

Dentists' knowledge of occlusal splint therapy for bruxism and temporomandibular joint disorders

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Abstract

Aims: The aim of this study was to investigate dentist's approaches to the use of splint therapy for myofascial pain, bruxism, and temporomandibular joint (TMJ) disorders and to assessment of treatment modalities.

Materials and Methods: A 12-item questionnaire was developed to determine dentists' knowledge of TMJ disorders and approaches for occlusal splint treatments. The researchers spoke with each dentist included in the study at his/her clinic or by telephone to assess their immediate knowledge and approach to the TMJ disorders. Chi-squared test was performed to analyze the values. The confidence interval was set as 95%.

Results: A total of 370 dentists working in Turkey were participated in this study. The most common splint application reason for occlusal splint treatment was bruxism (77.8%) while TMJ pain was very rare (%1.4). The use of hard splint ratios for 0–5 years of professional experience was 57.0%, 42.4.0%, and 26.8% for the experience of 5–15 years and over 15 years groups, respectively ($P < 0.001$). While the dentists' with sufficient knowledge soft splint application rates were 11.6%, hard splint application rates were 43.4% for the dentists with sufficient knowledge. Occlusion adjustment rate of dentists who practice in all three groups was under 16.0%.

Conclusions: The knowledge of the dentists about TMJ disorders and occlusal splint therapy were found to be insufficient. Their knowledge decreased with increasing experience.

Key words: Bruxism, occlusal splints, surveys, temporomandibular joint disorders

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Introduction

Occlusal splint therapy is the most commonly applied treatment modality in dentistry for myofascial pain and temporomandibular joint (TMJ) disorders.^[1] This modality is the primary approach to the treatment of several TMJ

disorders and is generally performed for myofascial pain related to bruxism and occlusal disharmony. Occlusal splints are also used to reduce clenching-induced earache and tooth pain and to alter certain headache patterns.^[2,3] They are sometimes used as adjunctive therapy to manage symptoms associated with TMJ disc derangement.^[4] Furthermore, controversial outcomes of the efficiency of occlusal splints have shown that the management of treatment success is not clearly explained as a specific therapy.^[1,5]

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The choice of an occlusal splint type is based on several factors.^[6] Soft splints are often used because they are readily and inexpensively fabricated^[7] and can effectively reduce muscle and TMJ pain,^[8,9] but hard splints^[10,11] have been shown to be consistently effective in patients with TMJ disorders. Therapeutic success is affected by the dentist's knowledge of TMJ disorders, therapy duration, splint type, and occlusal adjustment. A problem with any of these factors might result in disease progression or the development of a different disease. Only a few survey studies focused on the occlusal splint therapy have been declared.^[1,12,13]

The survey of USA dentists' showed that a significant number of dentists treat the bruxism patients with occlusal splints and a large number of the dentists made hard occlusal splints.^[13] Ommerborn *et al.*^[11] compared the therapies used most commonly by general dentists and dental specialists in Germany for the management of bruxism, revealing many differences between groups. In a survey study in Sweden, it was shown that the most common reasons for the occlusal splint treatment were bruxism, headache, and replacement of a previous appliance.^[14] Lindfors *et al.*^[12] revealed that large variations were found between the dentists in according to treatment indications, combinations with other treatments, scoring of clinical findings, follow-up periods, and evaluation of treatment results.

There is little information about dentists' approaches to myofascial pain, bruxism, and TMJ disorders in Turkey currently. Thus, the aim of this study was to investigate general dentists' approaches to occlusal splints therapy, as well as treatment modalities for bruxism, myofascial pain, and TMJ disorders and to assessment of their knowledge about this topic.

Materials and Methods

Among general dentists registered on the list of Turkish Dental Association members in 2013, 400 were selected by systematic random sampling as research subjects in this study.

