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Correlation between Curve of Spee and signs and symptoms of temporomandibular joint disorder

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Abstract

Introduction: Occlusion as an etiologic factor for occurrence of temporomandibular joint disorder (TMD) is controversial topic in Orthodontics. Hence, the present study was carried out to evaluate association between one of the occlusal curvature i.e. curve of spee (COS) and TMD.

Material And Method: 40 patients who presented with signs and symptoms of TMD were selected as a test group. Examination was carried out using the Guidelines of Axis 1 of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC-TMD). Control group consisted of 40 patients without signs and symptoms of TMD. COS was measured using digital caliper. All statistical analysis was performed using SPSS software. Independent t- test was carried out

Result: Significant association was revealed between curve of spee and signs and symptoms of TMD. Subjects with signs and symptoms of TMD showed flatter curve of spee whereas control group i.e. subjects without signs and symptoms of TMD showed steeper COS.

Conclusion: Subjects with presence of TMD tend to have flatter curve of spee as compared to subjects with healthy joint.

Keywords: Temporomandibular Disorders, TMJ, curve of Spee, occlusal curvature.

Introduction

The role of Occlusion in the etiology and prevalence of temporomandibular joint disorders has long been discussed and debated in Orthodontics. Review of literature suggests that there exists dichotomy of opinion related to occlusion as a causal factor of TMD. Although there is a consensus that Orthodontic treatment does not cause or treat temporomandibular joint disorders, studies have revealed significant associations between occlusal characteristics and signs and symptoms of TMD. Open bite has been positively associated with TMJ and muscle tenderness, excessive or negative overjet is accused to cause TMD[1]. An association between open bite, posterior crossbite, deep bite and occurrence of TMD has been reported by Tann[2]. Over jet greater than 6 mm, centric relation/ intercuspal position (CR/IP) slide greater than 4mm, unilateral lingual crossbite and 5 or more missing posterior teeth were identified to potentially relate to

occurrence of TMD[3]. It has been claimed that individuals with maxillary prognathism more frequently present clicking in the TMJs and that patients with narrow mandibular arches have higher levels of pain in the masticatory muscles[4].

Various studies reported in the Orthodontic literature demonstrated weak association between temporomandibular joint disorders and occlusal curvatures of which curve of spee and curve of Wilson are of prime importance. Currently, it is believed that occlusal alterations cause TMD and not only related to its development[5]. Among them, the Spee curve is little valued and studied.

The presence of curve spee of variable depth is common finding in occlusal arrangement and is the sixth key of occlusion (Andrews). Curve of spee has been defined as 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[6]. Normally, the Spee curve is concave, at the level of the mandibular teeth, and convex at the level of the maxillary teeth; the lowest point was the mesiobuccal cusp of the mandibular first molar. At the sagittal view, the Spee curve touches the area from the anterior surface of the mandibular condyles to the occlusal surface of the mandibular teeth[7]. Thus, the normal inclination is important because it provides greater free movements during the mandibular functional excursions, increases the masticatory effectiveness and accounts to compensate the condylar paths. Thus, the correct intercuspation is assured, avoiding premature contacts and the disclusion of the posterior teeth during the protrusion is enabled.

Present Orthodontic literature lacks correlation studies on the causal and/or consequent role of curve of spee in the development of TMD. Hence, this retrospective study was carried out to evaluate association between occlusal curvature and signs and symptoms of Temporomandibular Joint Disorders.

Materials and method

Sample size of 40 in each group was taken to determine power of the study at 95%. 40 Patients with signs and symptoms of TMD were selected from the patients who reported to the department for Orthodontic as well as non – Orthodontic purpose. Control group was selected retrospectively as pre-operative models of patients who are undergoing Orthodontic treatment in the department who neither presented nor gave history of TMDs.

In order to participate in the study, subjects had to be over 18 years old and have at least one molar, one premolar, canine, and two incisors in each quadrant. Subjects with a history of trauma involving the head, face, and neck region or with a history of systemic TMJ disease were excluded. In addition, subjects that had had treatment for temporomandibular disorders were also not included in the study.

Clinical examination

Examination of all the participants was done by one calibrated examiner according to the Guidelines of Axis 1 of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC-TMD)[8]. Certain modifications were done in some variables of RDC-TMD in order to increase clinical significance of statistical analysis. No differentiation was done between various joint sounds included in the RDC-TMD and joint sounds were handled as a binary variable. For all muscles that required the examiner to palpate at more than one site (e g, superior, middle, and inferior masseter muscle) only the highest palpation score was reported.

Study cast analysis

Digital caliper (Mitutoyo Digimatic caliper CD- 10CX, Mitutoyo Corporation, Kawasaki-shi, Japan) with a resolution of 0.01 mm and accuracy of 0.02 mm was used for study cast analysis. Depth of curve of spee was measured at the most distal premolar.

