Comparative Evaluation of Signs of Temporomandibular Joint Dysfunction and Occlusal Discrepancies in Asymptomatic Men and Women: A Cross-Sectional Study

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Abstract

Context: Temporomandibular joint (TMJ) disorders represent a multifactorial disease process manifesting with various combinations of signs and symptoms. Several studies have shown that there is an increased prevalence of TMJ dysfunction among females; however, there has been no conclusive explanation for this increased occurrence. Occlusal discrepancies have been identified as a causative factor in several cases. Aims: The present study was designed to identify the presence of three signs of occlusal discrepancy, namely the presence of anterior and/or lateral slide from centric relation to centric occlusion, occlusal contact on the nonworking side, and disclusive contact distal to canine on working side on purposeful lateral movement of mandible, in among the population with no signs of TMJ dysfunction. Methods and Materials: A sample population of 620 patients consisting of 313 females and 307 males with no signs of TMJ dysfunction were included in this study. Individual patients were examined for maximum inter-incisal opening, deviation of mandible on opening and closing, presence of joint sounds, and the three abovementioned signs of occlusal discrepancies. Results and Conclusion: The results revealed that there was no statistically significant difference in the occurrence of signs of TMJ dysfunction and of occlusal discrepancies among symptom-free men and women.

Keywords: Joint sounds, occlusal discrepancies, temporomandibular joint dysfunction

Introduction

Temporomandibular disorders (TMDs) are among the most challenging diseases of today’s society. It is said to present the clinician with diagnostic, prognostic, and management problems. Of such TMDs, temporomandibular joint (TMJ) dysfunction is reported to present itself as a multifactorial disease process, that may manifest with various combinations of signs and symptoms. Women have been found to represent the majority of patients with TMJ dysfunction, and several studies have shown that the female population of patients with TMJ dysfunction is more than 80%. A few epidemiological studies have indicated that large portions of the general population exhibit signs and symptoms of TMJ dysfunction, while examining 217 men and 217 women without any symptoms suggestive of TMJ dysfunction, noted a high percentage of their patients having some sign of TMJ dysfunction. Interestingly, they noted that men and women exhibited signs of TMJ dysfunction to a fairly equal prevalence. They also quoted unpublished data of another similar study, wherein in 701 patients without symptoms, joint sounds were noted in 47%, deviated opening in 49%, and limited opening in 10%. Seventy-two percentage of these patients had exhibited at least one of these aforementioned signs. Huber and Hall suggested that the presence of such signs may be a physiological variation of the normal and not actually indicative of TMJ dysfunction.

Till date, there actually exists no proven explanation for the high incidence of women seeking treatment for TMJ dysfunction after reporting of such symptoms.
Occlusal discrepancies or disharmonies are said to represent a major factor in the development of TMJ dysfunction.\cite{3,22-24} Zarb and Thompson\cite{9} reported that 61% of their patients requiring treatment for TMJ dysfunction had some form of occlusal discrepancy. One such example of occlusal discrepancy is the presence of an anterior and/or lateral slide from centric relation (CR) to centric occlusion (CO).\cite{12-14,9,21,22,25} Two other examples of occlusal discrepancies during purposeful lateral shift of the mandible are the presence of nonworking side contacts\cite{12,13,21,22} and disusive contacts distal to the canine on the working side.\cite{21,25} The recognition, management, and subsequent correction of occlusal discrepancies is one of the prime objectives in the treatment of TMJ dysfunctions.\cite{5,15,26} However, it will be interesting to note whether asymptomatic women exhibit any difference in the occurrence of occlusal discrepancies as compared to men.\cite{12,21}

A positive association between the presence of occlusal discrepancies and signs and symptoms of TMJ dysfunction in the general population has been suggested.\cite{12,19} However, only one study has directly examined the presence of occlusal discrepancies and signs of TMJ dysfunction on the basis of gender in a population without symptoms.\cite{21} Furthermore, the above study was limited to a population of navy personnel of the USA. Importantly, a review of the past epidemiologic studies reveals substantial methodological deficiencies, so the results might be quite equivocal. Mostly, these studies incorporated restricted ethnic and/or age groups in their methodologies.\cite{12-19} Besides, the measured parameters of TMJ dysfunction and occlusal discrepancies did show variations from one study to the next.\cite{12-19} Thus, the present study is designed to study the purported association of occlusal discrepancies and signs of TMJ dysfunction on the basis of gender and age.