A 12-item questionnaire was developed to determine dentists' knowledge of TMJ disorders and splint treatments. Questions aimed to determine each dentist's education level and commitment to patients. The telephone numbers and postal addresses of dentists in different regions of Turkey were obtained from the Turkish Dental Association. The study was conducted with complete adherence to the principles of the World Medical Association Declaration of Helsinki. The participants were informed about the study, and their written consent was obtained by e-mail. For this study, the researchers did not use e-mail or any other method that gave dentists time to ponder each question; rather, they spoke one-to-one with each dentist included in

the study at his/her clinic or by telephone to assess his/her immediate knowledge after providing their written consent. The questionnaire also gathered sociodemographic and descriptive information, such as the dentist's age, gender, and year of graduation. The dentists were asked about their knowledge and experience with different splint types and TMJ disorders. The final section of the questionnaire investigated the dentist's approach to TMJ disorders and bruxism (reason for the occlusal splint application, applied jaw, occlusal adjustment, clinical parameters, which assessed during the treatment, additional therapy, and the typical duration of patient follow-up). In addition, it was gathered that the treatment results and success criteria. The dentists were divided into three groups according to the time passed since graduation (group A: 0–5 years; group B: 5–15 years; group C: Over 15 years) and also divided into two groups according to knowledge about TMJ disorders and treatment modalities (group 1; sufficient, group 2; insufficient) in accordance with assertion of the participants.

Statistical analysis

The statistical analysis was performed using the statistical software "SPSS" version 15.0. (Inc., Chicago, IL) Pearson's Chi-squared test was performed to determine the significance of the scientific knowledge differences between genders, splint type and experience groups. Pearson's Chi-squared test was performed to investigate the correlations for measured values if needed. $P < 0.05$ was defined as the statistically significant level for the Chi-squared test.

Results

Of our sample of 400 dentists, 370 responded to our telephone survey (with the response rate of 92.5%). It means that 370 dentists working in different regions of the Turkey were included in this study. All of the dentists included in this study were practicing dentists. The mean age of the dentists was 33.12 ± 9.24 years (age range: 23–69 years). Dentists participating in the study 211 (57.1%) were male and 159 (42.9%) were female. 174 (82.5%) of male dentist and 114 (71.7%) of female dentist indicated that implementing occlusal splint ($P < 0.05$).

Characteristic and approaches of the dentists who use occlusal splint therapy were seen in Table 1. 42.0% of dentists ($n = 121$) reported implementing soft splint, 44.8% ($n = 129$) hard splint, and 13.2% ($n = 38$) reported that implementing both soft and hard splint combined. 76.7% of the dentists ($n = 221$) have the upper jaw, 23.3% ($n = 67$) have put into practice by the lower jaw splint. Given the duration of the splint therapy, 37.5% ($n = 108$) of the participants used the splint for 3 months, 10.1% ($n = 29$) for 6 months, 12.2% ($n = 35$) for over 6 months, and 40.3% ($n = 116$) applied the splint until the patients reported symptoms disappeared (until recovery). 51.7% ($n = 149$)

Table 1: Frequencies of characteristics and approaches of participants who use occlusal splint therapy

	Frequency (%)	Number of participant (n)
Gender		
Male	60.4	174
Female	39.6	114
Experience (years)		
0-5	37.2	107
5-15	43.4	125
Over 15	19.4	56
Reason		
Bruxism	77.8	224
TMJ pain	1.4	4
Myofacial pain	5.9	17
Combine	14.9	43
Splint type		
Soft	42.0	121
Hard	44.8	129
Both	13.2	38
Jaw		
Upper	76.7	221
Lower	23.3	67
Splint using time		
0-3 months	37.5	108
6 months	10.1	29
Over 6 months	12.2	35
Until recovery	40.3	116
Additional treatment		
Yes	51.7	149
No	48.3	139
Parameters		
Yes	32.3	93
No	67.7	195
Occlusal adjustment		
Yes	13.2	38
No	86.8	250
Success in treatment		
Yes	80.2	231
No	19.8	57
Success criteria		
Patient satisfaction	52.1	150
Improvement in clinical parameters	3.1	9
Pain reduction or disappearance	44.8	129
Knowledge		
Insufficient	69.8	201
Sufficient	30.2	87

