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Treatment of Night Bruxism With Two Different Occlusal Splints

Arta Asllani Bequiri¹, Biljana Kapusevska², Radomir Jovchevski³, Budima Pejkovska Shahpaska⁴, Besë Asllani⁵

¹PhD Student at Faculty of Dentistry, Univeristy "Ss. Cyril and Methodius", A Dent Clinic, Pristina, Kosovo

²PHI Univerity Dental Clinical Centre "St. Panteleimon" - Skopje, R.N.Macedonia, Faculty of Dentistry, Univeristy "Ss.Cyril and Methodius"

³Institute of Microbiology and Parasitology, Faculty of Medicine, Univeristy "Ss.Cyril and Methodius"

⁴ PHI University Dental Clinical Centre "St. Panteleimon" - Skopje, R.N.Macedonia,

Faculty of Medical Sciences, University "Goce Delcev" – Stip

⁵ Teaching Assistant in Alma Master European Campus College "Rezonanca", Departament of Pharmacy, Prishtina, Kosovo

ABSTRACT

Night bruxism is a prevalent parafunctional activity characterized by unconscious grinding and clenching of the teeth during sleep. This condition contributes to tooth wear, muscle discomfort, temporomandibular disorders, and prosthetic complications. Effective therapeutic intervention often includes the use of occlusal splints, which help redistribute occlusal forces and protect dental structures.

Purpose: The purpose of this article is to represent the treatment of night bruxism with two different types of occlusal splints: Ortopoli (acrylic-based, individually designed) and BioArt (thermoplastic foil-based, prefabricated), in patients diagnosed with night bruxism.

Material and methods: For the purpose of this study 80 patients were diagnosed, analyzed, treated, and monitored over four time intervals. They were divided into two groups: examined and control group. Patients were rehabilitated with Ortopoli and BioArt occlusal splints.

Results and Discussion: Patients treated with individually designed OrtoPoli splints show better statistical results in the rehabilitation of night bruxism as compared with literature results. The results clearly demonstrate the superior clinical performance of Ortopoli occlusal splints compared to BioArt in managing night bruxism.

Conclusion: Night bruxism can be brought under control with the help of individually designed occlusal splints with a preference for OrtoPoli occlusal splints.

Keywords: night bruxism, occlusal splints, Ortopoli splints, BioArt splints.

INTRODUCTION

Night bruxism is a complex unconscious oral parafunction that manifests primarily during sleep and is characterized by rhythmic and excessive grinding or clenching of the teeth⁽¹⁾.

It is considered both a sleep-related movement disorder and a stress-related habit, often going undiagnosed until damage becomes clinically evident⁽²⁾.

The etiology of night bruxism is multifactorial, involving central nervous system activity, psychosocial stressors, dental occlusion, and genetic predisposition^(3,4).

Zielinski et al. report a global prevalence of 21%, while the International Classification of Sleep Disorders, states that up to 90% of the general population may be affected, though only 5% exhibit clinical symptoms^(1,5).

Symptoms include jaw muscle fatigue, temporomandibular joint (TMJ) discomfort, headaches, and progressive tooth wear⁽⁶⁾.

In clinical practice, accurate diagnosis and individualized treatment planning are crucial. Studies by Shetty et al. and Macedo et al. show that night bruxism affects both sexes equally^(7,8).

One of the most effective management strategies is the application of occlusal splints. These are intraoral devices designed to protect the teeth and temporomandibular structures during nocturnal episodes. Two commonly used materials in occlusal splint fabrication are Ortopoli and BioArt. Ortopoli occlusal splints are fabricated from a high-impact, self-cured methyl methacrylate (MMA) acrylic resin. This material provides excellent resistance to the forces generated during bruxism, ensuring durability and stability⁽⁹⁾.

These splints are produced individually using a combination of liquid monomer and powder polymer, allowing for precise adjustment to the patient's occlusion and intraoral anatomy. The customizability of Ortopoli splints supports optimal adaptation and comfort, which is crucial for compliance and therapeutic efficacy⁽¹⁰⁾.

BioArt splints, in contrast, are prefabricated thermoplastic foils processed using the Ministar S® pressure-forming machine. While easier and faster to produce, they are less adjustable and typically offer less rigidity than acrylic-based alternatives. Though beneficial in short-term protection or in low-force bruxism cases, they may not provide the same level of control in moderate to severe bruxism as compared to Ortopoli⁽¹¹⁾.

Lobbezoo et al. Süreyya et al. and Adibi et al. emphasize the importance of individualization in splint therapy^(12,13,14).

Proper splint design promotes condylar stabilization and muscle relaxation, thus improving clinical outcomes.

PURPOSE

This study aims to evaluate and compare the therapeutic effectiveness of BioArt versus Ortopoli splints in patients diagnosed with night bruxism. A particular focus is placed on subjective symptom relief, objective clinical markers and patient satisfaction over multiple follow-up periods.

