

Analysis of Von Spee's Curve in Class-I Malocclusion

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ABSTRACT

Aim: To investigate the depth of von spee's curve in Class I malocclusion.

Study design: Cross sectional

Methods: The research was conceived at Department of Orthodontics, de'Montmorency College of Dentistry, Lahore; involving one hundred lateral cephalograms and casts of Class I malocclusion subjects (49 male, mean age: 14.9 ± 1.6 years; 51 females, mean age: 15.3 ± 1.4 years) were included. The depth of the curve was calculated on lateral cephalograms as perpendicular distance from incisal edge of lower central incisor to the lower border of mandible (L1-MP), distobuccal cusp tip of the lower second molar (M7-MP) to lower border of mandible, the deepest point of the von spee's curve to lower border of mandible (S-MP), and proportioned with each other.

Results: Results showed that the mesio-buccal part of the lower first molar was the deepest curve area, and eruption of lower incisors (L1-MP/S-MP) was more related to depth of von spee's curve as compared to eruption of lower molars (M7-MP/S-MP).

Conclusion: Vertical eruption of the lower incisors made a significant contribution to the von spee's curve depth in Class I subjects.

Keywords: Von spee's curve, Class I

INTRODUCTION

The Von Spee's Curve (VSC) can be defined as the line on a cylindrical tangent to the front condylar border, occlusal plane of lower second molar, and the incisal tip of mandibular front teeth.¹ It is named for the German embryologist Ferdinand Graf von Spee (1855-1937). F Graf von Spee. Key determinants of this curve are vertical growth, bite depth and differential eruption of molars and incisors.² The differential eruption timing allows unopposed lower first molar and lower front teeth eruption beyond the established lower occlusal surface.³

The Von Spee's Curve like Wilson's curve is important for balanced occlusion and functional occlusion, it also serves to enhance 3 dimensional freedom of movement of mandible. In addition, Von Spee's Curve are associated with esthetics of the face and are contributing to an esthetically satisfying smile. Since Von Spee's Curve are formed by the positioning of the teeth in the dental arches, the positioning should be such to efficiently absorb

occlusal forces during maxillomandibular function. It has been indicated that as the Von Spee's Curve deepens, overbite and overjet increase. It has also been reported that patients with temporomandibular disorders present greater sagittal and lateral occlusal curvatures.⁴

According to Andrews aging is responsible for deepening of VSC and its flatness is one of the key in six keys of ideal occlusion for which he advocated that flatness of the VSC while orthodontic therapy.⁵ Hemley discussed the VSC as mesial tipping of the posterior teeth and distal tipping of the lower cuspid with the two bicuspids locked.⁶ According to theory of Strang and Thompson VSC is resultant of supraerupted lower front teeth, depressed bicuspids, and mesially tipped posteriors.⁷ According to Burstone VSC should be corrected by intrusion of upper lower incisors, extrusion of molars, or combo.⁸ However, as per study VSC should be corrected by extrusion of the molars.⁹

The objective of present study was to investigate the relationship of the depth of the VSC with the vertical eruption of incisors and/ or molars in Class I malocclusion.

METHODOLOGY

This research was conceived after institutional approval at the Department of Orthodontics, de'Montmorency College of Dentistry, Lahore in which one hundred lateral cephalograms and models from records of untreated Class I malocclusion

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patients (49 boys, mean age:14.9 ±1.6 years; 51 girls, mean age: 15.3 ± 1.4 years) were included as per laid down criteria. Duration of this cross sectional study was January 2014 to December 2015.

Inclusion Criteria

- ALD ≤ 2.0 mm
- All teeth present except wisdoms
- Class I malocclusion (On Study Models)
- Good quality pretreatment Lateral cephalograms and models.