TMJ=Temporomandibular joint

of the dentists were implementing additional therapy such as thermal, pharmacologically, and cryotherapy, 48.3% ($n = 139$) of the dentists asserted that they applied no additional therapy with occlusal splint therapy. When asked to the dentists whether they had information about joint diseases or not, 30.2% of participants ($n = 87$) reported that they had sufficient information about the joint disease; however, 69.8% ($n = 201$) of dentists applying

occlusal splint have insufficient information relevant to the joint disease (etiology, pathophysiology, and therapy). 86.8% ($n = 250$) of the dentists applying the occlusal splint reported that they did not pay no attention to the occlusal adjustment. Although 80.2% ($n = 231$) of the dentists reported that occlusal splint therapy successfully resulted in patients, 19.8% ($n = 57$) reported the successful results were not observed due to the therapy. While patient satisfaction were the most common success criteria (52.1%) ($n = 150$), followed by pain reduction or disappearance (44.8%) ($n = 129$). Improvement in clinical parameters rate were rare success criteria between the dentists (3.1%) ($n = 9$). When asked to the dentists whether they had consider the clinical parameters during the treatment or not while 32.3% of participants ($n = 93$) reported that they had took into account about clinical parameters 67.7% ($n = 195$) of dentists applying occlusal splint reported not.

Regarding the gender differences in the occlusal splint application, 55.3% of female dentists were doing hard splint, 37.9% of men dentists reported implementing a hard occlusal splint ($P < 0.05$). In terms of evaluated knowledge of the joint, 59.6% ($n = 68$) of the female and 76.4% ($n = 133$) of the male dentists reported that they had no information about the TMJ disorders ($P < 0.001$). 18.4% ($n = 32$) of male dentists and 5.3% ($n = 6$) of the female dentists reported that they were applying the occlusal adjustment ($P < 0.01$) [Table 2].

The distribution of occlusal splint applications according to experience groups were shown in Table 3. Considering that, 57.0% ($n = 61$) of dentists with 0–5 years of professional experience were applying hard occlusal splint, this ratio was 42.4% and 26.8% for the experience of 5–15 years and over 15 years groups, respectively ($P < 0.001$). 56.1% ($n = 60$) of dentists with experience of 0–5 years reported that they had knowledge about the joint disease, this ratio was under 17.0% for the other groups ($P < 0.001$). Occlusion adjustment rate of dentists who practice in all three groups was under 16.0% with no statistically significant difference among groups ($P > 0.05$) [Table 3].

Regarding to the dentists' splint application reasons, 77.8% ($n = 224$) of the 288 dentists used occlusal splint for the treatment of bruxism, 1.4% ($n = 4$) for TMJ pain management, 5.9% ($n = 17$) for myofascial pain therapy; while 14.9% ($n = 43$) of the patients have applied the splint for the combined reasons described above [Table 1]. The distribution of occlusal splint applications according to splint types was shown in Table 4. It was observed a significant relationship between the reason and splint type ($P < 0.001$). Applied for bruxism soft- and hard-splints rates were above 80.0% ($n = 101$). Significant differences were found regarding the splint type and knowledge ($P < 0.001$). While the dentists' with sufficient knowledge soft splint

Table 2: Dentists' approaches rate to occlusal splints according to gender

	Male n (%)	Female n (%)	P
Splint type			
Hard	66 (37.9)	63 (55.3)	<0.05
Soft	84 (48.3)	37 (32.5)	
Both	24 (13.8)	14 (12.3)	
Knowledge			
Sufficient	41 (23.6)	46 (40.4)	<0.001
Insufficient	133 (76.4)	68 (59.6)	
Occlusal adjustment			
Yes	32 (18.4)	6 (5.3)	<0.01
No	142 (81.6)	108 (94.7)	
Total	174 (100)	114 (100)	

Table 3: Dentists' approaches rate to occlusal splints according to dentists' experience

	Experience groups n (%)			P
	0-5 years	5-15 years	Over 15 years	
Splint type				
Hard	61 (57.0)	53 (42.4)	15 (26.8)	<0.001
Soft	12 (11.2)	68 (54.4)	41 (73.2)	
Both	34 (31.8)	4 (3.2)	0 (0.0)	
Knowledge				
Sufficient	60 (56.1)	20 (16.0)	7 (12.5)	<0.001
Insufficient	47 (43.9)	105 (84.0)	49 (87.5)	
Occlusal adjustment				
Yes	17 (15.9)	16 (12.8)	5 (8.9)	NS
No	90 (84.1)	109 (87.2)	51 (91.1)	
Total	107 (100)	125 (100)	56 (100)	

