

Evaluation of the Relationship Between Partial Edentulism and TMJ Disorders

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Temporomandibular joint disorders (TMD) are defined as clinical problems that affect the masticatory muscles, temporomandibular joint (TMJ) and the related structures or both. Since the teeth are one of the most important components of the masticatory system and have a close relationship with muscles and TMJ they can induce changes in these components. The aim of the present study was to evaluate the prevalence of TMD in patients with partial edentulism and compare it with subjects with complete dentition. The present study was carried out on 100 subjects with partial edentulism with a free end (case group) and 100 subjects with complete dentition (control group). Data were collected with the use of Fonseca questionnaire and extraoral and intraoral clinical examinations. In the case group, 58% of the subjects exhibited the minimum degree of TMD, which was significantly different from the control group ($P < 0.03$). Clicking was the most prevalent problem of TMJ in both groups and the TMD manifestations increased with a decrease in the occlusal support areas based on Eichner index; the relationship between TMD severity and Eichner index was significant ($P < 0.02$). The results of the present study showed that partial edentulism is an important etiologic factor for TMJ disorders. Therefore, it is suggested that proper guidelines be provided for patients in order to replace lost teeth and create a stable occlusion.

Keyword: Partial edentulism, temporomandibular joint, temporomandibular joint disorders.

Temporomandibular joint disorders are very important in the medical science. Although these disorders have attracted ever-increasing attention in recent years, they are still considered a medical mystery¹. Approximately 65-85% of humans experience some symptoms of

temporomandibular joint dysfunction (TMD) at some time during their life. In this context, 5-7% of the whole population require treatment to decrease the symptoms of TMD.

Three factors are responsible for TMJ disorders: susceptibility, tissue changes and psychological factors. To make sure of the diagnosis of joint disorders, all the three factors should be present. An individual's emotional state is more important in the incidence of TMJ disorders

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at present. Psychological stresses are one of the inevitable components of our daily life now. Studies have shown that individuals are under different degrees of stress and usually exhibit increased muscular activity⁵.

In addition, it has been shown that there is a relationship between the number of teeth in the oral cavity and changes in the TMJ⁴. Loss of teeth exerts extra loads on the TMJ, contributing to the progression of structural changes in TMJ, which increase with aging⁶. Loss of first and second molars results in a mean of 0.56 mm of condyle displacement relative to the cranium⁷.

Joint sounds are present in 44.3% of patients with partial edentulism and the prevalence increases to 55.7% in patients with bilateral edentulism⁸; 60.2% of patients with loss of occlusal support have joint dysfunction, indicating that occlusal support is a factor in mastication and progression of TMD¹⁰.

The aim of the present study was to determine the prevalence of TMD in partially edentulous patients and evaluate the relationship between tooth loss and TMD.

MATERIALS AND METHODS

The study population in the present case/control study consisted of 2 groups with 100 subjects in each as the control and case groups, with an age range of 18-70 years. The case group consisted of partially edentulous patients in the Kennedy C I or C II classification and the controls consisted of subjects with complete dentition.

Data were collected with the use of a questionnaire and clinical examinations. A history was taken with the use of Fonseca questionnaire, which determines the degree and severity of TMD. The questionnaire consists of 10 questions for the evaluation of the presence of pain in the TMJ, head and neck during mastication, and presence of parafunctional habits, limitations in movement, joint clicks, a feeling of an abnormal occlusion and a feeling of psychological stress.

Physical examinations were carried out with the use of a dental mirror, a metallic ruler, a stethoscope and a probe. The numeric values of mouth opening, lateral excursions, deviations in the path of lateral excursions, presence or absence of clicking and crepitation, joint locking, condylar

luxation and pain in the TMJ and masticatory muscles were evaluated in extraoral examinations.

