COMPARISON OF CURVES OF SPEE IN CLASS II, DIVISION 1 MALOCCLUSIONS AND CLINICALLY NORMAL OCCLUSIONS

Comparação das curvas de Spee em oclusões classe II, divisão 1 e oclusões clinicamente normais.

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Abstract

Leveling of the curve of Spee is part of orthodontic treatment and it should be considered in space management procedures. The purpose of this study was to evaluate and compare the curve of Spee in 72 dental casts, 14 with clinically normal occlusion and 58 Class II, division 1 malocclusion (age between 11 and 14 years). All patients had mandibular second molars and premolars erupted and in occlusion. The measurements were made using an instrument developed specially to this study and a precision electronic digital caliper ruler. Three measurements were realized in the right and left lower hemi arches: buccal cusp tips of the first and second bicuspids, and mesio-buccal cusp tips of the first molars. There were no significant statistical differences between the curve of Spee in the clinically normal occlusion and Class II, division 1 malocclusion, been analyzed the average values of both sides and in six selected points.

Keywords: Curve of spee; Class II; Division 1 malocclusion; Normal occlusion.

Resumo

O nivelamento da curva de Spee é parte do tratamento ortodôntico e deve ser considerado nos procedimentos de controle de espaço. A finalidade deste estudo foi avaliar e comparar a curva de Spee em 71 modelos de gesso, sendo 14 com oclusão clinicamente normal e 58 com oclusão Classe II, divisão 1 (idade dos pacientes entre 11 e 14 anos). Todos os casos apresentavam-se com os segundos molares e pré-molares erupcionados e em oclusão. As medidas foram feias por meio de um instrumento especialmente desenvolvido para este estudo e de um instrumento eletrônico digital de precisão. Três medidas foram realizadas nos hemiarcos inferiores direitos e esquerdos: cúspides vestibulares do primeiro e secundo pré-molares e cúspide mesiobucal dos primeiros molares. Não houve diferenças estatísticas significantes entre os valores obtidos das curvas de Spee entre as oclusões normais e as oclusões Classe II, divisão 1, analisados os valores médios em ambos os lados em seis pontos selecionados.

Palavras-chave: Curva de Spee; Classe II; Divisão 1; Oclusão normal.

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Introduction

The normal occlusion presents a curve determined by the occlusal surfaces of the mandibular teeth. This curve was first described by Ferdinand Grat Von Spee (1890) and referred to as the curve of Spee (1), compensation curve (2, 3, 4) Blackwiel-Spee, occlusion line, Spee line (4), occlusal curve (5, 6, 7, 8) and is considered a line extending from the distal marginal edges of the most posterior teeth to the incisal edges of the central incisors (9). This curve can be different in right and left hemi arch, how describe by Andrews in 1972. (10)

The curve of Spee depth can varies from flat to excessive (11, 12) being reversed in rare cases (13, 14). In exaggerated overbite malocclusions cases, an excessive curve of Spee can be observed, and this curve can be leveled with the overbite correction (15).

An important purpose of a comprehensive orthodontic treatment is leveling the mandibular curve of Spee, which is characterized when the incisal of anterior teeth and the buccal cusp tip of the mandibular posterior teeth are in the same horizontal plane (16). This value should be considered and quantified in space management procedures (17).

The purpose of this study was to evaluate and compare the curve of Spee in clinically normal occlusion and Angle Class II, division 1 malocclusion (18) in individuals with age between 11 and 14 years.

Material and methods

seventy-two study casts of Brazilian individuals, 14 clinically normal occlusion (group 1) and 58 Angle Class II, division 1 malocclusion (group 2) were used. All subjects had mandibular permanent second molars and premolars erupted and in occlusion, and no absence of any permanent tooth.

Five points were marked in each mandibular hemi arch: incisal of the central incisor (point 1), buccal cusps tips of the first bicuspid (point 2) and second bicuspid (point 3), the mesiobuccal cusp tip of the first molar (point 4) and the highest cusp tip of the most distal tooth (point 5) (19, 20, 21, 22), 10 points for each cast (Figure 1).