MATERIAL AND METHODS

The research was being conducted at the Clinic for Dental Prosthetics at the University Dental Clinical Center "St. Panteleimon" in Skopje and at the A Dental Clinic in Pristina. The research protocol was approved by the Ethical Committee of the Faculty of Dentistry, Skopje, and all participants provide informed consent prior to their inclusion.

A total of 80 patients aged between 40 and 70 years, without gender limitation, were enrolled in the study. The participants were divided into two main groups: the examined group (n = 40) and the control group (n = 40), each further subdivided into two subgroups (n = 20).

Examined Group:

- Subgroup 1: 20 patients diagnosed with night bruxism were prosthetically treated with fixed dental constructions, managed pharmacologically and physiotherapeutically, and rehabilitated with individually designed occlusal splints.
- Subgroup 2: 20 patients received fixed-removable prosthetic constructions and were also managed pharmacologically and physiotherapeutically, and rehabilitated with custom occlusal splints.

Control Group:

- Subgroup 1: 20 patients with night bruxism were treated with fixed prosthetic constructions, managed pharmacologically with magnesium supplementation, and rehabilitated using occlusal splints.
- Subgroup 2: 20 patients received combined fixed-mobile prosthetic constructions, pharmacological treatment with magnesium, but no occlusal splints were provided.

All participants underwent a standardized clinical protocol, including anamnesis, extraoral and intraoral examination, and assessment of tooth structure loss using the Tooth Wear Index (TWI). The TWI categorizes wear severity from score 0 (no enamel loss) to score 4 (pulp exposure or extensive dentin loss), across various tooth surfaces, (in the examined and control group) (Legend 1).

Score	Surface	Criteria
0	B/L/O/I	No loss of enamel surface characteristics
	C	No change in contour
1	B/L/O/I	Loss of enamel characteristics
	C	Minimal loss of contour
2	B/L/O	Loss of enamel exposing dentine for less than 1/3 of the surface
	I	Loss of enamel just exposing dentine
	C	Defect less than 1mm deep
3	B/L/O	Loss of enamel exposing dentine for more than 1/3 of the surface
	I	Loss of enamel and substantial loss of dentine but not exposing the pulp or secondary dentine
	C	Defect 1 - 2mm deep
4	B/L/O	Complete loss of enamel or pulp exposure of secondary dentine
	I	Pulp exposure or exposure of secondary dentine
	C	Defect more than 2mm deep or pulp exposure or exposure of secondary dentine

Legend 1. Showing of Tooth Wear Index

Patients in both groups were also examined using Brux Checker foils to visualize nocturnal parafunctional activity. (Fig. 1a) and (Fig. 1b).



a

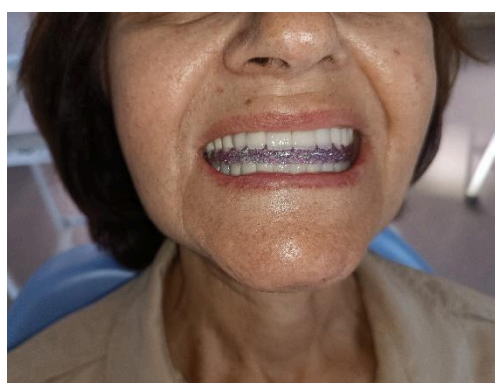


b

Fig. 1a) Foils for manufacture of Brux Checker

Fig. 1b) The apparatus Brux Checker

After prosthetic treatment was accomplished (in the examined and control groups), and then only patients in the examined group were rehabilitated with individually designed occlusal splints made from two different materials: Ortopoli acrylate and BioArt material.



a



b

Fig. 2a) Patient treated with Ortopoli occlusal splint

Fig. 2b) Patient treated with BioArt occlusal splint

Patient examinations are carried out and recorded in 4 time periods (at the first visit, after one week, after 1 month and after 6 months).

Data analysis was performed in the statistical program Statistica 7.1 for Windows and SPSS 23.0.

RESULTS AND DISCUSSION

Table 1. Tooth Wear Index / subgroups

Subgroup; LS Means: F(3, 72)=4,67, p=0,004						
Cell No.	Subgroup	DV_1	DV_1	DV_1	DV_1	N
		Mean	Std.err.	-95,00%	+95,00%	
1	Examined subgroup 1	1,17	0,15	0,88	1,46	20
2	Examined subgroup 2	1,50	0,16	1,18	1,82	20
3	Control subgroup 1	1,35	0,14	1,07	1,64	20
4	Control subgroup 2	1,90	0,14	1,61	2,18	20

A statistically significant difference in TWI was found between subgroups $F=4.67$ and $p<0.01$ ($p=0.004$). Patients with occlusal splints showed lower TWI values, indicating less tooth wear.

Oudkerk et al. say that TWI should be put under control immediately after the discovery of the etiological factors for its occurrence⁽¹⁵⁾.