NS=Nonsignificant

Table 4: Dentists' approaches rate to occlusal splints according to splint type

	Splint type n (%)			P
	Soft	Hard	Both	
Reason				
Bruxism	101 (83.5)	104 (80.6)	19 (50)	<0.001
TMJ pain	4 (3.3)	0 (0)	0 (0)	
Myofascial pain	4 (3.3)	6 (4.7)	7 (18.4)	
Combine	12 (9.9)	19 (14.7)	12 (31.6)	
Knowledge				
Sufficient	14 (11.6)	56 (43.4)	17 (44.7)	<0.001
Insufficient	107 (88.4)	73 (56.6)	21 (55.3)	
Experience (years)				
0-5	12 (9.9)	61 (47.3)	34 (89.5)	<0.001
5-15	68 (56.2)	53 (41.1)	4 (10.5)	
Over 15	41 (33.9)	15 (11.6)	0 (0)	
Additional treatment				
Yes	73 (60.3)	56 (43.4)	20 (52.6)	NS
No	48 (39.7)	73 (56.6)	18 (47.4)	

NS=Nonsignificant, TMJ=Temporomandibular joint

application rates were 11.6%, this ratio was 88.4% for the dentists with insufficient knowledge. However, hard

splint application rates were 43.4% for the dentists with sufficient knowledge. Significantly different distributions were obtained between the experience and splint type ($P < 0.001$). The higher usages were found as soft splint application (56.2%) in 5–15 years' experience. Regarding the usage of hard splint type, the most frequent rates were found in 0–5 years' experience (47.3%). Combined splint application frequencies were detected higher in 0–5 years' experience (89.5%). Significant differences were detected between the splint type and additional therapy ($P < 0.05$). The additional treatment was found more prominent as soft splint application (60.3%).

Discussion

Many researchers have agreed that occlusal splint therapy requires a good anamnesis, the detection of a true pathology, effective treatment modality planning, the use of an appropriate splint type, and the dentist's possession of appropriate knowledge.^{16,15,16} Researchers found diverse differences in the use of occlusal splint therapy for the management of the bruxism between the dentists in their surveys studies.^{11,12} The present study aims to investigate general dentists' approaches to the use of occlusal splints for bruxism, to estimate the knowledge and experience of temporomandibular disorders (TMDs) and the variations between the general dentists according to the treatment modalities in Turkey.

To gain information from the dentists, we modified questionnaire items from a mail-based survey designed at the University of Washington and fielded in the Seattle area.¹¹⁷ In the present study, the questionnaire was administered by telephone, providing an advantage over the technique used recently by Ommerborn *et al.*¹¹ Because respondents provided answers immediately, their "instant" knowledge of TMDs, bruxism, and occlusal splints could be evaluated. In addition, the administration of the questionnaire by telephone prevented misunderstandings and yielded a 100% response rate and confidence in the accuracy of survey data.

We found that 56.1% of young dentists (0–5 years of experience) had sufficient knowledge of TMJ disorders, whereas only 16% of dentists in other groups demonstrated such knowledge at most ($P < 0.001$). Dentists with 0–5 years of experience generally used hard occlusal splints ($P < 0.001$). The rate of hard occlusal splint application decreased with increased experience. Less than 16% of dentists in each group had performed occlusal splint adjustment ($P > 0.05$). These differences between young dentists and those with more experience may be due to two main factors. First, a soft splint is readily used and does not require occlusal adjustment, thereby reducing chair time in comparison with the use of a hard splint requiring occlusal adjustment. Second, dentists' knowledge might decrease over time.

