ORIGINAL ARTICLE

RADIUS OF CURVE OF SPEE IN PATIENTS REFERRING TO THE ORTHODONTIC DEPARTMENT OF TERTIARY CARE HOSPITAL

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ABSTRACT

Study was done to determine mean of radius of curve of spee in different vertical pattern

Curve of Spee is a naturally occurring phenomenon in the human dentition. This normal occlusal curvature is required for an efficient masticatory system. Exaggerated curve of Spee is frequently observed in dental malocclusions with deep overbites.1 Such excessive curve of Spee alters the muscle imbalance, ultimately leading to improper functional occlusion.It was cross sectional study design with 211 patients from department of Orthodontics, dental OPD Karachi Medical and Dental College, Abbassi Shaheed Hospital, Karachi, Pakistan. The data collection procedure was non–probability consecutive. Sampling procedure had inclusion criteria to be followed that included, No previous history of orthodontic treatment, healthy subjects having complete dentition, second molars erupted and except for third molars no other maxillary and mandibular teeth were absent. The exclusion criteria was also set for study including, any syndromic or cleft lip and palate subject will not be included, participants with history of trauma and patients with facial asymmetry. All the patients were examined by researcher. After thorough history and clinical examination for evaluating the inclusion and extrusion criteria patients were recruited for the study. All measurements were recorded on a predesigned Performa.

Key words: *Radius of curve of spee, cephlogram, vertical measurements*

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INTRODUCTION

Curve of Spee is a naturally occurring phenomenon in the human dentition. This normal occlusal curvature is required for an efficient masticatory system. Exaggerated curve of Spee is frequently observed in dental malocclusions with deep overbites.[2] Such excessive curve of Spee alters the muscle imbalance, ultimately leading to improper functional occlusion.

Orthodontists eventually deal with the curve of Spee in virtually every patient they treat. The purpose of this article to increase our knowledge regarding the development and its effect on dentition and its treatment in exaggerated cases.[3]

During oral growth and development, the resulting occlusal plane does not arise simply by chance. It has been postulated for almost a century, that the anteroposterior occlusal plane is curved because of the sagittal inclination of the teeth. The original article was written in 1890 by Ferdinand Graff Spee (1890),[4] This anteroposterior curve, or curve of Spee, was defined as the anatomical curve established by the occlusal alignment of the teeth, as projected onto 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, and ending at the anterior aspect of the mandibular condyle.[5]

Several authors emphasized a critical law of occlusal physiology that occlusal strength must be directed to the long axis of each tooth.

A similar study[6] was conducted in korea to see the relationship of curve of spee with the facial morphology showed The depth of the curve of spee in the mandibular arch was significantly related to overbite, overjet, and the sagittal position of the mandible with respect to the anterior cranial base. The curve of Spee was not affected by sex.

Exaggerated curves of Spee are frequently observed in dental malocclusions that present with deep vertical overbites.[7] During orthodontic treatment such excessive curves of spee are usually leveled and, in most instances, this leveling will result in a reduction of the anterior

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In the sagittal view, Spee connected the anterior Surfaces of the mandibular condyles to the occlusal surfaces of the mandibular teeth with an arc of a circle tangent to the surface of a cylinder lying perpendicular to the sagittal plane. He suggested that this geometric arrangement defined the most efficient pattern for maintaining maximum tooth contacts during chewing and considered it an important tenet in denture construction. This description became the basis for Monson's spherical theory.

The development of curve of Spee probably results from a combination of different factors including differences in the times of eruption of the mandibular permanent teeth, variations in skeletal morphology and growth of orofacial structures, sagittal jaw relationship and incisor occlusion, and development of the neuromuscular system.[8]

It has been suggested that the deciduous dentition has a curve of Spee ranging from flat to mild, whereas the adult curve of Spee is more pronounced.[9] The findings were supported by Ash.[10] Its greatest increase occurs in the early mixed dentition as a result of permanent first molar and central incisor eruption; it maintains this depth until it increases to maximum depth with eruption of the permanent second molars and then remains relatively stable into late adolescence and early adulthood. These findings also support those of Carter and McNamara[11] and Bishara *et al*.[12] that once established in adolescence, the curve of Spee appears to be relatively stable.

