

Incidence of Temporomandibular Disorders at Tooth Loss in the Supporting Zones

Nikša Dulčić, Josip Pandurić, Sonja Kraljević, Tomislav Badel
and Robert Čelić

Department of Prosthodontics, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

ABSTRACT

Although the literature reports that occlusal disorders can be associated with temporomandibular disorders (TMD), their direct scientific correlation is still mainly unproved. The aim of this study was to establish the incidence of symptoms and signs of TMD and tissue-specific diagnoses in a population of subjects with tooth loss in the supporting zones. The study was conducted on 196 partially edentulous subjects (Eichner's class II and III) at the average age of 51.2. Manual functional analysis was used as a diagnostic procedure. Chi-square test for independent samples was used for establishing the significance of the differences between the variables. In the total sample, 16.3% of the subjects had symptoms and signs of temporomandibular disorders (TMD), while in 46.9% of the subjects a tissue-specific diagnosis of TMD was found. The most frequent tissue-specific diagnoses were osteoarthritis and total or partial anterolateral disc displacement. A statistically significant difference between Eichner's class II and III was found for the tissue-specific diagnoses of myofascitis of the lateral pterygoid muscle, partial anterolateral disc displacement and capsulitis. The results of this study suggest that the incidence and intensity of TMD are higher in subjects with greater tooth loss in the supporting zones, regardless of their sex.

Key words: manual functional analysis, supporting zones, temporomandibular disorders

Introduction

The etiology of temporomandibular disorders (TMD) comprises many factors of endogenous and exogenous origin. En-

dogeous etiological factors include idiopathic, systemic, psychosomatic, psychosocial and pathophysiological factors

of TMD, while exogenous factors include trauma and occlusal disorders resulting from prosthetic, conservative, orthodontic, surgical or periodontal treatment¹. Although the literature reports that occlusal disorders such as anterior open occlusal relationship, vertical overlap exceeding 6 or 7 mm, difference between the retruded contact position and intercuspal contact position exceeding 2 mm, five or more extracted posterior teeth and unilateral reverse articulation can be associated with TMD^{2–7}, a direct scientific correlation between malocclusion and TMD is still mainly unproved^{8–10}.

TMD often occur in general population. Many studies have been undertaken on various populations in order to determine causes and symptoms and signs of TMD^{11–17}. Several studies examined the influence of subjects' sex on TMD incidence^{18–24}, and there were further investigations into the correlation between TMD and tooth loss, changes in the occlusion caused by tooth loss, degree of edentulism and type of prosthetic replacement^{25–31}. However, the findings of such studies have considerable variations due to differences in the terminology of description, data collection, analytic approaches and factors selected for the study³².

The aim of this study was to establish the incidence of symptoms and signs of TMD and tissue-specific diagnoses in a population of subjects with tooth loss in the supporting zones. The incidence was examined in relation to missing teeth in the supporting zones and sex of the subjects.

Subjects and Methods

The study was conducted on 196 partially edentulous subjects at their random visits to the clinics of the Department of Prosthodontics of the Faculty of Dentistry, University of Zagreb. The sub-

jects were aged between 36 and 71 (mean age was 51.2), and they had tooth loss in at least one supporting zone. There were 68 males and 128 females.

The subjects were divided according to the number of antagonist teeth contacts in the supporting zones. Eichner³³ defined three classes of these contacts: class I – antagonist contacts are present in all four supporting zones, class II – antagonist contacts are present, but not in all four supporting zones, class III – there are no antagonist contacts in any supporting zone. This study comprised subjects of Eichner's class II and III.

Manual functional analysis as defined by Bumann and Lotzmann³⁴ was used as a diagnostic procedure in this study. A short specific case history was taken first. It included dental, medical and personal history of the subject, and data about the presence of one or more TMD symptoms – pain, crepitation or clicking in the head and neck region.