In the intraoral examinations, the subjects oral hygiene and gingival statuses were evaluated with plaque index (Table 1) and gingival index (Table 2), respectively. The number of teeth lost and the classification of the edentulous area were recorded in the data sheets. The status of occlusion was recorded based on Eichner index, which relies on the presence or absence of occlusal contacts in each premolar or molar area, referred to as the occlusal support. A maximum of 4 occlusal support areas can exist and in each area there should be a contact between a tooth and its opposing tooth. Each dental system is classified in one of the six groups of this index: A (4 areas of occlusal support; B1 (3 areas of occlusal support; B2 (2 areas of occlusal support); B3 (one area of occlusal support); B4 (contact between the anterior teeth with no areas of occlusal support); C (no contact between the remaining teeth) (6).

Data were collected and analyzed with SPSS 20. Chi-squared test was used to evaluate the relationships between and comparison of the prevalence of qualitative variables. T-test was used to compare quantitative variables.

RESULTS

There were 100 subjects in each group in the present study. The case group consisted of 59 females and 41 males with a mean age of 45.7 years, and the control group consisted of 61 females and 39 males with a mean age of 32.7 years. Of all the subjects in both groups in the present study, 101 subjects (50.5%) exhibited a minimum degree of TMD, with 58% of these subjects in the case group, indicating a significant difference from the control group ($P < 0.03$). Pain in the facial muscles (65.4%), emotional and psychological sensitivity (65.3%), headache and joint sounds were the most frequent symptoms detected in subjects with a minimum degree of TMD.

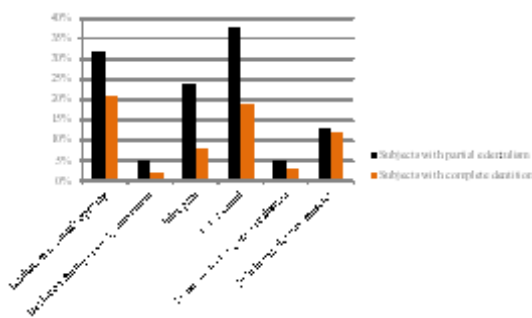
The maximum mouth opening in the case group was 45.2 mm, with 46.3 mm in the control group, indicating no significant differences between the two groups ($P < 0.2$). On the other hand, 32% and 21% of the subjects in the case and control groups, respectively, had limitations in mouth opening, with no significant differences between

Table 1. Dental plaque index based on Ratteitschek Atlas of Periodontology

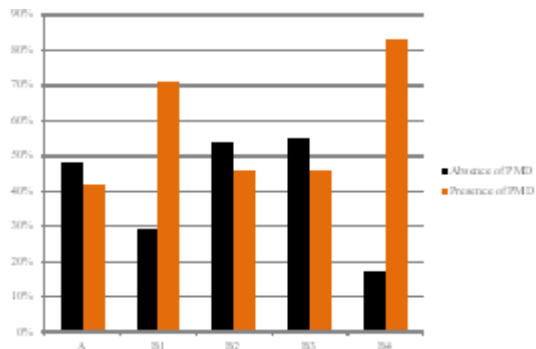
Grade	
0	No plaque present
1	Presence of a thin layer of plaque at the gingival margin detected by an explorer only
2	Presence of a moderate amount of plaque at gingival margins, absence of plaque at interdental areas, plaque visible by direct visualization
3	A large amount of plaque at gingival margins; interdental areas are filled with plaque

Table 2. Dental plaque index based on Ratteitschek Atlas of Periodontology

Grade	
0	Normal gingiva, no inflammation, abnormal color and bleeding
1	Mild inflammation, minor color change and minor change in gingival surface texture, without bleeding
2	Moderate inflammation, rubor, swelling, bleeding on probing
3	Severe inflammation, rubor and swelling, tendency for spontaneous bleeding and sometimes ulcerated



Graph 1. Comparative frequencies of TMD symptoms and signs in subjects with partial edentulism and those with complete dentition