METHODOLOGY

It was cross sectional research work that was conducted at the department of Orthodontics, dental OPD Karachi Medical and Dental College, Abbassi Shaheed Hospital ,Karachi, Pakistan. Six months after approval of synopsis**.** Sampling technique was Non–probability. Consecutive**.** Sample size was calculated by using WHO calculator, on the bases of pilot study taking statistics of radius of curve of spee in low angle cases as 63.3333mm$\pm$6.05530mm in margin of error 0.969 at confidence of interval 90%, the calculated sample size will be 106. On the basis of inclusion criteria. No previous history of orthodontic treatment, healthy subjects having complete dentition**,** second molars erupted and except for third molars no other maxillary and mandibular teeth were absent**.** Exclusion criteria were: Any syndromic or cleft lip and palate subject, who have history of trauma, patients with facial asymmetry. All the patients were examined by researcher. After thorough history and clinical examination for evaluating the inclusion and extrusion criteria patients were recruited for the study. Verbal informed consent was taken from the patients then the lateral cephlogram was recorded, taken in centric relation, was surveyed and classified by observation into the three categories of vertical relationships as normal angle, high angle and low angle.[13] All the findings were recorded by single researcher under the observation of his supervisor in order to avoid observer bais. The measurements were recorded on a predesigned Performa.The study was done to determine mean of radius of curve of spee in different vertical pattern

To determine the vertical measurements, Sella nasion to mandibular plane(SNMP)[14] was taken as an angle form between sella-nasion line and mandibular plane. Its norm is 32$\pm$4 degree.

To determine the mean curve of spee with cephlometric vertical measurements there were two steps: First, determination of the radius of curvature (cephalometric analysis), and to determine the vertical measurements on the Cephlogram. and the present associations were noted. The technique is described below:

A transparent card was transported over a radiograph and the circle that adapted most closely was selected as a radius of curve of spee (along the cuspal tips of canine pre-molars and all molars)

RESULTS

To test the hypotheses descriptive and inferential statistical method is applied. To test the association between curve of spee and vertical malocclusion one way anova is applied.

One way anova was applied to see association between curve of spee and vertical malocclusion. Mean value is 66, 112 and 34 for high, normal and low vertical malocclusion angles. P value is > 0.05 which shows that there is no association between curve of spee and vertical malocclusion.

DISCUSSION

The finding of the study showed that curve of spee is present at highest level in normal angle class. One of the longitudinal study was done that showed the development of curve of Spee from primary dentition to the permanent dentition in a sample of normal occlusions. The findings showed that the primary occlusal plane is relatively flat, there is a large increase in depth of curve of Spee after the eruption of the permanent first molars,[15] there is another large increase in depth of the curve of Spee after the eruption of the permanent second molars, the curve of Spee decreases in depth

TABLE 1: ONE WAY ANOVA IS APPLIED TO SEE THE ASSOCIATION BETWEEN CURVE OF SPEE AND VERTICAL MALOCCLUSION

	N	Mean
High Angle	66	63.18
Normal Angle	112	60.71
Low Angle	34	59.70

**P value is 0.089 which shows that result is insignificant and there is no association present between curve of spee and vertical class malocclusion.

after the eruption of the second molars and is relatively stable throughout late adolescence through adulthood, the permanent incisors and first molars erupt significantly more than the primary second molars and the development of the significant increase in curve of Spee during the transition from the primary to the permanent dentition results specifically from the differential eruption of the permanent mandibular first molars and incisors compared to the primary second molars. The above mentioned research is one of the initiatives for knowing curve of spee in normal population at different age levels. There are more studies needed to be done for studying radius of curve of spee.[16]

Burzin and Nanda[17] specifically investigated the stability of incisor intrusion and found that maxillary incisor showed insignificant relapse. According to Praeter *et al*.[18] leveling the curve of Spee during orthodontic treatment seems to be very stable on a long-term basis.

There are more studies done for measuring the radius of curve of spee that support the findings of present study[19]. One of the study was done in India for awareness of the standard value of the maxillary and the mandibular curves of Spee[20] which may aid the clinician in developing occlusion in the sagittal plane and would be useful when providing prosthetic rehabilitation for patients with occlusal derangement. The aim of the study was to assess and compare the radius and depth of curve of Spee in maxillary and mandibular arches in men and women, in a group of young Indian population for which 25 men and 25 women between the age of 19 to 24 years were taken. The findings of the study showed that radii and depths of curve of Spee were larger in maxillary than mandibular arches in both men and women. Also, the difference in the radii of mandibular arch was statistically significant between men and women. It is noted that gender difference is also present in radius and depth of curve of spee in maxillary and mandibular arches of participants.

CONCLUSION

Finding of the study shows that association between curve of spee and vertical malocclusion is insignificant that is P value > 0.05 with mean difference is 63.18, 60.71 and 59.70 for high, normal and low angle respectively.

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