Structures within the temporomandibular joint (TMJ) and masticatory muscles were individually examined with specific manual techniques that consisted of two parts: basic and expanded examination^{1,34}. By means of active and passive mandibular movements and isometric contraction of the masticatory muscles, the aim of basic examination was to determine whether TMD were arthrogenous, myogenous or neurogenous. Expanded examination of arthrogenous disorders was performed by means of dynamic compressions and dynamic translations including mouth opening, protrusion and closing. They distinguished tissue-specific causes of clicking in the TMJ region. The incidence, intensity and time of clicking in the pathway of the condyles were observed after each compression and translation and compared with the results of active movements without manipulation. The occurrence of pain and crepitation was also recorded. The results

of the occurrence of crepitation, pain and clicking on active and passive mandibular movements and isometric contraction of the masticatory muscles, as well as dynamic compressions and dynamic translations, were entered into a modified check list³⁵. Tissue-specific diagnoses were determined based on the data from the check list. Each subject could have one or more tissue-specific diagnoses. Chi-square test for independent samples was used for establishing the significance of the difference between the incidence of TMD in relation to Eichner's classification and the subjects' sex. The significance levels of $p > 0.05$, $p < 0.05$ and $P < 0.01$ were determined.

Results

The history established that 16.3% of the subjects had at least one symptom of TMD. TMD symptoms were found in 25.5% of Eichner's class II and in 7.8% of Eichner's class III subjects. A statistically significant difference in the incidence of symptoms between the subjects with Eichner's class II and III was found ($\chi^2 = 11.2$; $df = 2$; $p < 0.01$). The distribution according to sex showed that 23.5% of males and 12.5% of females had at least one symptom of TMD. A statistically significant difference in the incidence of TMD symptoms was found between sexes ($\chi^2 = 3.95$; $df = 2$; $p < 0.05$). Symptoms were found in 22.2% of females and in 30% of males with Eichner's class II, and in 5.4% of females and in 14.2% of males with Eichner's class III. A statistically significant difference in the incidence of TMD symptoms in females was found between Eichner's class II and III ($\chi^2 = 8.07$; $df = 2$; $p < 0.01$).

Clinical examination by means of manual functional analysis reported TMD in 46.9% of the subjects. TMD was found in 51.1% of Eichner's class II and in 43.1% of Eichner's class III subjects. No statisti-

cally significant difference was found in the incidence of TMD between Eichner's class II and III. The distribution according to sex showed that 47% of males and 46.8% of females had TMD. No statistically significant difference was found between sexes. Table 1 shows the incidence of TMD in relation to Eichner's classification and sex.

TABLE 1
INCIDENCE OF TMD SIGNS IN RELATION TO TOOTH LOSS IN THE SUPPORTING ZONES (EICHNER'S CLASSIFICATION) AND SEX

Eichner's classification	Males	Females	Total
Class II	20/40	28/54	48/94
Class III	12/28	32/74	44/102
Total	32/68	60/128	92/196

Tissue-specific diagnoses were determined based on the data achieved by manual functional analysis. Table 2 shows the incidence of tissue-specific diagnoses and their distribution in relation to sex and Eichner's classification. A total of 112 tissue-specific diagnoses (1.16 diagnoses per subject) were established in 96 subjects with TMD. The most frequent tissue-specific diagnoses were osteoarthritis (16.3% of the subjects), total disc displacement (11.2% of the subjects), partial anterolateral disc displacement (9.1% of the subjects) and myofascitis of the lateral pterygoid muscle (6.1% of the subjects), while other tissue-specific diagnoses occurred in 14.2% of the subjects. Eichner's class II subjects accounted for 57.1% of the total number of diagnoses, and Eichner's class III subjects accounted for 42.9%. There was no statistically significant difference in the total incidence of tissue-specific diagnoses between Eichner's class II and III. A statistically significant difference between Eichner's

TABLE 2
INCIDENCE OF TISSUE-SPECIFIC DIAGNOSES IN RELATION TO TOOTH LOSS IN THE SUPPORTING ZONES (EICHNER'S CLASSIFICATION) AND SEX

Tissue-specific diagnosis	Eichner's class II			Eichner's class III			Total (N=196)
	Males (N=40)	Females (N=54)	Total (N=94)	Males (N=28)	Females (N=74)	Total (N=102)	
Osteoarthritis	6	6	12	8	12	20	32
Osteoarthritis	2	0	2	0	0	0	2
Myofascitis of contractor muscles	0	0	0	2	2	4	4
Myofascitis of the lateral pterygoid muscle	2	8	10	0	2	2	12
Capsulitis of the lateral ligament	0	2	2	0	2	2	4
Disc hypermobility	0	2	2	0	2	2	4
Partial anteromedial disc displacement	2	0	2	0	0	0	2
Partial anterolateral disc displacement	7	7	14	2	2	4	18
Total anterior disc displacement	10	2	12	1	9	10	22
Disc displacement with adhesion	0	2	2	0	0	0	2
Cartilage hypertrophy	0	0	0	0	0	0	0
Condyle hypermobility	0	2	2	2	2	4	6
Disc displacement with terminal reposition	0	0	0	0	0	0	0
Capsulitis	4	0	4	0	0	0	4
Total	33	31	64	15	33	48	112

