Patient responses to vacuum formed splints compared to heat cured acrylic splints: pilot study

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Abstract

Objective Vacuum formed and heat cured acrylic splints have been used in the diagnosis and treatment of temporomandibular disorders. The aim of this study was to evaluate patient's preference to either the vacuum formed or the heat cured acrylic splint.

Material and methods Twenty patients planned to receive splints were chosen from the dental school. Both types of occlusal splints were fabricated for each of them. Each patient used the splints alternatively on a nightly basis for 3 weeks. After 3 weeks, each patient completed a questionnaire regarding the comfort, fit, retention, occlusal contact, taste, gingival and lip irritation, smoothness and smelling. Statistical analysis was conducted by the MacNemar's Chisquare test.

Results There was no statistical difference in patient's responses to the different splint materials except for the comfort of wearing through the night.

Conclusion The vacuum formed and heat cured acrylic splint may be equally worn in patient preference for treatment of temporomandibular disorders.

Keywords Temporomandibular disorders • Vacuum formed splints • Heat cured acrylic splints • Patient comfort and quality of life

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Introduction

Occlusal splints have been used in dentistry for the treatment management of Temporomandibular Disorders (TMDs) [1–4]. TMDs are a group of problems characterized by temporomandibular joint (TMJ), facial, cervical and/or head pain, joint noises, and limited range of mandibular motion [5].

There are many diagnostic and therapeutic uses for occlusal splints [6–9]. Occlusal splints have been used with the goals of altering occlusal relationships, redistributing occlusal forces, preventing wear and mobility of teeth, reducing bruxism and other parafunctional habits, repositioning of the condyle and treating masticatory muscle pain [5].

The dental profession agrees that occlusal splints for the treatment of masticatory muscle pain are clinically effective [3,10]. Heat cured acrylic splints have consistently been shown to be effective

[6,11–13]. The use of vacuum formed splints rather than heat cured acrylic splints in the construction of an occlusal splint provides advantages to the dentist, the patient and the laboratory technician. Vacuum formed splints are more rapidly constructed, more easily fitted and delivered [14].

No scientific data exist to suggest whether a heat cured acrylic or vacuum formed splint is preferred by patients. This leaves the clinician to rely on the observational data offered by their dental education or information from fellow colleagues, and personal experiences, when deciding which appliance to use to treat their patients. The purpose of this study was to evaluate patient's responses to both the vacuum formed and the heat cured acrylic splint.

Material and methods

Twenty patients-already treatment-planned for occlusal splints at the University of

Istanbul, Faculty of Dentistry, Department of Maxillofacial Prosthodontics, were selected at random to participate in this study. All patients met the following inclusion criteria: [15] (1) A TMD diagnosis from the following list of TMD diagnostic subgroups (more than one was acceptable): myofascial pain; disk displacement with reduction; osteoarthritis; TMJ inflammation. (2) Patients had to be over 18 years old. The duration of treatment for each patient was between 3 to 6 weeks.

Exclusion criteria for this study included: current use of removable prostheses; more than one tooth missing per quadrant; Class III molar occlusions; major psychiatric disorders.

For the heat cured acrylic splints maxillary and mandibular impressions were made with irreversible hydrocolloid (Blueprint; Dentsply Caulk, Milford, Del), poured with hard die stone (Stone; Whip Mix Corp, Louisville, Ky) and mounted on articulator with a face-bow transfer and

centric relation record. The heat cured acrylic splints were made of methyl-methacrylate (Lucitone Clear Resin; Dentsply Caulk, Milford, Del), which replaced an invested wax pattern (Wax; Henry Schein, Port Washington, NY) made on a duplicate of the maxillary cast. The wax pattern provided the splints with an anterior guidance to ensure posterior disclusion on lateral and protrusive movements. The splints were then heat cured for 12 hours under pressure in a hot water bath [16].

For the vacuum formed splints maxillary impressions were made with irreversible hydrocolloid (Blueprint; Dentsply Caulk, Milford, Del) and poured with hard die stone (Stone; Whip Mix Corp, Louisville, Ky). The vacuum formed splints (Clear splint sheets; Ultradent Products Inc, South Jordan, Utah) were fabricated directly from the maxillary casts. The splints were adjusted in the mouth to provide posterior disclusion on lateral and protrusive movements. Self-curing acrylic (Lucitone 199 Repair Material; Dentsply Caulk, Milford, Del) was added to the occluding surface of those splints where posterior disclusion was difficult to obtain [14].

Each patient was delivered two occlusal splints. The vacuum formed splints and the heat cured acrylic splints in this study were fabricated in a similar manner as described in several studies [10,17]. They were all rigid and had a freedom of movement in all excursions [18,19]. The splints did not cause any irreversible changes in the

occlusion or in the temporomandibular joint [12]. The same dentist adjusted both splints on each patient to assure that the fit of both splints was similar.