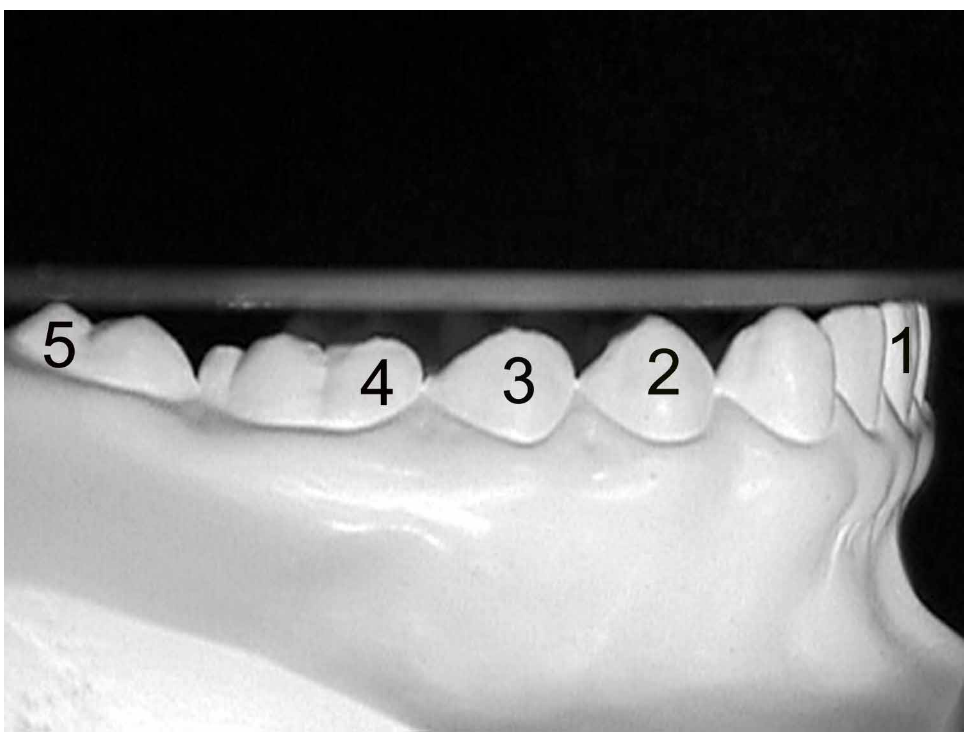

Figure 1 - Right lateral view of the mandibular cast with the five points marked

For the depth measurements, an acrylic instrument was developed to orient the oclusal surfaces (Figure 2). This instrument was made using a hard acrylic acrylic plate with a perforation in a half-elliptical form, approximately 1,2 cm width per 4,0 cm length.

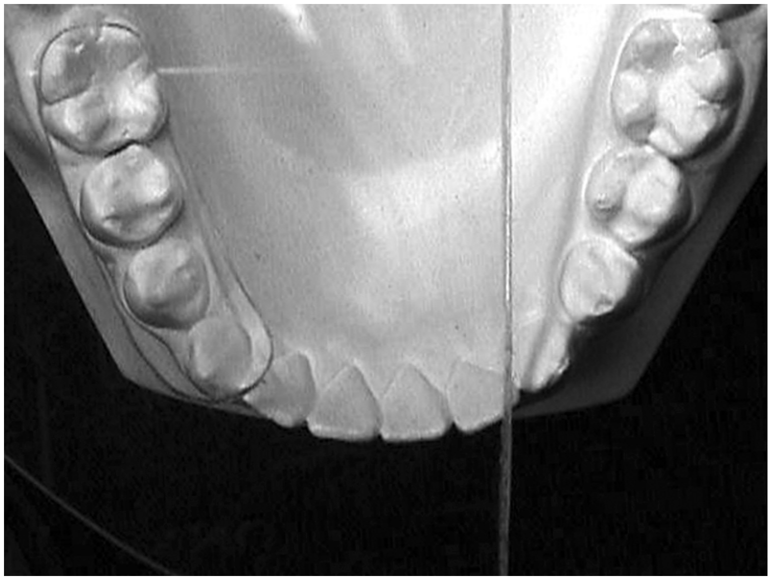

Figura 2 - The acrylic instrument positioned over the mandibular cast

Figure 2 - The acrylic instrument positioned over the mandibular cast

The instrument was placed over the cast and supported in anterior (point 1) and posterior region (point 5) in order to permit accessing the digital caliper ruler to measure all reference points (Figure 3 and 4) and avoid any interference of the canines, frequently positioned above the oclusal plane.