class II and III was found for the tissue-specific diagnoses of myofascitis of the lateral pterygoid muscle ($\chi^2=5.66$, $df=1$, $p<0.05$), partial anterolateral disc displacement ($\chi^2=5.86$, $df=1$, $p<0.05$) and capsulitis ($\chi^2=4.25$, $df=1$, $p<0.05$). The total sample showed a statistically significant difference between males and females for the tissue-specific diagnosis of capsulitis ($\chi^2=7.26$, $df=1$, $p<0.01$). A statistically significant difference between sexes was

also found within the group of subjects with Eichner's class II for the tissue-specific diagnosis of capsulitis ($\chi^2=5.12$, $df=1$, $p<0.05$), but within the group of subjects with Eichner's class III no statistically significant difference between sexes was found in relation to tissue-specific diagnoses. A statistically significant difference between Eichner's class II and III was found in females for the tissue-specific diagnoses of myofascitis of the lat-

eral pterygoid muscle ($\chi^2=5.36$, $df=1$, $p<0.05$) and partial anterolateral disc displacement ($\chi^2=4.31$, $df=1$, $p<0.05$), and in males for the tissue-specific diagnosis of total disc displacement ($\chi^2=4.20$, $df=1$, $p<0.05$).

Discussion and Conclusions

In this study 16.3% of the subjects reported symptoms of TMD in their case histories, which corresponds to the study results by Hansson and Nilner¹¹, Agerberg and Inkapool¹⁴ and Magnusson, Egermark and Carlsson³⁶, who reported symptoms of TMD in 15–20% of the subjects, while Okeson³⁷ found a considerably higher percentage of subjects with subjective symptoms. The difference between these results can be explained by different psychosocial status of the groups of subjects and different education and awareness of the subjects. The relation between symptoms of TMD and subjects with Eichner's class II and III established in this study is in accordance with the research carried out by Bawendi²⁵, Choy and Smith²⁷ and Sassen²⁸, while the established relation between the frequency of symptoms and the subjects' sex is contrary to the results obtained by Rieder et al.¹⁹ and Helkimo³⁸.

By manual functional analysis TMD were diagnosed in 46.9% of subjects, which corresponds to the study results by Hansson and Nilner¹¹ and Helkimo³⁸. The research results of other authors indicate signs of TMD in 50–80% of subjects^{13,14,31,38,39}. In this study no statistically significant difference was found in the incidence of TMD between Eichner's class II and III, which partially corresponds to the research results by Kerschbaum and Voss²⁶, Sassen²⁸ and Seligman and Pullinger³¹. Almost identical TMD incidence was found in males and females, which corresponds to the research results by Agerberg and Carls-

son¹⁸, Lundh and Westesson²² and Carlsson⁴⁰, while other authors report a higher TMD incidence in females than in males^{16,20}.

Bumann and Zaboulas⁴¹ compared their tissue-specific diagnoses of the TMJ achieved by manual functional analysis with magnetic resonance imaging of the TMJ. Their results showed a correspondence of 80–94% with magnetic resonance findings, which confirms the reliability and credibility of manual functional analysis as a clinical diagnostic method. Therefore, the incidence of tissue-specific diagnoses in this study determined by manual functional analysis could be compared with the findings by other authors that were based mainly on magnetic resonance imaging of the temporomandibular joint^{39,42–46}. The incidence of osteoarthritis in the population of this study is in accordance with the research by Peroz³⁹ and Carpuso⁴², and the findings for total disc displacement and partial anterolateral disc displacement have also been confirmed by several authors^{43–46}. The most frequent myogenous tissue-specific diagnosis was myofasciitis of the lateral pterygoid muscle, and a high frequency of pain associated with the lateral pterygoid muscle was confirmed by other authors^{40,42}. The results of this study indicated a higher incidence of myogenous diagnoses in the subjects with a lower tooth loss (Eichner's class II), while arthrogeous diagnoses were more frequent in the subjects with Eichner's class III, which is in accordance with the findings by Bumann, Kopp and Ewers³⁰ and Peroz³⁹. In contrast to these studies, Lundh and Westesson²² and Roberts et al.²⁹ did not establish any correlation between signs of TMD and tooth loss.