Exclusion Criteria

- History of trauma
- History of medical problems
- Previous orthodontic treatment
- Previous oral surgery

Data Collection Procedure: All cephalograms were traced manually by one examiner. The following reference points and planes on lateral cephalograms were used:

- L1, tip of lower centrals;
 - M7, Disto-labial cusp tip of lower second molar;
 - MP, lower border of mandible;
 - L1-MP, Distance from lower incisor tip to lower border of mandible;
 - M7-MP, Distance from the disto-buccal cusp tip of lower second molar to lower border of mandible; and
 - S-MP, Distance from the deepest point of the VSC to lower border of mandible.
- VSC's depth was calculated on casts by method advocated by Veli et al.¹⁰ The perpendicular distance from the cusp tips to the constructed line through the

horizontal reference plane were calculated and the deepest points of VSC were measured for both the sides.

Statistical Analysis: The data analysis was done using analyzed SPSS 20. A paired t-test was applied for side comparison of dental cast values and quantitatively determines the contribution of eruption of mandibular molars (M7-MP/S-MP) and eruption of mandibular incisors (L1-MP/S-MP) to the depth of VSC on lateral cephalograms. P<0.05 was set as statistically significant value. Linear regression analysis was used to calculate Pearson's correlation coefficient for determination of correlation between two variables as depth of VSC (S-MP) to eruption of mandibular molars (M7-MP/S-MP) as well as depth of VSC (S-MP) to eruption of mandibular incisors (L1MP/S-MP).

RESULTS

The means, standard deviations, minimum and maximum values, t-values and p-values of the average perpendicular measurements on lateral cephalogram are presented in Table 1. The value M7-MP was significantly less than LI-MP showing highly significant difference. The multiple linear regression analysis showed that lower incisors had a significant correlation to VSC (Table 2). The mesio-buccal part of mandibular molar was the deepest (maximum 2.43 ± 0.47 mm & minimum 1.87 ± 0.89) in Class I subjects. There was no significant side difference in the depth of the VSC (Table 3).

Table 1: Analysis of von spee's curve in class-I malocclusion

Measurements	Minimum	Maximum	Mean mm	SD	t-value	P value
M7-MP	42.2375	46.7254	44.5503	1.6707	-	-
L1-MP	36.4465	40.5622	38.4802	1.6530	3.95	<0.001
S-MP	34.7888	37.4465	36.0694	1.1260	2.08	<0.05

<0.001= statistically highly significant <0.05 = statistically significant

Table 2: correlation between vertical eruption of incisors and molars with vsc depth on lateral cephalograms

Measurement	Deviation Scores	Coefficient of Determination (r- value)
M7-MP/S-MP	-56.96	-0.112
L1-MP/S-MP	-11.21	-0.022

r= or near to 1 — strong positive correlation
 r= or near to -1 — strong negative correlation
 Strong negative correlation (r- value near to -1) inversely related to more vertical eruption of teeth.

Table 3: Sides comparison of depth of the vsc on plaster models

Mean	Standard Deviation	Side Difference	Standard Error	t value	p
2.544	0.723	-0.076	0.089	-0.788	0.379

Statistical significance at p<0.05

DISCUSSION

The main significance of VSC is its role in chewing and mastication; so its evaluation is must for proper diagnosis and treatment planning.¹¹In this study, we aimed to do analysis of depth of VSC in Class I malocclusion subjects.

There was insignificant side difference in the depth of the VSC in present study which is in agreement with findings of Marshall et al² and Veli et al¹⁰ who concluded insignificant difference in depth of the VSC between the right and left sides of the mandibular arch. The deepest area of VSC was mesio-buccalpart of the lower first molar which is in accordance to Veli et al.¹⁰Result of present study is also in accordance with Imtiaz et al¹² and Nayyar et al¹³, who found that VSC was deepest in class II div II malocclusion and flat in class III malocclusion. According to study conducted by Veli et al¹⁰ VSC depth in Class III malocclusion was more associated with vertical eruption anterior teeth. Present study also showed similar correlation between vertical eruption of lower incisors and deep VSC in Class III malocclusion, but results are in contrast to Yadav et al¹⁴.

No gender comparison of VSC data was done, keeping in mind reported lack of sex dimorphism in the depth of the VSC¹⁵⁻¹⁷. Limitations of this study are cross sectional study and small sample size; further studies with a longitudinal follow-up and larger sample size are suggested.

CONCLUSION

The vertical eruption of mandibular incisors made a significant contribution to the depth of VSC in Class I subjects.

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