

A Comparative Analysis Of Depth of Curve Of Spee Between Individuals with Normal Dentition And Individuals With Occlusally Worn Out Dentition

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ARTICLE HISTORY

Received : Oct 13, 2022

Accepted: Dec 1, 2022

ACCESS THE ARTICLE ONLINE



DOI: <https://doi.org/10.37080/nmj.137>

ISSN : 2645-8438

KEYWORDS

Attrition, curve of spee; digital vernier caliper

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CONFLICT OF INTEREST : None

ACKNOWLEDGEMENTS: None

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ABSTRACT

Introduction: The curve of spee plays an important role to create Christensen's phenomenon in natural dentition. This study was performed to assess the difference in depth of the curve of Spee between normal and attrited dentition.

Methods: An analytical cross-sectional study was performed to measure the depth of curve of speed in a total of 80 willing participants who met the inclusion criteria, of which 40 had normal dentition and 40 had attrited dentition. Measurements were done on stone casts by using a rigid metal scale and a digital vernier caliper. Analytical statistical analysis (independent t-test) was done using SPSS Statistical Software Package (version 21.0).

Results: There was a statistically significant difference in the depth of the curve of Spee between the two groups.

Conclusions: The depth of the curve of spee decreases with the advancing of the age of human as attrition of the teeth occurs with age. Although there is a decrease in the depth of the curve of spee it should be maintained and created while performing full mouth rehabilitation and other extensive prosthodontic treatments.

INTRODUCTION

The curve of spee or the anteroposterior curve is defined as "the anatomic 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, ending with the anterior-most portion of the mandibular condyle"- GPT 9.¹ The curve is formed by the natural alignment of the teeth and this alignment should be reciprocated as much as possible in the artificial teeth during prosthodontic treatment.

The curve of Spee is the anteroposterior curve which helps in the protrusive disclusion of the posterior teeth which is a key component in mutually protected occlusion. The depth of the curve of Spee plays an important role while fabricating a fixed prosthesis may it be a single

How to cite (Vancouver Style)

Khanal B, Sapkota SM, Thakur SN, Chaulagain R. A Comparative Analysis Of Depth of Curve Of Spee Between Individuals with Normal Dentition And Individuals With Occlusally Worn Out Dentition. Nepal Med Jor. 2022;5(2):1-4.

crown or an extensive full mouth rehabilitation. The occlusal surface of the dentition tends to wear out occlusally as the age of the individual advances. This is mainly due to friction between opposing dentitions during normal masticatory activities and also due to various parafunctional habits like bruxism, bruxomania, foreign body biting etc. Since the cusp tips also get reduced in size, it may change the depth and radius of curve Spee. We can measure the depth of the curve of Spee by digitally scanning the cast of the patient followed by using suitable software or by measuring on the cast by using various types of vernier calipers.⁴ In this current study the depth of the curve of Spee was measured by using a combination of a rigid metal scale and a digital vernier caliper. This study was done to analyze if there is any difference between the depth curve of Spee of normal dentition and dentition with occlusal wear.

METHODS

An analytical cross-sectional study was conducted among patients visiting the Department of Prosthodontics from Jan 2022 to Aug 2022. Ethical clearance was obtained from the Institutional Review Committee of Chitwan Medical College. (IRC No: CMC-IRC/078/079-069) The convenience sampling method was used and the sample size was calculated by using Cochran's formula $n = z^2 pq / e^2$ (where n=sample size, p=proportion of success, q=1-p, e=margin of error, z=1.96 at 95% confidence level, p=0.95 i.e. 95% success proportion, q=0.05, e=0.05). By using this formula sample size of 72.99 was obtained. $\{n = (1.96)^2 \times 0.95 \times 0.05 / (0.05)^2 = 72.99\}$. From this calculation, the sample size was taken as 80.

Data collection was done from willing patients after taking written consent from them. Patients were divided into two groups of 40 each where group 1 included stone casts of 40 individuals with normal (non-attributed) dentition and group 2 consisted of stone casts of 40 individuals with occlusal wear (attributed) dentition. Alginate impression was made of the 80 individuals who met the inclusion and exclusion criteria as suggested by Ferrario et al.²

Inclusion Criteria

1. Individuals having complete permanent dentition including 2nd molar with bilateral Angle's class 1 permanent molar and canine relationship with a horizontal and vertical overlap of 2mm to 4 mm.

Exclusion Criteria

1. Moderate or severe clinical Temporomandibular diseases.
2. Dentition having extensive restorations, cast restorations or cuspal coverage restorations.
3. Previous or current orthodontic treatment.
4. Anterior or lateral crossbite.
5. Pathological periodontal conditions.