This study suggests that the incidence and intensity of TMD are higher in subjects with greater tooth loss in the supporting zones, regardless of their sex. It should also be pointed out that although

a rather small number of subjects reported symptoms of TMD in their case histories, clinical examination by manual functional analysis indicated at least one sign of TMD in almost 50% of all subjects. This may increase the awareness that

there may be a larger number of patients with treatment needs in the wider population.

REFERENCES

1. BUMANN, A., U. LOTZMANN: Funktionsdiagnostik und Therapieprinzipien. (Thieme Verlag, Stuttgart, 2000). — 2. PULLINGER, A. G., D. A. SELIGMAN, J. A. GORNBEIN, J. Dent. Res., 72 (1993) 968. — 3. MCNAMARA, J. A. Jr., D. A. SELIGMAN, J. P. OKESON, J. Orofac. Pain, 9 (1995) 73. — 4. RAUSTIA, A. M., P. M. PIIRTINIEMI, J. PYHTINEN, Cranio., 13 (1995) 152. — 5. HENRIKSON, T., E. C. EKBERG, M. NILNER, Acta Odontol. Scand., 55 (1997) 229. — 6. ČELIĆ, R., V. JEROLIMOV, J. PANDURIĆ, Int. J. Prosthodont., 15 (2002) 43. — 7. ČELIĆ, R., V. JEROLIMOV, J. Oral. Rehabil., 29 (2002) 58. — 8. SELIGMAN, D. A., A. G. PULLINGER, W. K. SOLBERG, J. Prosthet. Dent., 59 (1988) 483. — 9. SELIGMAN, D. A., A. G. PULLINGER, J. Craniomandib. Disord., 3 (1989) 227. — 10. CACCHIOTTI, D. A., O. PLESH, P. BIANCHI, C. MCNEILL, J. Craniomandib. Disord., 5 (1991) 167. — 11. HANSSON, T., M. NILNER, J. Oral. Rehabil., 2 (1975) 313. — 12. INGERVALL, B., B. MOHLIN, B. THILANDER, J. Oral. Rehabil., 7 (1980) 185. — 13. RUGH, J. D., W. K. SOLBERG, J. Dent. Edu., 49 (1985) 398. — 14. AGERBERG, G., I. INKAPOOL, J. Craniomandib. Disord., 4 (1990) 154. — 15. JAGGER, R. G., C. WOOD, J. Oral. Rehabil., 19 (1992) 353. — 16. WAMAN, A., J. Orofac. Pain, 9 (1995) 235. — 17. MATSUKA, Y., H. YATANI, T. KUBOKI, A. YAMASHITA, Cranio., 14 (1996) 158. — 18. AGERBERG, G., G. E. CARLSSON, Acta Odontol. Scand., 30 (1971) 597. — 19. RIEDER, C. E., J. T. MARTINOFF, S. A. WILCOX, J. Prosthet. Dent., 50 (1983) 81. — 20. PULLINGER, A. G., D. A. SELIGMAN, W. K. SOLBERG, J. Prosthet. Dent., 59 (1988) 228. — 21. HUBER, M. A., E. H. HALL, Oral Surg. Oral Med. Oral Pathol., 70 (1990) 180. — 22. LUNDH, H., P. L. WESTESSON, Oral Surg. Oral Med. Oral Pathol., 72 (1991) 637. — 23. LIST, T., S. F. DWORIN, J. Orofac. Pain, 10 (1996) 240. — 24. KUTTILA, M., P. M. NIEMI, S. KUTTILA, P. ALANEN, Y. LE BELL, J. Orofac. Pain, 12 (1998) 67. — 25. BAWENDI, B., Dtsch. Zahnärztl. Z., 3 (1977) 931. — 26. KERSCHBAUM, T., R. VOSS, Dtsch. Zahnärztl. Z., 33 (1978) 439. — 27. CHOY, E., O. E. SMITH, J. Oral. Rehabil., 7 (1980) 331. — 28. SASSEN, H., Dtsch. Zahnärztl. Z., 37 (1982) 969. — 29. ROBERTS, C. A., R. H. TALLENTS, R. W. KATZBERG, R. E. SANCHEZ-WOODWORTH, M. A. ESPELAND, S. L. HANDELMAN, Oral Surg. Oral Med. Oral Pathol., 63 (1987) 645. — 30. BUMANN, A., S. KOPP, R. EWERS, Dtsch. Zahnärztl. Z., 44 (1989) 962. — 31. SELIGMAN, D. A., A. G. PULLINGER, J. Craniomandib. Disord., 5 (1991) 265. — 32. MCNEILL, C.: Temporomandibular disorders: guidelines for classification, assessment, and management. (Quintessence Publishing Co., Chicago, 1993). — 33. EICHNER, K., Dtsch. Zahnärztl. Z., 10 (1955) 1831. — 34. BUMANN, A., LOTZMANN, U.: TMJ Disorders And Orofacial Pain – The Role Of Dentistry In A Multidisciplinary Diagnostic Approach. (Thieme, Stuttgart – New York, 2002). — 35. DULČIĆ, N.: Correlation between changes in temporomandibular joint disc and tooth loss. In Cro. Master Thesis. (School of Dental Medicine, University of Zagreb, Zagreb, 2001). — 36. MAGNUSON, T., I. EGERMARK, G. E. CARLSSON, J. Orofac. Pain, 14 (2000) 310. — 37. OKESON, J. P.: Orofacial pain: guidelines for assessment, diagnosis, and management. (Quintessence Publishing Co., Chicago, 1996). — 38. HELKIMO, M.: Studies on function and dysfunction of the masticatory system. Thesis. (University of Göteborg, Göteborg, 1974). — 39. PEROZ, I., Inform. Orthodont. Kieferorthop., 29 (1997) 381. — 40. CARLSSON, G. E., J. Orofac. Pain, 13 (1999) 232. — 41. BUMANN, A., D. ZABOULAS, Eur. J. Orthod., 18 (1996) 511. — 42. CARPUSO, U., Minerva. Stomatol., 45 (1996) 321. — 43. RAMMELSBERG, P., W. GERNET, U. NEUMAIER, Dtsch. Zahnärztl. Z., 47 (1992) 444. — 44. KATZBERG, R. W., P. WESTESSON, R. H. TALLENTS, C. M. DRAKE, J. Oral. Maxillofac. Surg., 54 (1996) 147. — 45. EBERHARD, D., H. P. BANTLEON, W. STEGER, Eur. J. Orthod., 22 (2000) 489. — 46. WEINBERG, L. A., J. K. CHASTAIN, J. Am. Dent. Assoc., 117 (1990) 305.