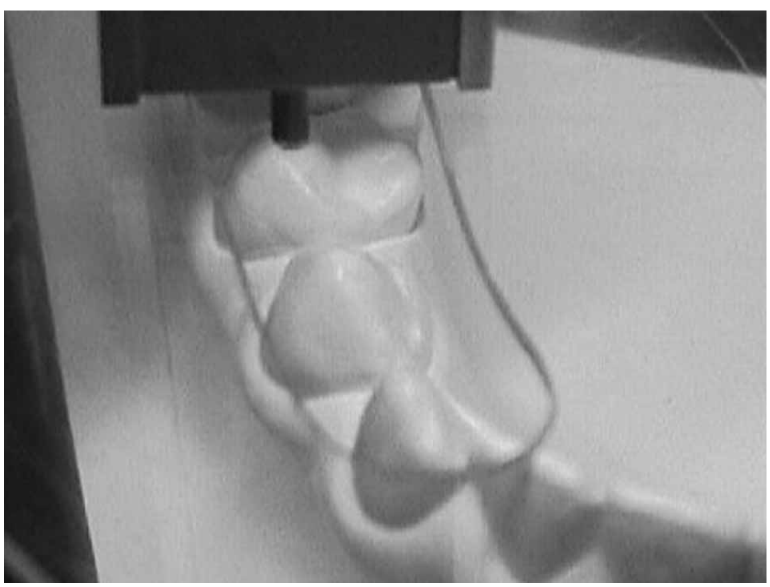

Figura 3 - The cast, the caliper ruler and the acrylic instrument positioned to the measurements of the curve of Spee depth, in mesiobuccal cusp edge of the first mandibular right molar

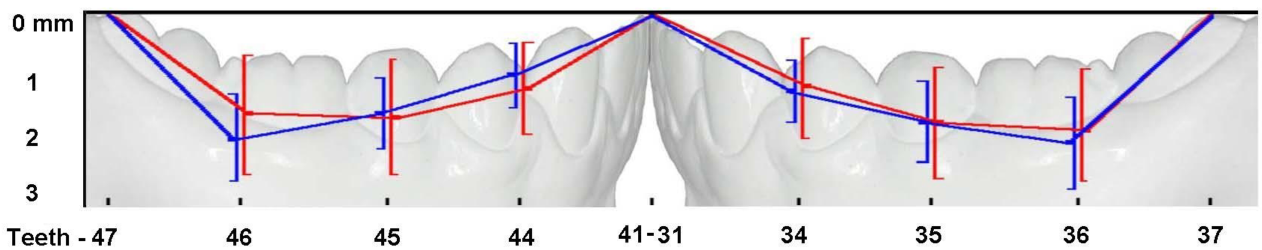

Figura 4 -

All measurements were obtained on the right and left sides and an average of the curve of Spee depth was calculated; 1,78 mm was subtracted from the measures, corresponding to the thickness of the acrylic instrument.

The measurements were analyzed and statistically compared by Student's "t" test ($p<.05$).

Results

There were no statistically significant differences ($p >$ or $= 0.05$) between the curve of Spee depth in clinically normal occlusion and Angle Class II, division 1 malocclusion, when analyzed the average of the values in right and left sides, and in the six selected points individually. These results are showed in Tables I to VIII.

