

## Comparison of stabilization and placebo splint effect on psychological aspects and oxidative stress in chronic temporomandibular disorders

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### OBJECTIVES

Studies imply higher psychoemotional distress in patients affected by temporomandibular disorders (TMD) when compared to controls (1,2). It has been suggested that oxidative stress (OS) plays role in experience of TMD; also, increased OS may be associated with pathogenesis of psychological disorders (3,4).

**AIM:** to evaluate effect of stabilization splint (SS), therapeutic modality for TMD, on psychological traits of TMD patients and compare it with placebo splint (PS), a thin thermoforming foil (Figure 2). Another aim was to assess selected OS biomarkers during TMD treatment and associate them with psychological traits.

### MATERIALS AND METHODS

Thirty-four chronic TMD patients were randomized into SS and PS treatment groups and followed for 6 months (at baseline, 3rd and 6th month) (Figure 1). Outcomes included psychological aspects assessed with Graded Anxiety Disorder 7-item (GAD-7) and The Patient Health Questionnaire-9 (PHQ-9). Influence of treatment type was analyzed with regards to the levels of OS biomarkers in saliva. Selected biomarkers were Superoxide Dismutase (SOD) as antioxidant, Malondialdehyde (MDA) as oxidant and Total Antioxidant Capacity (TAC). OS markers were normalized to the concentration of total protein. Evaluation of oxidant (MDA)/antioxidant (SOD) ratio was also evaluated. Methods in detail are available in our published study (5).

#### Statistical analysis:

Data analyzed on an intention to treat basis, with missing data being substituted employing the K-Nearest Neighbour algorithm. A log transformation was performed for all non-normally distributed data (OS markers). Between-group analysis was performed using ANCOVA. Association between changes in treatment outcomes were tested using Pearson's correlation.

### RESULTS

Participants treated with SS demonstrated greater reduction of depressive symptoms (PHQ-9 scores) after both 3<sup>rd</sup> ( $p=0.011$ ,  $\eta^2=0.193$ ) and 6<sup>th</sup> month ( $p=0.007$ ,  $\eta^2=0.207$ ) (Figure 3).

When compared to PS, participants in SS showed significant reduction of oxidant/antioxidant ratio ( $p=0.018$ ,  $\eta^2=0.167$ ) at 3<sup>rd</sup> month (Figure 4).

Participants treated with SS demonstrated better improvement for anxiety symptoms (GAD-7), and greater decrease in levels of TAC and MDA than participants with PS. However, the observed results were not statistically significant ( $p>0.05$ ).

At 6<sup>th</sup> month the reduction of depressive symptoms (PHQ-9) was positively correlated with the decrease of afternoon TAC ( $r = 0.596$ ,  $p = 0.007$ ) in participants treated with SS. No significant associations were found in participants treated with PS.

Table 1. Correlation between changes in psychological traits and TAC concentrations' change, †  $p<0.05$ .

Treatment	Reduction	3-month follow-up		6-month follow-up	
		Afternoon TAC	Afternoon TAC	Afternoon TAC	Afternoon TAC
SS	GAD-7	0.181	0.413		
	PHQ-9	-0.125	<b>0.596*</b>		
PS	GAD-7	-0.102	0.376		
	PHQ-9	0.151	0.216		

### CONCLUSION

Our data suggest that SS may effectively improve depressive symptoms in TMD patients as well as the oxidant/antioxidant ratio. Improvement of psychological aspects related to pain could be reflected in oxidative status.

