Occlusal contact in children with Temporomandibular Disorders. A pilot study

ABSTRACT

Aim The aim of the present study was to perform a comparative analysis of occlusal contact points in children with and without signs and symptoms of Temporomandibular Disorders (TMD).

Material and Methods Study design: Cross-sectional study. One hundred fifty children between 6 and 14 years of age were evaluated using the Helkimo questionnaire and a clinical exam. The occlusal contact points in each child were recorded during maximal intercuspation with the aid of carbon strips. Digital photographs were taken of the upper and lower arches before and after recording the occlusal contacts. The number of contact points between sides were compared and recorded on individual charts (occlusograms). Statistics: Student’s t-test and Pearson’s chi-square test were used for the statistical analysis, with the level of significance set at 0.05, which revealed no statistically significant differences between genders. The Student’s t-test revealed a statistically significant difference in the mean number of occlusal contact points between the participants with and without TMD, with a higher number of contact points among those without TMD. There was no significant difference between sides.

Results The results of this study show a difference in the number of occlusal contact points in centric occlusion between children with and without TMD.

Conclusion Regardless of the degree of severity, the number of occlusal contact points is lower among children with TMD.

Keywords Temporomandibular joint; Temporomandibular joint disorder; dental occlusion.

Introduction

Temporomandibular disorder (TMD) is defined as a set of painful and/or dysfunctional conditions involving the muscles of mastication and/or the temporomandibular joint (TMJ) [Pedroni et al., 2003]. The characteristic symptoms of TMD are muscle and/or joint pain upon palpation, impaired mandibular function and joint noises. Regarding overall prevalence, these symptoms affect over 75% of the population. Epidemiological studies demonstrate that signs and symptoms of TMD can cause headaches and facial pain and can affect chewing function. While this condition is found in all age groups, the prevalence in children is considered low, increasing with age in adolescents and young adults [Egermark et al., 2001; Thilander et al., 2002].

The resting position of the mandible is the result of the coordination of the posterior cervical muscles and of those placed anterior to the cervical spine [Goldstein et al., 1984; Solow and Sonnesen, 1984]. Mandible movement is dictated by neuromuscular control until the initial contact of the teeth [Sonnesen et al., 2001]. The contact of the upper and lower teeth during mandible activity is denominated occlusion, which is classified in the literature [Demir et al., 2004; Velez et al., 2007].

Premature occlusal interference is a possible cause of headache and facial pain. This type of alteration can affect chewing function and lead to functional asymmetry in the stomatognathic system [Acosta-Ortiz et al., 2004; Schmitter et al., 2007]. Premature interference may also be the consequence of a change in occlusal position secondary to the presence of joint and/or muscle pain and may cause mandible deviation, resulting in excessive pressure on the joint [Fuji, 2001]. In contrast, premature contact is known to cause a reduction rather than an increase in muscle activity and stems from pathologies of the TMJ and muscles of mastication. In the growth phase, when bone structures and muscles are developing, deviations stemming from occlusal interference may produce greater symptoms, as this type of premature contact may generate malocclusions due to the functional deviation of the mandible and periodontal alterations as a response to pain [Murray et al., 1996]. With pain symptoms, patients may functionally alter their habitual
chewing pattern so that this action can be performed more comfortably. This functional alteration between arches may exert a negative neuromuscular influence, with severe craniocervical disorders that may lead to the development of severe TMD, with a direct effect on quality of life [Acosta-Ortiz et al., 2004; Motta et al., 2011].

Considering the numerous factors that may pathologically influence the TMJ, the aim of the present study was to perform a comparative analysis of occlusal contact points in children with and without signs and symptoms of TMD and relate the findings to the degree of severity.

### Materials and methods

The present study was carried out in compliance with the norms that regulate research involving human beings in Resolution nº 196/96 and 251/97 of the Brazilian National Board of Health and received approval from the Ethics Committee of the Universidade Nove de Julho (Brazil). The parents/guardians of the participants were duly informed as to the objectives of the study and signed an informed consent.