The examiner was blinded for study cast measurements in order to avoid bias. After completion of all the measurements data was recorded and collected in Microsoft excel sheet. Curve of spee was again measured on 15 random study cast to check interexaminer reliability.

All the patients with presence of joint sound, muscle tenderness are recorded under test group. Separate score was not recorded for right and left side. All statistical analysis was performed using SPSS software. Independent t-test was carried out to test association between test group and control group. The level of significance (α) was 0.05. Hence value less than 0.05 was considered statistically significant.

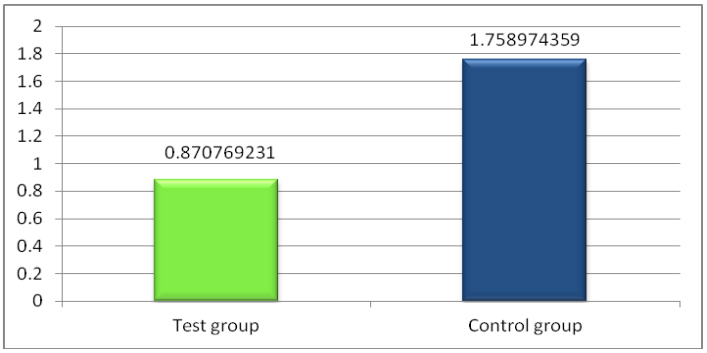
Results

Present study consisted of 47 females and 33 males. The mean age for test group was

18 to 35 years whereas mean age group for control group was 22 to 37 years. No differentiation was made between right and left joint sounds; also muscle tenderness was counted as single entity irrespective of laterality. The mean value of curve of spee for test group was 0.88 and that for control group was 1.75. The results showed statistically significant difference between test group and control group.

Group	N	Mean	Standard deviation	Standard error of mean	P value of t test
Test group	40	0.87	0.36	0.058	0.033*
Control group	40	1.75	0.38	0.061	

Table 1- Comparison between test group and control group



Graph 1- Comparison between test group and control group

Discussion

The present study was carried out to assess relationship between occlusal curvatures and signs and symptoms of TMDs. TMD has been defined as collective term referring to a number of clinical problems involving the masticatory musculature, the temporomandibular joint(s), and associated structures or both[3]. Role of occlusion in the development of TMD has long been debated in literature. There exists a functional homeostatic balance between the various components of the masticatory system including the teeth, periodontium (hard and soft tissue supporting structures), masticatory and cervical musculature, temporomandibular joint structures and the psyche of each individual. This balance may be disrupted by a number of factors acting either alone or in combination resulting in the expression of signs and symptoms associated with TMD. Basic science research has provided an enhanced understanding of pathogenesis, those cellular events and reactions and other pathologic mechanisms occurring in the development and maintenance or recurrence of TMD.

Occlusion as an etiologic factor for TMDs is long term discussed and debated. Because of multifactorial character and heterogeneous form, diagnosis and treatment of TMD is still considered controversial issue among Orthodontic professionals.

The Spee curve is a curve line at anteroposterior direction, determined by the tangency of the buccal cusp tips from molars to canine teeth. At the sagittal view, spee curve touches the area from the anterior surface of the mandibular condyles to the occlusal surface of the mandibular teeth. Thus, the normal inclination is important because it provides greater free movements during the mandibular functional excursions, increases the masticatory effectiveness and accounts to compensate the condylar paths. Studies reveal close relation between COS and amount and direction of crushing masticatory forces[9-10]. Another group of study found significant association between COS and presence of joint sound during lateral excursion[11].

Result of the present study suggests minimal curve of spee in patients with signs and symptoms of TMD, whereas, patients without signs and symptoms with TMD showed deep curve of spee. The possible mechanism is explained by Osborn according to which COS was biomechanically associated with relative position of condyle in glenoid fossa[12]. Steeper COS is associated with anteriorly positioned condyle whereas flatter COS is associated with posteriorly positioned condyle. More posterior positioning of condyle leads to anterior disk displacement with subsequent joint sound. Thus, it can be concluded that flatter COS could be predisposing factor for development of joint sound or could be due to more posterior positioning of condyle during growth and development.

Another theory suggests less disocclusion of posterior teeth in patients with flatter COS leading to excessive molar contact during lateral excursion of mandible. This would subsequently increase forces applied to joint during normal function and could be the cause of joint sound[13]. These theories are not scientifically proven and assumption based. However other studies have revealed opposite correlation, suggesting need for further systematic long term studies to show association between occlusal curvature and TMD signs and symptoms.

Conclusion

Present study suggests

1) Patients with sign and symptoms of Temporomandibular joint disorder tend to have flatter curve of spee.
2) Steeper curve of spee is not associated with Temporomandibular joint disorder.

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