Table I - Comparison of the curve of Spee values between the right first bicuspid of the group 1 and 2

Group	Data	Average	Standard deviation	Standard error
1	14	0.9464	0.4910	0.1312
2	58	1.1591	0.7268	0.1942

Table II - Comparison of the curve of Spee values between the right second bicuspid of the group 1 and 2

Group	Data	Average	Standard deviation	Standard error
1	14	1.5650	0.5673	0.1516
2	58	1.6045	0.9037	0.2415

Table III - Comparison of the curve of Spee values between the right first molar of the group 1 and 2

Group	Data	Average	Standard deviation	Standard error
1	14	1.9443	0.705	0.1884
2	58	1.5848	0.9201	0.2459

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Table IV - Comparison of the right side average of the curve of Spee values of the group 1 and 2

Group	Data	Average	Standard deviation	Standard error
1	14	1.4850	0.5387	0.1440
2	58	1.4488	0.7984	0.2134

Table V - Comparison of the curve of Spee values between the left first bicuspid of the group 1 and 2

Group	Data	Average	Standard deviation	Standard error
1	14	1.2157	0.4805	0.1284
2	58	1.1772	0.7807	0.2087

Table VI - Comparison of the curve of Spee values between the left second bicuspid of the group 1 and 2

Group	Data	Average	Standard deviation	Standard error
1	14	1.6886	0.6477	0.1731
2	58	1.6893	0.8667	0.2316

Table VII - Comparison of the curve of Spee values between the left first molar of the group 1 and 2

Group	Data	Average	Standard deviation	Standard error
1	14	2.0071	0.6804	0.1818
2	58	1.7334	0.8990	0.2403

Table VIII - Comparison of the left side average of the curve of Spee values of the group 1 and 2

Group	Data	Average	Standard deviation	Standard error
1	14	1.6379	0.5658	0.1512
2	58	1.5338	0.7956	0.2126

Source: Pos-graduation program – Orthodontics – PUCPR, Curitiba, Brazil.
Note: Correlation not significant at .05 level.

Discussion

Although the orthodontists do not evaluate and consider the curve of Spee in all cases, treatment planning should be a combination of cefalometric and dental discrepancy (20, 23), considering the curve of Spee as an important factor in diagnosis (24, 19, 20, 21)

Several authors had measured (15, 19, 21, 25, 26, 27, 28) the curve of Spee in

cast as well in this study. However, others had used different techniques as: cast digitalized (15, 19, 24, 25, 26) and instruments developed and idealized for that aim (27, 28). Salomão e Caetano (27) demonstrated that the use of an instrument designed to measure the curve of Spee depth assures greater precision than when measured without a special instrument. Considering this results, an instrument for the measurements of the curve of Spee depth was developed for this research.

Steadman (13, 14) observed that any dentition or pair of casts presents four curves of Spee: two in the upper arch and two in the lower arch. These curves can be classified in four types: excessive, advisable, flat and reversed (rare in lower arch). The Class II malocclusion cases can be treated by the correction of the molar relation, the teeth correct alignment and the curve of Spee leveling, once upon that the deep overbite can be explained by the presence of an abnormal curve of Spee (13, 14, 15).

Shannon e Nanda (28) have found that Class II molar malocclusion had significantly deeper pretreatment curve of Spee measurements than Class I malocclusions.

The curve of Spee contributes to set up the anterior overbite and is favorable to the approach of the maxilar and mandibular oclusal planes, in mandibular elevation (14). According with this concept, the curve of Spee depth in individuals with Class II malocclusion should be deeper than in individuals with clinically normal occlusion.

However, the results obtained in this study were different since there were no statistically significant differences between the curve of Spee depth in individuals with clinically normal occlusion and in Class II, division 1 malocclusion.

In spite of this, the clinical evaluation should be associated and considered in orthodontic treatment planning, once upon that one of the orthodontic treatment purposes is leveling the curve of Spee (16). And for this leveling, the value of the curve of Spee depth should be considered and quantified in space management procedures (17) to prevent incisor flaring and consequently assuring aesthetics, function and stability of the treatment results.

Conclusion

There were no differences between the curve of Spee depth when analyzed and compared six selected points individually, as well as between the average values of the curve of Spee depth in right and left sides.

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