A cross-sectional study was carried out for the evaluation of occlusal contact points in children with TMD. One hundred fifty children between 6 and 14 years of age registered at the Children’s Clinic of the School of Dentistry of the Universidade Nove de Julho were examined. The inclusion criteria for the selection of the participants were the following: presence of the primary 2nd molar and permanent 1st molar for children aged six to 10 years and presence of the permanent 1st molar in children aged 11 to 14 years. The children in both groups had Class I occlusion (Angle’s occlusion classification), characterised by good positioning between the apical bone bases of the maxilla and the mesiovestibular cuspid of the upper first molar occluding in the mesiovestibular sulcus of the lower first molar [Demir et al., 2004]. Children in orthodontic treatment, those with neurological disorders and cleidocranial dysplasia were excluded. Based on the eligibility criteria, 44 children were selected for participation. Questionnaires were administered prior to any intervention and the Helkimo index was employed for the diagnostic investigation of TMD. The Helkimo questionnaire is a specific index for the investigation of TMD made up of 10 self-explanatory questions with responses of yes/no/sometimes addressing the most frequent signs and symptoms of orofacial pain and TMD [American Society of Temporomandibular Joint Surgeons, 2003].

A clinical examination was also performed, consisting of the inspection of the teeth and occlusion, palpation of the trapezius, sternocleidomastoid, temporalis, masseter, digastric and medial pterygoid muscles and palpation of the TMJ. Moreover, a calliper was used to measure maximal mouth opening and lateral movements of the mandible. Based on the clinical findings, the children were classified according to the Helkimo criteria.

During the clinical examination, the patient remained seated in a chair positioned at 90 degrees with Camper’s plane parallel to the ground and was instructed to close the mouth for maximal intercusal centric occlusion. The patients were first trained to become familiarised with the procedure. The patients performed their usual bite in intercuspation ten times for the certification of this type of occlusion, with the aid of an intraoral mirror. The data were recorded on individual forms. The procedure was performed by a previously trained examiner with no time constraints.

AccuFilm II (Parkell, NY, USA) carbon paper was used on both sides simultaneously for the determination of occlusal contact points. The patient was positioned in the dental chair at 90 degrees with Camper’s plane parallel to the floor and was instructed to close his/her mouth until achieving maximal intercuspation. The patients were first trained in the procedure and performed approximately ten bites with maximal intercuspation [Mazetto et al., 2002]. The teeth were dried with sterilised gauze and air syringe in order to allow the carbon paper to mark all contact points clearly with no smudges. The marking was performed by the same operator in a single closing of the mouth in order to avoid the overlapping of marks. Muller tweezers (Duflex, Juiz de Fora, Brazil) were used for gripping the carbon strips. The occlusion was recorded before and after the procedure using a digital camera (Sony) at a magnification of 12X and with the aid of a mouth mirror for photographs. The carbon paper was then transferred to an occlusogram (Appendix) for the analysis of the contact points and subsequent correlation with the presence or absence of TMD. Each occlusogram was individually numbered.

### Statistical analysis

The data were organised in tables and graphs and submitted to statistical tests. Descriptive statistics [mean and standard deviation (SD)] were used for the characterisation of the sample. The Student’s t-test for repeated measurements was used in the analysis of contact points. Pearson’s chi-square test was used to determine the association between contact points and the presence/classification of TMD.

### Results

Among the 150 patients evaluated, 44 fulfilled the eligibility criteria. Mean age of the participants was nine years (SD = 2.06); 47.7% (n = 21) were girls and 52.3% (n=23) were boys. Regarding the presence and severity of TMD, 38.6% (n = 17) had no signs or symptoms, whereas 61.4% (n = 27) exhibited some degree of TMD: 43.2% (n = 19) had mild TMD; 11.4% (n = 5) had
moderate TMD; and 6.8% (n = 3) had mixed or severe TMD. Gender was not associated to the presence or severity of TMD in the sample (chi-square test = 0.477, p = 0.353) (Table 1, 2).