Three purported signs of TMJ dysfunction are limited or decreased jaw opening, deviation of jaw on opening and closing, and joint sounds.\cite{3,12,13,27} Three signs of occlusal discrepancy are the presence of an anterior and/or lateral slide from CR to CO on complete closure, occlusal contacts on the nonworking side and disusive contacts distal to canine on working side, during purposeful lateral movement of mandible.\cite{12,22,25} With these objective criteria in mind, this study was designed, with the aim of surveying a normal population without any reported symptoms of TMJ dysfunction, for the prevalence of these putative signs of TMJ dysfunction and to determine the presence of any gender or age variation.

**Materials and Methods**

The sample population consisted of 620 patients without symptoms suggestive of TMJ dysfunction. The patients, 313 females and 307 males, were among those who sought treatment for common dental ailments at the general outpatient department of dental teaching institution.

Another criteria for inclusion or exclusion of patients in this study was that no patient had more than two longstanding absent teeth or prosthesis for the same number for more than 2 months. Cases which had an edentulous area or single tooth prosthesis exactly opposite were also not included in the sample. None of the patients examined had received orthodontic therapy in the previous 2 years.

As mentioned above, none of the patients examined for this study had ever complained of TMJ pains or myofascial pain dysfunction.

The following materials were used in the examination of each patient:  a stethoscope, sticking plaster, millimeter ruler, vernier calipers, and articulation tape with good chair light. While one of the first three investigators examined the suitability of the patient to be included into the study by careful history taking and examination, the actual measurements and observations of occlusal discrepancies were recorded by any two of the later three investigators. Any disagreement in their observations was decided on by one of the first three authors. Intra- and inter-examiner reliability was established before the commencement of the study. A rate of concordance of >90% was recorded throughout the study, at 2 weekly intervals. The whole study was conducted in a 24 weeks period. Computerization of patient particulars ensured that no subject was repeated in the study.

Age and gender were recorded. The patient was seated upright in a regular dental chair. Maximum opening was determined by asking the subject to open comfortably wide and placing the tips of the digital vernier calipers on the incisal edges of the maxillary and mandibular incisors. Measurements were rounded to the nearest millimeter. Since vertical overbite was not measured in this study, the term, maximal interincisal distance is used rather than maximal opening.\cite{20} A measurement of <37 mm was interpreted as a limited opening.\cite{21} The next observation was the detection of deviation of the mandible on opening and closing. The patient was instructed to close on the posterior teeth. The investigators gently parted the upper and lower lips. The patient was then asked to open slowly to the wide position and closing slowly thereafter, repeating this motion several times while the investigator visually watched for any deviation. The absence of deviation was confirmed by keeping the tips of the thumbs of the investigator facing each other at the midline of the chin, and the pads of the other fingers at the TMJ. In case deviation was suspected, diamond-shaped pieces of sticking plaster were placed at nose tip and mental protruberance and deviation if any, confirmed on opening and closing.

To determine the presence of joint sounds, the diaphragm of the stethoscope was placed on the skin surface over the TMJ space, and the patient was instructed to open wide and close several times, slightly faster than the previous determination for deviation. Any pain or tenderness that was reported over the TMJ space during this exercise was reported to the first three authors, and if confirmed, meant that the patient was excluded from the study.

Occlusal discrepancy resulting from an anterior or lateral slide between CR and CO was determined in the manner described...
by Solberg et al.[12] Moderate posterior pressure was exerted on the chin, and the jaw was passively manipulated to the first tooth contact, such that the patient was closing in the most retruded position of mandible in relation to maxilla. With the aid of a millimeter rule at the sagittal plane, the magnitude of movement of the mandibular incisors from CR to CO was assessed visually. An easily observable anterior shift (>1 mm) was recorded as an anterior slide; and a lateral slide was recorded when a lateral shift (>1 mm) occurred from CR to CO.

To detect nonworking (balancing) contacts, articulation tape was placed between the maxillary and mandibular teeth of the patient. Then, the patient was assisted with lateral occlusal movements. Nonworking interferences were evaluated by direct observation and by location of the articulation tape markings. Positive findings were recorded.

The final observation was the detection of disclusive contacts posterior to the canine on the working side during lateral occlusal movements. The patient was similarly assisted in lateral occlusal movements. Disclusion of the canines on the working side was observed and recorded. During the study, the interexaminer reliability was tested by selecting the data of 10 random study subjects at every two weeks interval. A $\kappa$ coefficient >0.85 was recorded throughout the study.

Statistical analysis was done using the Chi-square test ($P = 0.05$).

**RESULTS**

A total of 313 females and 307 males formed the sample population as shown in Table 1. For the female patients, the age range was 18–59 years, with a mean age of 33.11 years. For the male patients, the age range was 18–56 years, with a mean age of 33.99 years. Nearly 62.66% of the female patients and 60% of the male patients were between the ages of 26 and 37 years.

