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## Quality of life of children with bruxism treated with orthodontic appliances

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### Abstract

**Introduction:** Bruxism and its treatment are challenging for any pedodontic patient.

**Goal:** The goal is to evaluate the influence on the quality of life of the orthodontic appliances beneficial for bruxism treatment (Andersen and Twin-block) in children, aged 7-12.

**Method:** The study was done on 50 patients, aged 7-12, with diagnosed bruxism, and divided into two groups. The first group received Andersen's orthodontic appliances, while the second received Twin-block orthodontic appliances. The quality of life and the state of the bruxism were recorded twice: at the beginning of the study and after 6 months.

**Conclusion:** The treatment of bruxism proved to be practically identical between the Andersen and the Twin-block appliances. The quality of life on the other hand, showed significantly better results in regards to the Andersen appliance, making it the orthodontic appliance of choice when treating bruxism in children.

**Keywords:** bruxism, quality of life, orthodontics, Andersen, Twin-block

### Introduction

Bruxism is a complex occlusal parafunction which can be categorized in multiple categories of different parafunctions. According to the international classification of sleep disorders, bruxism is considered a condition characterized with grinding of the teeth during the night, clenching of the jaws, followed with damage to the hard tooth structures, grinding sounds and pain in the masticator musculature. In the dictionary of prosthodontic terms, bruxism is defined as a subconscious oral habit of rhythmic nonfunctional pressing, clenching and grinding of the teeth when making movements that are not part of mastication and lead to occlusal trauma [1].

The episodes of bruxism, how long they last, as well as the interval in which they appear are random, individual to the specific patient. Bruxism is present in 6-20% of the population in all ages, starting with the eruption of the deciduous teeth [2].

Bruxism, as a parafunction, is very difficult to diagnose. One of the methods to diagnose is to get a detailed anamnesis of the patient with symptoms particular to this disorder [3].

Bruxism's main symptoms are teeth grinding, the sounds that accompany these movements during sleep and pain in the muscles in the morning hours, caused by the hyperactivity of the muscles, causing fatigue. Aside from the pain in the muscles, the patients with more advanced stadiums of bruxism have further complications caused by the development of additional TMD, musculoskeletal pain, otalgia – pain in the ear and the TMJ, headaches as well as pain in the teeth, caused by hyperemia of the dental pulp. Bruxism is most present in patients that are emotionally liable, with a compulsory nature and anxiety [4].

Child bruxism is present in around a third of all children, with the highest presence at the age of 5. Most of children, during their development are faced with bruxism, caused by occlusal obstructions and early occlusal contact, which are caused by the nature of the mixed dentition of deciduous and permanent teeth. Factors like bad habits, TMD, malocclusions, hypopnea, high anxiety, the character of the child, as well as stress can lead to child bruxism. As a result of this, children with bruxism, are commonly faced with crepitations in the TMJ, disorders in the movement of the mandibula, limitations when opening their mouths, periauricular pain,

headaches, sensitivity of the jaw etc [5].

Child bruxism starts around the age of 4-8 years old, it reaches its zenith at the age of 10-14 years, after which a decrease is noted in later years [6].

Clinical methods of diagnosing bruxism include detection of early occlusal contact using articulation paper, wax and plaster models, palpation of the masticatory muscles and the TMJ, as well as auscultation of the TMJ. Bruxcheckers and bruxquantifiers are also used as additional diagnosis methods [7].

Bruxcheckers are simple, yet very effective devices that are used when determining occlusal patterns of contacts that appear during grinding, lateral movements of the lower jaw that patients with bruxism make and are used to diagnose bruxism. With the help of bruxcheckers, occlusal contacts and the direction of the grinding are noted during sleep bruxism. It can also be used as an indicator of the correlation between the current occlusal state and the potential development of periodontal disease and TMD. This device is made on an anatomical plaster model. A special material is adapted on the model using heat. This material is then worn by the patient during the night while they sleep. After the night the points of contact where the bruxism occurred can be noted by the presence of whit spots [8].

When treating bruxism, there are different types of therapy, including: psychological therapy, prosthodontic, orthodontic, as well as pharmacological. This disorder is very complex, and because of this a combination of therapeutic disciplines are advised. The most commonly used orthodontic appliances in the treatment of bruxism are the Andersen and Twin block appliance [9].