N. Dulčić

Department of Prosthodontics, School of Dental Medicine, University of Zagreb, Gundulićeva 5, 10000 Zagreb, Croatia

UČESTALOST TEMPOROMANDIBULARNIH POREMEĆAJA KOD GUBITKA ZUBI U POTPORNIM ZONAMA

SAŽETAK

Iako je u literaturi opisano da okluzijski poremećaji mogu utjecati na temporomandibularne poremećaje (TMD), njihova direktna znanstvena povezanost još je uglavnom nepotvrđena. Cilj ovog istraživanja bio je utvrditi učestalost simptoma i znakova TMD-a i tkivnospecifičnih dijagnoza u populaciji ispitanika s gubitkom zubi u potpornim zonama. Istraživanje je provedeno na 196 djelomično bezubih ispitanika prosječne starosti 51,2 godine. Manualna funkcijska analiza korištena je kao dijagnostički postupak. Pomoću chi-square testa za nezavisne uzorke utvrđena je značajnost razlika između varijabli. U ukupnom uzorku ispitanika 16,3% ispitanika imalo je simptome TMD-a, dok je u 46,9% ispitanika postavljena tkivnospecifična dijagnoza TMD-a. Najčešće tkivnospecifične dijagnoze bile su osteoartroza te potpuna i djelomična anterolateralna dislokacija zglobne pločice. Utvrđena je statistički značajna razlika između klase II i III po Eichneru u tkivnospecifičnim dijagnozama miofascitisa lateralnog pterigoidnog mišića, djelomične anterolateralne dislokacije zglobne pločice i kapsulitisa. Rezultati ovog istraživanja pokazuju da su učestalost i intenzitet TMD-a veći u ispitanika s većim gubitkom zubi u potpornim zonama, bez obzira na njihov spol.

Ključne riječi: funkcijska analiza, potporn zone, temporomandibularni poremećaji