Table 2 denotes the prevalence of the putative signs of the TMJ dysfunction, namely maximum interincisal opening below 37 mm, deviation of jaw on opening and/or closing, and jaw sounds on opening and/or closing. There were no significant differences between men and women in the occurrence of abovementioned signs.

Table 3 depicts the prevalence of occlusal discrepancies as percentages of the male and female populations. There were no significant differences between genders in the occurrence of CR to CO slides, nonworking side contacts, and working side disclusive contacts posterior to the canines.

Table 4 compares the total number and percentages of the patients (male and female) showing at least one of the putative signs of TMJ dysfunction. There was no statistical significance for gender prevalence.

Table 5 depicts the concurrent prevalence of the putative signs of TMJ dysfunction with the signs of occlusal discrepancy that have been investigated in this study. They have been represented as percentages of the male and female population of this study. No significant differences were identified between the two genders in the concurrent occurrence of any sign of TMJ dysfunction and any sign of occlusal discrepancy.

**DISCUSSION**

The prevalence of the maximum interincisal opening being <37 mm is in agreement with the findings of the previous study.[12,13,21] In fact, in the questionnaire study by Solberg et al.,[12] they had an even lesser incidence of restricted opening at 3.5% in a study sample of 739 patients, inspire their restricted mouth opening was set at 40 mm. Rieder et al.[13] and Huber and Hall[21] reported nearly similar findings of
the prevalence of restricted opening of 5.4% in population of 1040 and 6% in population of 434 patients, respectively. Similarly, the findings on deviation on opening, the present study was also in agreement with the findings of previous studies. Moreover, the previous researchers also did not report any statistically significant gender variation for these two signs of TMJ dysfunction. The prevalence of TMJ sounds between men and women was nearly equal and was in agreement with the findings of Huber and Hall. However, this prevalence was in disagreement with that in other reports. Rieder et al. observed a significant difference in the prevalence of joint sounds between men and women, 40% and 50%, respectively. Similarly, Solberg et al. reported a significant difference in the prevalence of joint sounds, 21% for men and 35% for women. Huber and Hall reported a much higher incidence of joint sounds in men and women at 50% and 51%, respectively. A lower percentage in the present study as compared to the latter study could be the lower mean age in the present study. A positive association between increasing age and an increased prevalence of joint sounds has been reported.

The prevalence of nonworking (balancing) contacts in this study, 26% for men and women each, is less than that of Huber and Hall i.e., 35% for men, 32% for women, and higher than the findings reported by Rieder et al., wherein nonworking contacts were present in 12% and 16% of the men and women, respectively. However, in the Rieder et al. study, only severe interferences were noted. Just as in the previous studies, no statistically significant variations are noticed between the genders for nonworking side contacts. Similarly, the findings of this study for CR to CO shift, conferred with that of Solberg et al. and Huber and Hall. The salient point here is that none of these studies showed any gender variation with respect to prevalence of occlusal discrepancies.

These results confirm that the high prevalence of female TMJ dysfunction patients with symptoms is probably due to factors other than the above-mentioned presence of putative signs of TMJ dysfunction and occlusal discrepancies. Many factors have been proposed to explain the predominance of female patients with symptoms of TMJ dysfunction. Women are reportedly more likely to seek healthcare than men and the incidence of psychophysiologic disease, acute arthritis, and headache is said to be greater in women. Kaintura et al. though in a questionnaire study have questioned the role of stress in causing TMJ dysfunction. Aufdemorte et al. have proposed a role for female sex hormones in the pathogenesis of TMJ dysfunction while Cordray has suggested an alteration in neuromuscular adaptive capacity in those who present with symptoms of TMJ dysfunction. However, no conclusive explanation for the predominance of female patients with TMJ dysfunction has been established, and additional research is required, especially of the longitudinal type. Alternatively, studies may be design to establish why male patients do not present with symptoms of TMJ dysfunction inspite of having a similar prevalence of putative signs of TMJ dysfunction and occlusal discrepancies as women.

**CONCLUSION**

From this study, it is concluded that there are no statistically significant differences in the prevalence of the putative signs of TMJ dysfunction and occlusal discrepancies between men and women. It is suggested that there are factors other than the presence of these signs of TMJ dysfunction and occlusal discrepancy, which are responsible for the predominance of female patients with TMJ dysfunction. The putative signs of TMJ dysfunction and occlusal discrepancy may not be primarily responsible for the etiology of TMJ dysfunction but may have an aggravating role at best in cases already having TMJ dysfunction. The authors do not suggest the need to avoid doing occlusal corrections as a means to manage TMJ dysfunction as studies by Kirveskari et al. have shown the beneficial role of occlusal corrections in the management of temporomandibular disorders.

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**Conflicts of interest**

There are no conflicts of interest.

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