### LITERATURE

- Carlson CR, Okeson JP, Falace DA, Nitz AJ, Curran SL, Anderson D. Comparison of psychologic and physiologic functioning between patients with masticatory muscle pain and matched controls. *J Orofacial Pain*. 2015;7:15–22.
- Fillingim RB et al. Potential psychosocial risk factors for chronic TMD: descriptive data and empirically identified domains from the OPPERA case-control study. *J Pain*. 2011;12: T46–T60.
- Liu T, Zhong S, Liao X, Chen J, He T, Lai S, Jia Y. A Meta-Analysis of Oxidative Stress Markers in Depression. *PLoS One*.2015;10:e0138904.
- Fedoce ADG, Ferreira F, Bota RG, Bonet-Costa V, Sun, PY, Davies KJA. The role of oxidative stress in anxiety disorder: cause or consequence? *Free Radic Res*. 2018;52:737-750.
- Alajbeg IZ, Vrbanović E, Lapić I. et al. Effect of occlusal splint on oxidative stress markers and psychological aspects of chronic temporomandibular pain: a randomized controlled trial. *Sci Rep*.2020;10:10981.

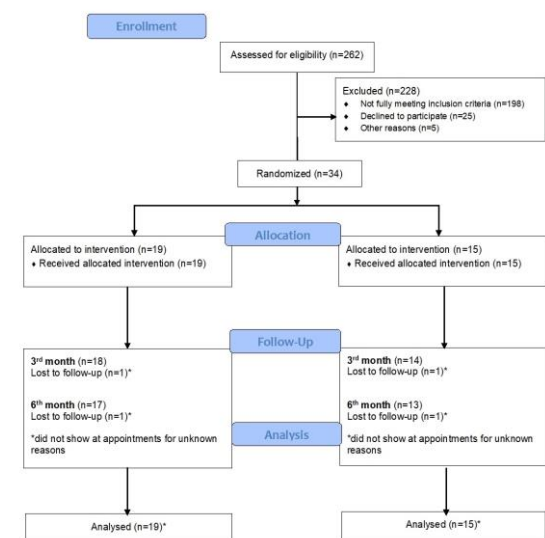


Figure 1. Distribution of the participants throughout the study



Figure 2. Stabilization splint (left) and placebo splint (right) in patient's mouth

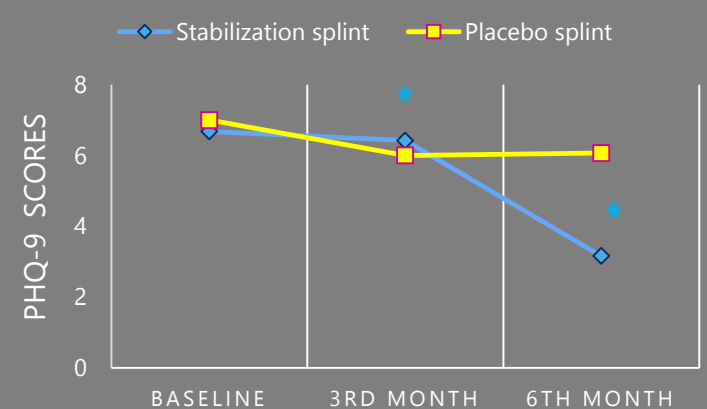


Figure 3. PHQ-9 scores changes over time in 6-month treatment period

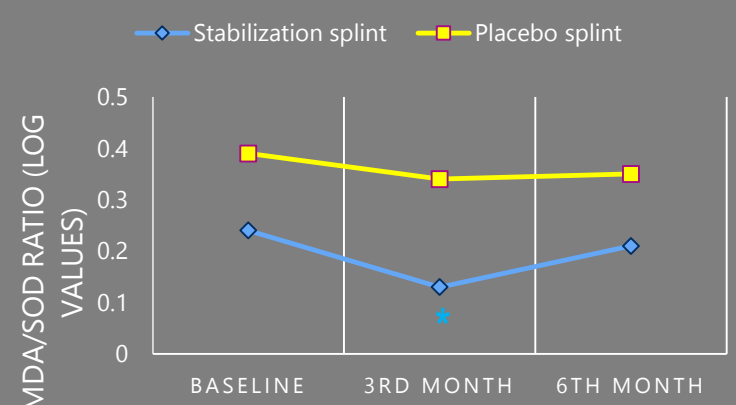


Figure 4. MDA/SOD ratio changes over time in 6-month treatment period