Andersen's appliance is an appliance that covers the lingual and occlusal surfaces of the teeth, as well as the oral surfaces of the alveolar ridges. It also has labial arches for both jaws, and it's meant to lead the lower jaw to a protruding position. It's an efficient and economic orthodontic appliance used for early orthodontic treatment, which by moving the lower jaw to an anterior position, moves the condyle of the TMJ forward. Although in adult patients with completed bone growth the appliance doesn't cause changes in the bone structure, in patients with deciduous and mixed dentitions it stimulates horizontal growth of the condyle in the TMJ, as well as stimulation of the physiological growth of the mandibulae by acquiring a new occlusal situation. This appliance is worn at night during sleep, as well as during the day, for at least 3-4 hours [10].

The Twin block appliance is meant to be worn throughout the day. This appliance corrects the relation between both jaws by moving the mandibula. This appliance provides fast results treating the malocclusion by changing the occlusal plane, leading the mandibula to its correct position. By doing this, the occlusal forces are used to treat the malocclusion. The upper and lower parts of the Twin block appliance are positioned on a 70 degree angle. They are meant to be worn throughout the day, so they can use the totality of the occlusal forces, including the forces of mastication. The sensation of wearing these appliances is not dissimilar to wearing total prosthodontics, allowing the patients to eat comfortably while the appliances are in place [11].

Taking in account that children aged 7-12 are a fragile group of patients, especially when bruxism is involved, they require appropriate care, without losing sight of the quality of the young lives.

Based on the low number of available research papers regarding this field of dentistry, and wanting to add to its

development and help this fragile group, where quality of life is of the utmost importance for them to use these appliances appropriately, we decided to form the following goals:

- To diagnose bruxism using bruxcheckers;
- To note the quality of life of children with diagnosed bruxism, without orthodontic appliances;
- After diagnosing the bruxism to treat the patients with an orthodontic appliance – Andersen or Twin block;
- To check the correlation of the quality of life of the children and the choice of orthodontic appliance;
- To be able to provide an answer regarding the correlation between the orthodontic treatment of bruxism and the quality of life.

## Material and Method

The quality of life of children aged 7-12 years with diagnosed bruxism, using bruxchecker and treated using orthodontic appliances were methodologically analyzed. The subjects were divided into two groups consisting of 25 subjects each:

- The first group of patients was treated using an Andersen appliance, and
- The second group of patients was treated using a Twin block appliance.

50 patients were included in this research, aged 7-12 without limiting the distribution of the patients based on their sex. All the patients were treated using orthodontic appliances. All subjects included had to have been diagnosed with bruxism, had mixed dentition with erupted first permanent molars, had no previous trauma and hadn't received orthodontic treatment before.

Children that had prematurely extracted teeth, have autoimmune disorders, mental health issues, including problems with their endocrine system, as well as if they had been using medications that affect the central nervous system, were excluded from the study.

All patients that accepted to be part of this study, were instructed, as well as their parents, on the proper use of their corresponding orthodontic appliance.

The following clinical examinations were conducted on all patients:

- anamnesis
- clinical intraoral examination
- diagnosis of bruxism using bruxcheckers
- filling up the questionnaire for quality of life of children (AUQUEI).

The quality of life and the bruxism were noted in two separate occasions:

- on their initial visit, and
- after six months.

The quality of life was examined from four different aspects of life:

- Function,
- Family,
- Recreation and
- Autonomy.

## Results

### 1. Autonomy / First visit

The total value of the answers relating to the autonomy of the children where therapy with Twin block was administered that was recorded on the first visit  $Z = -0.47$ , and  $p < 0.05$  ( $p = 0.64$ ) do not significantly differ in relation to the value of the responses relating to the autonomy of the children where

therapy with Andersen’s appliance was applied (Table 1).

**2. Recreation / First visit**

The total value of the answers regarding the aspect of recreation where the Andersen appliances were ordained on the first visit where higher compared with the total value of the answers that corresponded to the second group. The difference of  $Z=5,45$  and  $p<0,001(p=0,000)$  is significant (Table 1).

**3. Function / First visit**

The total value of the answers that relate to the function of the

children where Twin block appliances were applied, in their first visit, where  $Z=-3,39$  and  $p<0,001(p=0,000)$ , is significantly larger than the total value corresponding to the group with Andersen appliances (Table 1).

**4. Family / First visit**

The total value of the answers that correlate to family where Andersen’s appliances were ordained in the first visit is bigger compared to the value of the answers from the other group of children, the group treated with Twin block appliances. This difference, where  $Z=6,06$  and  $p<0,001(p=0,000)$ , is significant (Table 1).

