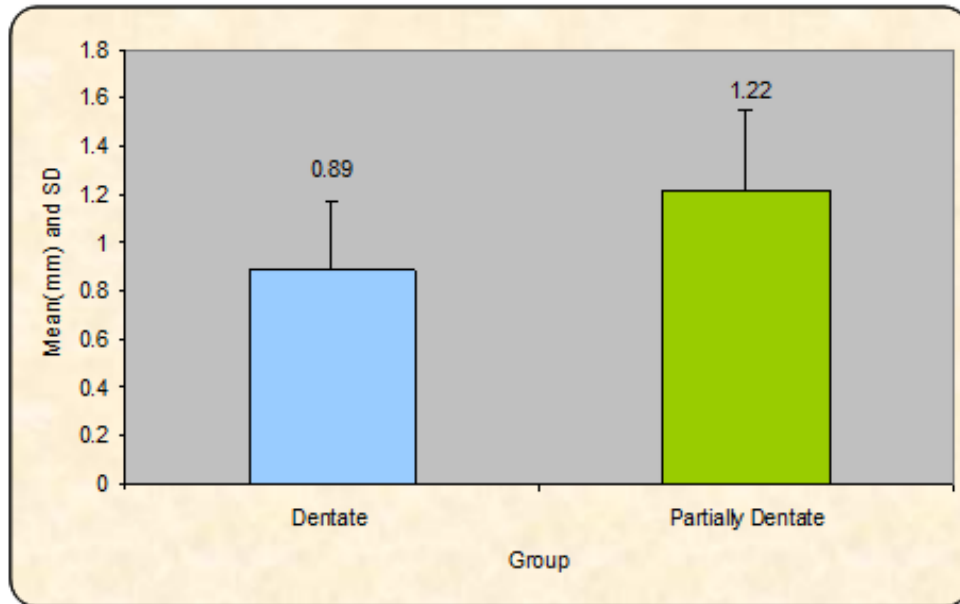


Graph 2: Evaluation of curve of spee in partially dentate patients in males and females

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	N	Mean	Std. Deviation	Std. Error Mean	Range	t-value	p-value
Dentate	10	0.89	0.28	0.02	-1.40-1.90	2.37	0.029 S, p<0.05
Partially Dentate	10	1.22	0.33	0.10	-2.00-1.50		

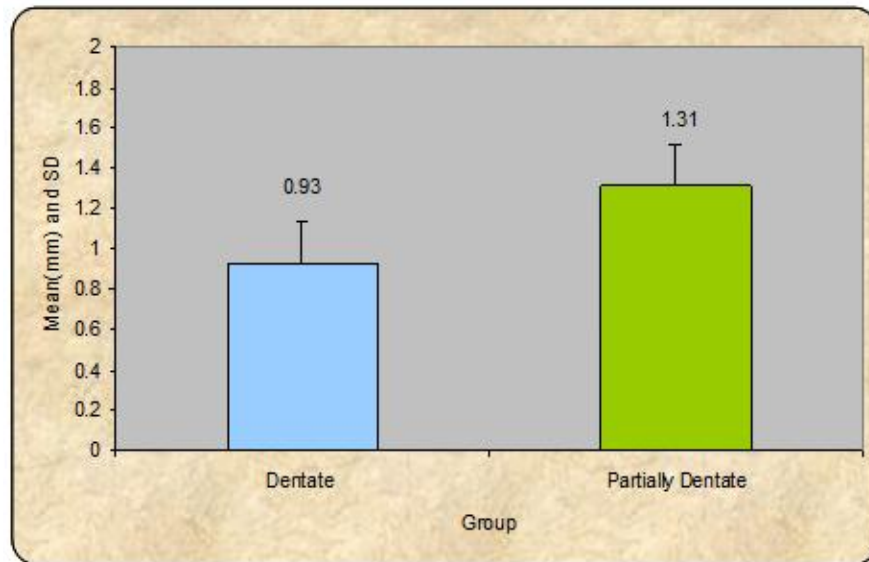
Table 5: Comparative Evaluation of curve of spee in dentate patients and partially dentate patients with missing posterior teeth in males



Graph 3: Comparative Evaluation of curve of spee in dentate patients and partially dentate patients with missing posterior teeth in males

	N	Mean	Std. Deviation	Std. Error Mean	Range	t-value	p-value
Dentate	10	0.93	0.21	0.06	0.60-1.30	3.95	0.001 S, p<0.05
Partially Dentate	10	1.31	0.21	0.06	-1.70-1.50		

Table 6: Comparative Evaluation of curve of spee in dentate patients and partially dentate patients with missing posterior teeth in females



Graph 4: Comparative Evaluation of curve of spee in dentate patients and partially dentate patients with missing posterior teeth in females

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