Graph 2. Percentages of comparative frequencies of TMD in each edentulous group based on Eichner index

the two groups ($P < 0.2$). In the clinical examination, the most prevalent problem of the joint in the two groups was clicking (with 38% in the case and 19% in the control group), with a statistically significant difference between the two groups ($P < 0.001$). Pain and sensitivity in the joint were the second most frequent problems (24% in the case and 8% in the test group), with a significant difference between the two groups ($P < 0.01$). There were no significant differences between the two groups in other clinical symptoms. Deviation from the path during mouth opening was detected in 5% and 2% of the subjects in the case and control groups, respectively, with no significant difference between the two groups ($P < 0.2$). Joint locking was observed in 5% and 3% of the subjects in the test

and control groups, respectively, with no significant difference between the two groups ($P < 0.3$). Crepitation and joint luxation were observed in none of the subjects in the two groups. Pain and sensitivity percentages were almost similar in the two groups (13% in the case group and 12% in the control group), with no significant difference between the two groups ($P < 0.7$).

There was a significant difference in the frequency of TMD between the two groups (58% and 43% in the case and control groups, respectively). Based on the Eichner index classification, group A had the maximum occlusal contacts, which was observed in 57.7% of the subjects; such subjects had no TMD problems and the frequency of TMD increased with a decrease in occlusal support areas

based on data presented in Table 3, which was significant statistically ($P < 0.2$).

DISCUSSION

The relationship between the severity of TMJ disorders and loss of teeth has always been a controversial issue. In general, the factors responsible for TMD have been categorized as muscular, occlusal and psychological. In this context, occlusal factors such as partial edentulism have been reported as a major etiologic factor for pathologic conditions of TMJ.

Although some studies, including those by Hattori *et al.*,⁸ and Sato *et al.*,⁹ suggested that loss of posterior teeth has no effect on creating or increasing loads on TMJ, the present study showed a clear relationship between the severity of TMD and some of its manifestations with partial edentulism. In general, the highest prevalence of TMD was observed in partially edentulous subjects (58%), compared to 43% in the control group. Krzemeien, too, reported such a difference (87% in partially edentulous subjects vs. 70% in subjects with complete dentition). These results might suggest that a lack of support from the posterior teeth might somehow affect the balance between TMJ structures. One of the reasons might be the fact that loss of a number of teeth might result in the tilting of the adjacent teeth toward the edentulous area, resulting in premature contacts, finally giving rise to changes in the position of the condyle in the fossa and TMJ disorders¹².

Apart from a lack of joint balance, some other factors, too, including stress, should be present to induce morphological changes in the joint and increase joint sounds¹⁵. In the present study, too, psychological factors were detected in 65.3% of subjects who had a mild degree of TMD.

In the present study, there was a significant relationship between TMD severity and a decrease in the number of occlusal support areas based on Eichner index ($P < 0.02$). A study by Kayser *et al.*, showed similar results. In that study, Kayser *et al.*, evaluated the effect of partial edentulism on the performance of TMJ with the use of three parameters: pain in the joint and muscles, symptoms in the ear and limitations in mandibular movements. The researchers concluded that if at least one of the four occlusal units are present, it

is possible for such an oromaxillary system to adapt itself to partial edentulism. Meanwhile, unilateral or bilateral absence of occlusal support areas significantly increases the symptoms of TMD.

Evaluation of different types of TMJ problems showed that the most prevalent pathologic conditions in the subjects was joint sound (38%), consistent with the results of studies by Hanso *et al.*, and Amini and Sadeghi.

Consistent with the results of a study by Garcia *et al.*,¹¹ the results of this study showed no significant relationship between TMD and Kennedy CI I and CI II partial edentulism; however, in relation to the type of partial edentulism (Kennedy classification) the highest prevalence of TMJ disorders was associated with Kennedy CI I partial edentulism (59%). Similar results were also reported by Amini and Sadeghi¹², i.e. in bilateral free-end partial edentulism there is an increase in the load exerted on TMJ, compared to other types of partial edentulism, resulting in deviation, biomechanical changes and joint instability.

CONCLUSION

The results of the present study showed that partial edentulism can be an important factor in the induction of TMJ disorders; therefore, it is suggested that clinicians provide guidelines for such patients to replace lost teeth and refer such patients to specialty centers to create a stable occlusion to prevent more complex, and possibly irreversible, problems in future.

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