Table 2. Loss of color of the Brux Checker after 6 months

Subgroup			Usage of Brux Checker			Total
			No loss of color	Loss of color laterotrusion	Loss of color mediotrusion	
	Examined subgroup 1	Count	20	0	0	20
		%	100,0%	0,0%	0,0%	100,0%
	Examined subgroup 2	Count	19	1	0	20
		%	95,0%	5,0%	0,0%	100,0%
	Control subgroup 1	Count	0	9	11	20
		%	0,0%	45,0%	55,0%	100,0%
	Control subgroup 2	Count	0	13	7	20
		%	0,0%	65,0%	35,0%	100,0%
Total		Count	39	23	18	80
		%	48,8%	28,8%	22,5%	100,0%

Subgroup 1 of the examined group showed no color loss on Brux Checker, while subgroup 2 had only 1 case of laterotrusion. Control groups had significant color loss and parafunctional signs. This validates the protective effect of occlusal splints.

Taira et al. indicated the usefulness of the Brux Checker during follow-up examinations in patients with diagnosed night bruxism, which is in correlation with our studies⁽¹¹⁾.

Table 3. Difference / BioArt & Ortopoli clinical symptomatology / after 6 months

			Ortopoli / clinical symptomatology		Total
			Yes	No	
BioArt / clinical symptomatology	Yes	Count	8	0	8
		%	20,5%	0,0%	10,0%
	No	Count	23	0	23
		%	59,0%	0,0%	28,8%
	Not present	Count	8	41	49
		%	20,5%	100,0%	61,3%
Total		Count	39	41	80
		%	100,0%	100,0%	100,0%

In the crosstabulation performed between BioArt and Ortopoli / clinical symptomatology after six months, for Fisher's Exact test=60.534 and $p < 0.001$ ($p = 0.000$) / Monte Carlo Sig.(2-sided) /0.000-0.000/ there is a significant difference in clinical symptomatology. Patients treated with Ortopoli occlusal splints showed better subjective and objective symptomatology than those treated with BioArt.

Littner et al. determined an improvement in clinical symptomatology in patients with night bruxism with the manufacture of individually manufactured hard acrylic splints compared with splints made from soft factory foil⁽⁹⁾.

Table 4. Clinical evaluation for night bruxism

R1; LS Means: F(3, 216)=166,45, p=0,0000						
Cell.No.	R1	DV_1 Mean	DV_1 Std.Err.	DV_1 -95,00%	DV_1 +95,00%	N
1	A2Mean	1,99	0,06	1,87	2,12	80
2	A2Mean	1,57	0,05	1,47	1,68	80
3	A2Mean	1,27	0,04	1,19	1,36	80
4	A2Mean	1,18	0,04	1,10	1,25	80

Significant reduction in clinical symptoms over four evaluations $F=166.45$ and $p<0.001$ ($p=0.000$) there is a significant difference in the border value of the average score of the clinical form for night bruxism.

Kapusevska et al. the importance of the synergy of the action of multiple treatments, which also confirms our results in 4 time intervals⁽³⁾.

This can be attributed to the inherent material properties of Ortopoli, which allow for better customization, increased rigidity, and long-term durability. The self-cured MMA acrylic used in Ortopoli splints is more resistant to occlusal forces, leading to improved stabilization of the mandible and better distribution of occlusal loads during nocturnal activity^(9,10).

In contrast, BioArt splints, though easier to fabricate and more cost-effective, lack the adaptability and mechanical robustness required for severe bruxism cases. The thermoplastic material used in BioArt splints, when processed using vacuum formers, provides a uniform but less rigid structure, which may be insufficient to counter high-intensity bruxism forces, leading to partial or full relapses in clinical symptoms^(11,14).

Our findings align with previous literature that supports the use of hard acrylic splints over soft or foil-based splints in patients with significant bruxism-induced wear or TMJ involvement^(12,3).

Additionally, the individualized fabrication process of Ortopoli splints offers clinicians the flexibility to adjust vertical dimension, occlusal surface design, and interarch contact points according to the unique functional demands of each patient.

Furthermore, the results from the Brux Checker analysis indicated a significantly higher reduction in parafunctional wear patterns among patients using Ortopoli splints. This suggests that the anatomical fit and stability of the splint play a crucial role in minimizing nocturnal parafunction, which is in line with the mechanism proposed by Smardz et al. where optimal occlusal coverage and stabilization reduce muscular hyperactivity and TMJ overload⁽¹⁶⁾.

CONCLUSION

Night bruxism presents significant challenges requiring individualized diagnosis and therapy. This study confirms that the use of occlusal splints plays a critical role in the management and rehabilitation of patients with night bruxism.

The comparison between Ortopoli and BioArt occlusal splints revealed that Ortopoli splints offer superior outcomes in terms of clinical symptom reduction, anatomical adaptation, and long-term wear resistance. In contrast, BioArt splints, while easier to fabricate, demonstrated limited adaptability and lower efficacy in reducing parafunctional wear patterns. These findings underscore the importance of material selection and individual customization in achieving optimal therapeutic outcomes.

Therefore, prosthetic rehabilitation combined with Ortopoli occlusal splints should be considered a preferred treatment modality for patients with night bruxism.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest related to this study.

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