**Table 1:** Measured quality of life factors for First group & Second group, for the first visit

Autonomy	Rank Sum First group	Rank Sum Second group	U	Z	p-level	Valid N First group	Valid N Second group
Total	613,50	661,50	288,50	-0,47	0,64	25	25
Recreation	Rank Sum First group	Rank Sum Second group	U	Z	p-level	Valid N First group	Valid N Second group
Total	918,50	356,50	31,50	5,45	0,000	25	25
Function	Rank Sum First group	Rank Sum Second group	U	Z	p-level	Valid N First group	Valid N Second group
Total	463,00	812,00	138,00	-3,39	0,000	25	25
Family	Rank Sum First group	Rank Sum Second group	U	Z	p-level	Valid N First group	Valid N Second group
Total	950,00	325,00	0,00	6,06	0,000	25	25

**1.1 Autonomy / Second visit**

The total value of the answers relating to the autonomy of the children where therapy with Twin block was administered that was recorded on the second visit  $Z = -1.52$ , and  $p >0.05$  ( $p = 0.13$ ) do not significantly differ in relation to the value of the responses relating to the autonomy of the children where therapy with Andersen’s appliance was applied (Table 2).

**2.1 Recreation / Second visit**

The total value of the answers regarding the aspect of recreation where the Andersen appliances were ordained on the second visit where higher compared with the total value of the answers that corresponded to the second group. The difference of  $Z=3,30$  and  $p<0,001(p=0,000)$  is significant (Table 2).

**3.1 Function / Second visit**

The total value of the answers that relate to the function of the children where Twin block appliances were applied, in their second visit, where  $Z=-4,02$  and  $p<0,001(p=0,000)$ , is significantly larger than the total value corresponding to the group with Andersen appliances (Table 2).

**4.1 Family / Second visit**

The total value of the answers that correlate to family where Andersen’s appliances were ordained in the first visit is bigger compared to the value of the answers from the other group of children, the group treated with Twin block appliances. This difference, where  $Z=5,29$  and  $p<0,001(p=0,000)$ , is significant (Table 2).

**Table 2:** Measured quality of life factors for First group & Second group, for the second visit

Autonomy	Rank Sum First group	Rank Sum Second group	U	Z	p-level	Valid N First group	Valid N Second group
Total	559,00	716,00	234,00	-1,52	0,13	25	25
Recreation	Rank Sum First group	Rank Sum Second group	U	Z	p-level	Valid N First group	Valid N Second group
Total	467,50	807,50	142,50	-3,30	0,000	25	25
Function	Rank Sum First group	Rank Sum Second group	U	Z	p-level	Valid N First group	Valid N Second group
Total	430,50	844,50	105,50	-4,02	0,000	25	25
Family	Rank Sum First group	Rank Sum Second group	U	Z	p-level	Valid N First group	Valid N Second group
Total	910,00	365,00	40,00	5,29	0,000	25	25

**Discussion**

Taking in account the fact that the quality of life of children is essential in this very fragile group of patients – preadolescent children, when treating them with orthodontic appliances, the available literature is insufficient.

When treating bruxism in preadolescent children, the most recommended orthodontic appliances are the Andersen appliance, Twin block, Herbst’s, the TMJ appliance, the TMD appliance, as well as bruxguards. The most commonly used

appliances are Andersen and Twin block.

In the available literature, there is data that child bruxism is present in 35% of the population, especially during the presence of the mixed dentition. If this parafunction isn’t treated on time, it can cause a lot of damage to the hard, as well as the soft oral tissues.

When analyzing the quality of life of the first group in correlation with the sex of the subjects, where  $p>0,05$ , the difference in the results was insignificant.

The age of the children treated with Andersen's appliance varied in the interval of  $9,12 \pm 1,45$  years;  $\pm 95,00\%$  KI: 8,52-9,72; where the youngest patients were 7, while the oldest were 12 years old.

When analyzing the quality of life of the second group, where Twin block appliances were used, in correlation with the sex of the subjects, where  $p > 0,05$ , the difference in the results was insignificant.

The age of the children treated with Andersen's appliance varied in the interval of  $9,12 \pm 1,45$  years;  $\pm 95,00\%$  KI: 8,26-9,582; where the youngest patients were 7, while the oldest were 12 years old.