Each patient was instructed to wear the heat cured acrylic splint on even numbered dates and the vacuum formed splint on odd numbered dates. The splints were switched every night. After 1 week, the necessary adjustment on both splints were made by the dentist. The patients continued to alternate splints for 2 more weeks. At the end of each 3 week session, the patients were seen to have each splint of each patients was evaluated by a questionnaire to complete (Table 1). The patient responses were recorded as a categorical binomial variable (Yes/No) and statistical analysis was conducted by Fisher's Exact, Chi-square test. Statistically significant was accepted $p < 0.05$ and two tailed significance. NCSS-PASS 2000 statistical package was used to analyse the data.

Results

There were 19 female and 1 male patients; age ranged 18 to 56 year. Table 1 shows the collective responses of the patients to the questionnaire, and reflects some of the feelings patients had regarding the occlusal splint. The vacuum formed splint compared favourably with the heat cured acrylic splint over the period of the study in relation to comfort and wearing through the night. However, there was no statistical difference in patient's responses regarding fit,

retention, occlusal contact, taste, gingival and lip irritation, smoothness and smelling of the two splint materials 95% confidence interval was not calculated.

Discussion

In this study the advantages/disadvantages concerning patient's subjective preference between heat cured acrylic splints and vacuum formed splints were compared. There are studies that examine the patient preference of occlusal splints made with different materials, comparing visible light cured with heat cured splints. Santos et al. [20] found that patients had no preference between visible light cured and heat cured acrylic splints. On the other hand, Leib [16] found that the light cured occlusal splint was preferable from the patient's perspective to the heat cured acrylic splint.

The effect of the vacuum formed splint and the heat cured acrylic splint in treatment of patients with TMD was not evaluated in this study. This study evaluated the differences in patient responses between the vacuum formed splint and the heat cured acrylic splint. In fact, it is very important that the way of fabrication and delivery of the occlusal splints and the patient's acceptance of occlusal splints in treatment of the patient with TMD.

This is the first study to compare vacuum formed with heat cured splints. The opinion of the patients in this study was that the vacuum formed splint is favourable to the heat cured acrylic splint regarding

Table 1 Questionnaire and responses

	Vacuum formed splint				Heat cured splint				Two tailed significant	
	Yes	%	No	%	Yes	%	No	%	P	
1. Is the occlusal splint comfortable?	16	80	4	20	6	30	14	70	0.003	
2. Is the occlusal splint fitting well?	13	65	6	30	11	55	8	40	0.74	
3. Does the occlusal splint have enough retention?	14	70	6	30	14	70	6	30	1.00	
4. Does the occlusal splint feel natural?	14	70	6	30	15	75	5	25	1.00	
5. Can the occlusal splint be worn throughout the night?	19	95	1	5	10	50	10	50	0.003	
6. Are the tooth contacts on the occlusal splint even and comfortable?	14	70	6	30	11	55	9	45	0.51	
7. Does the occlusal splint have a bad taste?	7	35	13	65	5	25	15	75	0.73	
8. Does the occlusal splint irritate your gums and your lips?	8	40	12	60	1	5	19	95	0.019	
9. Does the occlusal splint have an unsmooth surface?	11	55	9	45	5	25	15	75	0.10	
10. Is the occlusal splint smelling bad?	7	35	13	65	3	15	17	85	0.27	

comfort. However, the patient responses for fit, retention, occlusal contact, taste, gingival and lip irritation, smoothness and smelling of the two splint materials were not difference.

The vacuum formed splint can be constructed on the original model and therefore does not require duplication of the cast. This step reduces the fabrication time and eliminates the possibility of distortion. The vacuum formed splints are also less expensive and easier to fabricate than heat cured splints. Therefore, the vacuum formed splint could be prescribed for immediate and emergency use. The comfortable feeling that the patients attributed to the vacuum formed splint may be due to its weight.

Adjustment of occlusal contact for the heat cured acrylic splint was easier than the vacuum formed splint. Some cases, it was necessary to add the self-curing acrylic on the occlusal surface of the vacuum formed splint to provide the posterior disclusion. That was reason, 11 out of 20 patients felt that unsmooth surface on the vacuum formed splint. The unsmooth surface is prone to staining for the vacuum formed splint while occlusal adjustment on the vacuum formed splint is more difficult than the heat cured acrylic splint.

There were no difference between the vacuum formed splint and the heat cured acrylic splint regarding fit, retention, occlusal contact, taste, gingival and lip irritation, smoothness and smelling. The heat cured acrylic splint can be recommended for long-term therapy and for the sensitive, stressed patient [20].

Future studies are necessary to evaluate the functional differences between the vacuum formed and heat cured acrylic splint.

Conclusion

The study indicated, based on the limited number of patients, that the vacuum formed

and heat cured acrylic splint may be equally worn in patient preference for treatment of Temporomandibular disorders.

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