The assessment of the number of occlusal contact points initially considered only the presence or absence of TMD. The participants without TMD had a mean of 19.41 (SD = 2.42) contact points on the right side and 20.24 (SD = 1.56) on the left side. The participants with TMD had a mean of 9.7 (SD = 2.97) contact points on the right side and 10.22 (SD = 2.88) on the left side. The difference in the number of contact points between groups was statistically significant (p < 0.005) (Table 3).

In the detailed analysis, the participants with TMD were classified based on severity. The mean number of occlusal contact points in those with mild TMD was 10.32 (SD = 3.11) on the left side and 10.74 (SD = 2.68) on the right. Among those with moderate TMD, the mean number of occlusal contact points was 8.00 (SD = 2.12) on the left side and 9.00 (SD = 3.74) on the right. Among those with severe TMD, the mean number of occlusal contact points was 8.67 (SD = 2.51) on the left side and 9.00 (SD = 2.64) on the right. No statistically significant differences were found among the participants with mild, moderate and severe TMD (Table 4).

### Discussion

In the present study there was a high prevalence of TMD among children aged 6 to 14 years (61.4%). TMD disrupts the functional balance of three fundamental elements: dental occlusion, muscles of mastication and TMJ [Miyawaki et al., 2004]. Thus, the stomatognathic system in children with signs and symptoms of TMD may be developing in a pathological fashion.

The aetiological factors of TMD in children are similar to those in adults. The most widely accepted notion is that there are initiating, predisposing and perpetuating factors. Initiating factors cause the installation of TMD;
predisposing factors increase the risk and are divided into systemic, psychological and structural factors; and perpetuating factors affect the progression or cure of TMD [Dworkin and Leresche, 1992]. However, the aetiology of TMD in young individuals is generally associated to parafunctional habits, trauma and occlusal, systemic and psychological factors. Early diagnosis is a prerequisite for an effective treatment and detailed questionnaires are important tools for the planning of each case. The present study employed the Helkimo questionnaire as a diagnostic means due to its ease of use and proven sensitivity for the age group studied [Muñoz et al., 2004].

The prevalence of TMD among children varies depending on the age and the criteria used in the examination. Different studies on the prevalence of TMD in children and adolescents report a 40% prevalence of signs and symptoms in younger groups (5 to 8 years), 46% in children of an intermediate age (9 to 12 years) and 31% in those between 13 and 15 years. Signs and symptoms of TMD in children and adolescents run from mild to moderate and may even be unconscious, thereby reflecting physiological and psychological changes. In the present study, in which the participants had a mean age of nine years (SD = 2.06 years), the prevalence of TMD was even higher (61.4%; n=27). The majority had a mild degree of TMD of a muscular origin. Scientific evidence demonstrates that the points of contact between occlusal surfaces of antagonist teeth during maxillomandibular contact exert an influence over the functional activity of the muscles of mastication and TMJ [Pakhala and Laine, 1991; Murray et al., 1996; Barbosa et al., 2008]. Thus, a lack or excess of occlusal interference may be the consequence of changes in contact positions secondary to the presence of joint and/or muscle pain and may cause mandibular deviation, resulting in excessive pressure on the joint [Fuji, 2002]. In the present study, the participants with TMD (regardless of the severity) had a lower number of contact points than those without TMD, although a number of studies report no direct influence between TMD and occlusal contact points [Cauas et al., 2004; Feteih, 2006; Bonakdarchian et al., 2009].

Based on the literature researched and the findings of the present study, the record of the distribution of occlusal contact, in combination with a clinical evaluation and detailed patient history, provides a better basis for the early and more effective rehabilitation of the stomatognathic system [Millstein and Maya, 2001; Ciancaglini et al., 2002].

**Conclusion**

There was a significant difference in the number of contact points in centric occlusion between children with and without TMD. Regardless of the severity, children with TMD had a significantly lower number of contact points on both sides in comparison to those without TMD.

**Aknowledgment**

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**References**