Dentists' knowledge of the etiology and treatment of TMJ disorders and bruxism is important. Occlusal splints were the first treatment choice among male and female dentists in our sample. The effectiveness of hard occlusal splints has been demonstrated.^[18,19] Although several studies have reported the use of soft occlusal splints,^[20,21] these splints have been shown to increase pain and nocturnal electromyographic recordings compared with hard splints.^[22] Thus, hard occlusal splints should be used in patients with these problems. The survey results indicated that female dentists had more knowledge of TMJ disease than male dentists and used hard occlusal splints more frequently ($P < 0.05$).

Gnauck *et al.*^[14] and Lindfors *et al.*,^[12] in their survey studies, stated that the commonest reasons for the treatment with soft-hard occlusal splints between the dentists were bruxism and headache. Similarly, in our study, the most common reason was found as bruxism for both splint types. Myofascial pain was very rare reason for occlusal splint application in all groups (under 4.0%). Gnauck *et al.*^[14] concluded that a large number of appliances made to treat TMD were soft appliances. We found similar frequencies of soft and hard splint type. However, the less common was found as combined splint application.

In a survey study, it was found that the dentists widely use soft occlusal splints although their scientific knowledge is not enough compared to hard occlusal splints.^[12] Similarly, in this study, even the many of the dentists' choice were found soft splint, their knowledge was found inadequate compared to the hard occlusal splint.

Significantly, different correlation was found between the experience and splint type ($P < 0.001$). Increased experience caused decreased the usage of hard and combined splint types. This result may indicate that the increased experience can promote the selection of soft splint type.

The present study also found that 86.9% of respondents did not perform occlusal splint adjustment; only 18.3% of male dentists and 5.3% of female dentists reported experience with this technique. Because occlusal disharmony is known to be a primary cause of TMJ disorders and myofascial pain, occlusal splint adjustment is necessary for the treatment of such disorders.^[15,16] Occlusal splints that do not allow adjustment cannot be used to treat TMJ disorders. Furthermore, a variety of pathologies might be caused by iatrogenic occlusal interferences.^[15] Although most dentists included in the present study, particularly female dentists, claimed that they had sufficient knowledge of TMDs, bruxism, and occlusal splints, the results of the telephone-based survey indicated a clear need for dentists' education about these topics.

Most respondents reported that they used occlusal splints in the maxilla ($P < 0.001$). Occlusal splints can be

placed on the maxillary or mandibular dental arch to correct a loss of support, and patients' requirements vary depending on the location of anterior guidance adjustment.^[23] Our survey results indicated that dentists fulfilled their patients' requirements; 40% of participating dentists typically implemented splint therapy for >6 months, until symptoms disappeared. However, this lengthy application of splint therapy indicated that dentists had insufficient scientific knowledge about the appropriate duration of the therapy. Regardless of the diagnosis, uncontrolled or excessively long-term initial occlusal splint therapy is known to lead to pathological and to some extent irreversible, changes in the masticatory system.^[23]

Lindfors *et al.*^[12] in their survey study, revealed that soft occlusal splints was more often combined with other treatment modalities compared to treatment with hard splints. Similarly, additional treatment in our study most used in practice has been found that soft splint application compared to hard and combined splint applications. We found no difference among dentist groups (with regard to gender or experience) in the use of additional therapies, such as thermal, pharmacological, or cryotherapy. This finding supports the dentists' conscious use of occlusal splints.

The dentists' knowledge and of TMDs, bruxism, and occlusal splint therapy is important because patients with such disorders generally present to general dentists in towns lacking dental specialists. To overcome this problem, national dental associations and dentistry faculties should organize postgraduate training symposia across the country, and all dentists should be encouraged to attend. Deficiencies in the educational system should also be addressed with the help of university programs from abroad, which can provide accreditation.

Conclusion

The dentists participating in this survey showed insufficient knowledge of TMDs, bruxism, and occlusal splints. Their knowledge decreased with increasing experience. The dentists' therapeutic methods are incompatible with those accepted or recommended on the basis of scientific knowledge in dental practice in Turkey. Thus, national dental associations and dental faculties should work together to organize postgraduate training symposia, and all dentists should be encouraged to attend to reinforce and augment their education. A comparative study should be performed to investigate these issues in general dentists and specialists.