For rating, the subjects with occlusal wear the tooth wear index suggested by Smith and Knight³ was used. (Table 1) From the index, the score of 2 or above was considered as the occlusal wear group.

Table 1: Smith and Knight's Tooth wear index

Score	Criteria
0	No loss of enamel surface characteristics
1	Loss of enamel surface characteristics
2	Buccal, lingual and occlusal loss of enamel, exposing dentine for <1/3 of the surface; incisal loss of enamel; minimal loss of dentine
3	Buccal, lingual and occlusal loss of enamel, exposing dentine for >1/3 of the surface; incisal loss of enamel; substantial loss of dentine
4	Buccal, lingual and occlusal complete loss of enamel, pulp exposure or exposure of secondary dentine; incisal pulp exposure or exposure of secondary dentine

After making stone casts from the alginate impression base was made using base former for all models so that the height of all the casts was uniform.

The prepared stone models were then measured by using a rigid metal scale and a digital vernier caliper (BERENT BT 4059, BERENT Tools (Shanghai) Ltd.) with an accuracy of measurement to 4 decimals of mm. The scale was positioned to touch the tip of the mandibular cuspid and the distobuccal cusp tip of the mandibular second molar.⁴ That was followed by measuring the perpendicular distance between the rigid metal scale and the mesiobuccal cusp tip of the mandibular first molar. This procedure was repeated on both sides. The measurements of the depth of the curve of Spee on both sides and their mean were taken for statistical analysis. The data were entered in an excel sheet and an independent 't'-test was performed for statistical analysis using SPSS Statistical Software Package (version 21.0).

RESULTS

Among the participants in the study, 47.5% (N=38) were female while 52.5% (N=42) were male. The age group of the individuals participating in this study is depicted in table 2.

Table 2: Age distribution of participants

Age Group	Normal Dentition Group	Occlusal wear group	Total
20-30	34	0	34
31-40	4	3	7
41-50	2	16	18
51-60	0	13	13
61-70	0	8	8
Total	40	40	80

When the depth of the curve of Spee was compared between individuals with non-attrited dentition (2.13mm) and attrited dentition (1.67mm), a significant difference was found. ($p < 0.05$) (Table 3)

Table 3: Depth of Curve of Spee in normal dentition and occlusal wear dentition.

A	B	C	D	E	F
Normal dentition	40	2.13	0.70787	0.11192	(significant)
Occlusal wear dentition	40	1.67	0.44846	0.07091	

Note: A = Type of Occlusion, B = N, C = Mean of depth of curve of Spee (mm), D = S.D, E = S.E.M, F = Independent sample t-test

DISCUSSION

In natural dentition, the presence of a curve of Spee plays an important role in the posterior disclusion when anterior teeth are protruding which is also termed Christenson's phenomenon.

While fabricating a fixed prosthesis this same phenomenon should be maintained for the overall health of the stomatognathic system.

Many authors in the past have taken the incisal edge of central incisors or the tip of the canine for measuring the curve of Spee.^(2, 6, 7) Some authors suggest that the deepest point of the curve of Spee is the mesiobuccal cusp of the mandibular first molar while others suggest that it is at the second premolar area.^(7,8)

In this study, the mean depth of the curve of Spee in normal dentition was 2.13 mm and in occlusally worn dentition was 1.67 mm. The difference between the mean of the two groups was statistically significant. In a similar study done by Sengupta et al⁹ they also found a significant difference in the curve of Spee dimension between normal dentition and occlusally wear group. Likewise in various studies by Brown¹⁰, De Kock¹² and Knott¹¹, they observed that the curve of Spee gradually reverses with age. On the contrary, a study by Karani J et al⁴ found a statistically non-significant decrease in the depth of curve of Spee between the normal dentition group and occlusal wear group.

The presence of the curve of Spee in natural dentition plays an important role in causing posterior disclusion during protrusive movements which is given the term Christensen's phenomenon. It is very important to recreate this phenomenon while doing full mouth rehabilitation since failure to do this can result in trauma to the stomatognathic system.

CONCLUSIONS

The curve of Spee plays an important part in maintaining sound health of the stomatognathic system, and maintaining it during various prosthodontic treatment procedures can't be overlooked. In this present study, it was observed that there is a decrease in the depth of the curve of Spee in attrited dentition when compared with normal dentition which was found to be statistically significant. Although there was a decrease in the depth of curve Spee it was still present in the occlusal wear group in this study. While performing extensive treatment like full mouth rehabilitation it is important to create an adequate depth of curve of Spee for long-term health and prognosis of the treatment.

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