When analyzing the part of the questionnaire that was about autonomy in the first group of subjects, the Cronbach's Alpha=0,82 is very high, which points to a very strong inner consistency of the answers for the 7 questions that are present in this subsection of the questionnaire.

In the part of the questionnaire that correlates to the part about autonomy in the second group of subjects, the Cronbach's Alpha=0,53 is medium high and points to a medium high internal consistency between the 7 questions forming this part.

At the second visit, the total value of the answers when it comes to the autonomy in children with Twin block appliances, where  $Z = -1,52$  and  $p > 0,05$  ( $p = 0,13$ ) is significantly higher than the total value of the answers compared to the first group of subjects with Andersen's appliances.

In the part of the questionnaire that correlates to the part about recreation in the first group of subjects, the Cronbach's Alpha=0,46 is medium high and points to a medium high internal consistency of the answers for the 7 questions that are present in this subsection of the questionnaire.

When analyzing the part of the questionnaire that was about recreation in the first group of subjects, the Cronbach's Alpha=0,59 is medium high and points to a medium high internal consistency between the 7 questions forming this part.

The total value of the answers, at the second visit, when it comes to the recreation in children with Twin block appliances, where  $Z = -3,30$  and  $p < 0,001$  ( $p = 0,000$ ) is significantly higher than the total value of the answers regarding recreation compared to the first group of subjects with Andersen's appliances.

The part of the questionnaire regarding function in the group with Andersen's appliance, the Cronbach's Alpha=0,86 is very high and it points to a very strong inner consistency of the 7 answers in this subgroup.

After a detailed analysis of the answers regarding function, the group with Twin block appliances had a Cronbach's Alpha=0,53 which is medium high and points to a medium high consistency between the 7 questions correlating to function.

The total value of the questions regarding function in children with Twin block appliances on their second visit, where  $Z = -4,02$  and  $p < 0,001$  ( $p = 0,000$ ) is significantly higher compared to the total value of the first group, the group with Andersen's appliances.

Detailed analysis of the questionnaires regarding family in the first group of subjects had a Cronbach's Alpha=0,78, a high value pointing to a high inner consistency between the 6 available questions on the subject of family.

The part of the questionnaire that is about family in the second group of subjects had a Cronbach's Alpha=0,32 a value that is regarded as medium low, pointing to medium low consistency in the answers.

The total value of the answers correlating to family in the first group, the group with Andersen appliances on the second visit had a higher value compared to the second group, where  $Z = 5,29$  and  $p < 0,001$  ( $p = 0,000$ ).

When assessing the potential factors that could lead to the development of bruxism, according to Luecken *et al* [12] the immediate family can play a significant role. Children of young and inexperienced parents are shown to be especially susceptible to not only negative psychological and social characteristics, but also an increased risk of physical diseases, as well as oral parafunctions. From here we can conclude that optimal familial relationships are crucial in the treatment of bruxism.

This fact is seconded by the thesis conducted by Paula M Castel *et al* [13], where when testing the quality of life between children with and without bruxism, they concluded that the difference between them is insignificant, and the only determining factor in the development of bruxism was the age of the mother, pointing to family as an important social factor.

## Conclusion

Starting from the fact that children with bruxism, where orthodontic treatment was needed in the form of an Anderson or Twin block appliance, in order to deal with this parafunction, but without neglecting the quality of life, we came to the following conclusions:

1. The values of the questionnaire on the quality of life from the aspect of autonomy, we noted a decrease of the quality of life of 5.8% in the first group with Andersen appliances, while the second group, with Twin block appliances, a decrease of 10.6% was noted. From this we can conclude that the superior appliance in regards to this aspect is the Andersen appliance ;
2. Questions related to recreation point to a decrease of 4.2% in the quality of life in the first group. This is significantly lower than the 14.9% noted in the second group, leading us to conclude that the Andersen appliance is superior in this aspect as well;
3. The values noted in the segment regarding function in the quality of life questionnaire point to a decrease of 3.7% in patients with Andersen appliances, a value markedly lower than the one noted in patients with Twin block appliances – 17%, which leads us to the conclusion that Andersen's appliance is superior.
4. The final aspect of the questionnaire, which correlates to the family, points out a decrease of 2,3% in the quality of life in patients with Andersen appliances. The results in the second group showed a decrease of 3,1%, which continues the trend of the previous aspects of this questionnaire, definitively pointing to the Andersen appliance as the superior orthodontic appliance when it comes to the treatment of bruxism with minimal decrease in quality of life.

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