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Conflicts of interest

There are no conflicts of interest.

References

1. Ommerborn MA, Taghavi J, Singh P, Handschel J, Depprich RA, Raab WH. Therapies most frequently used for the management of bruxism by a sample of German dentists. *J Prosthet Dent* 2011;105:194-202.
2. Biondi DM. Headaches and their relationship to sleep. *Dent Clin North Am* 2001;45:685-700.
3. Capp NJ. Occlusion and splint therapy. *Br Dent J* 1999;186:217-22.
4. Dylina TJ. A common-sense approach to splint therapy. *J Prosthet Dent* 2001;86:539-45.
5. Dao TT, Lavigne GJ. Oral splints: The crutches for temporomandibular disorders and bruxism? *Crit Rev Oral Biol Med* 1998;9:345-61.
6. Pettengill CA, Growney MR Jr, Schoff R, Kenworthy CR. A pilot study comparing the efficacy of hard and soft stabilizing appliances in treating patients with temporomandibular disorders. *J Prosthet Dent* 1998;79:165-8.
7. Naikmasur V, Bhargava P, Guttal K, Burde K. Soft occlusal splint therapy in the management of myofascial pain dysfunction syndrome: A follow-up study. *Indian J Dent Res* 2008;19:196-203.
8. Harkins S, Marteney JL, Cueva O, Cueva L. Application of soft occlusal splints in patients suffering from clicking temporomandibular joints. *Cranio* 1988;6:71-6.
9. Wright E, Anderson G, Schulte J. A randomized clinical trial of intraoral soft splints and palliative treatment for masticatory muscle pain. *J Orofac Pain* 1995;9:192-9.
10. Lundh H, Westesson PL, Eriksson L, Brooks SL. Temporomandibular joint disk displacement without reduction. Treatment with flat occlusal splint versus no treatment. *Oral Surg Oral Med Oral Pathol* 1992;73:655-8.
11. Suvinen T, Reade P. Prognostic features of value in the management of temporomandibular joint pain-dysfunction syndrome by occlusal splint therapy. *J Prosthet Dent* 1989;61:355-61.
12. Lindfors E, Magnusson T, Tegelberg A. Interocclusal appliances – Indications and clinical routines in general dental practice in Sweden. *Swed Dent J* 2006;30:123-34.
13. Pierce CJ, Weyant RJ, Block HM, Nemir DC. Dental splint prescription patterns: A survey. *J Am Dent Assoc* 1995;126:248-54.
14. Gnauck M, Helkimo M, Magnusson T. Routines for interocclusal appliance therapy among general dental practitioners in a Swedish county. *Swed Dent J* 2012;36:125-32.
15. Ash MM Jr. Occlusion, TMDs, and dental education. *Head Face Med* 2007;3:1.
16. Badel T, Marotti M, Kern J, Laskarin M. A quantitative analysis of splint therapy of displaced temporomandibular joint disc. *Ann Anat* 2009;191:280-7.
17. Le Resche L, Truelove EL, Dworkin SF. Temporomandibular disorders: A survey of dentists' knowledge and beliefs. *J Am Dent Assoc* 1993;124:90-4, 97-106.
18. Carraro JJ, Caffesse RG. Effect of occlusal splints on TMJ symptomatology. *J Prosthet Dent* 1978;40:563-6.
19. Greene CS, Laskin DM. Splint therapy for the myofascial pain – Dysfunction (MPD) syndrome: A comparative study. *J Am Dent Assoc* 1972;84:624-8.
20. Block SL, Apfel M, Laskin DM. The use of a resilient rubber bite appliance in the treatment of MPD syndrome. *J Dent Res* 1978;57:92.
21. Quayle AA, Gray RJ, Metcalfe RJ, Guthrie E, Wastell D. Soft occlusal splint therapy in the treatment of migraine and other headaches. *J Dent* 1990;18:123-9.
22. Okeson JP. The effects of hard and soft occlusal splints on nocturnal bruxism. *J Am Dent Assoc* 1987;114:788-91.
23. Bumann A, Lotzmann U. *TMJ Disorders and Orofacial Pain*. New York: Thieme; 2002.