Pediatric bruxism – Implication of tonsil and adenoid hypertrophy in its etiology and resolution

Original Article

Authors

Filipa Morgado
Hospital Beatriz Ângelo, Portugal

Patrícia Lopes
Hospital Beatriz Ângelo, Portugal

Gonçalo Caetano
Hospital da Senhora da Oliveira,

Bruna David
Hospital Beatriz Ângelo, Portugal

Andréa Gaspar
Hospital Beatriz Ângelo, Portugal

Maria Pimenta Machado
Hospital Beatriz Ângelo, Portugal

Alberto Santos
Hospital Beatriz Ângelo, Portugal

Carlos Macor
Hospital Beatriz Ângelo, Portugal

Correspondence:
Filipa Morgado
filiparuasmorgado@gmail.com

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Abstract

Objective: To identify the incidence of bruxism in children with obstructive sleep-disordered breathing (OSRD) and to evaluate the impact of adenotonsillectomy on the resolution of bruxism.
Study Design: Retrospective observational study of 54 children with OSRD who underwent adenotonsillectomy.
Materials and Methods: Questionnaire applied to caregivers of children aged 2-12 years, who underwent adenotonsillectomy for OSRD between January and November 2021, at Hospital Beatriz Ângelo.
Results: 54 children were evaluated and it was found that 40,7% of the children had bruxism, with only 9.3% after surgery.
Conclusion: According to our study, as it has been already described in the literature, there is a relationship between adenotonsillectomy and bruxism, with improvement or resolution in 77% of children that presented bruxism before surgery.
Palavras-chave traduzidas: Bruxism; adenoid hypertrophy; adenotonsillectomy; obstructive sleep-disordered breathing (OSRD)

Introduction

Bruxism is defined as an involuntary activity of the masticatory system, produced by contractions of the jaw elevator muscles, and is characterized by the parafunctional behavior of grinding and/or clenching the teeth. It may occur during sleep (sleep bruxism) or when a person is awake (awake bruxism). [1]

Bruxism may be diagnosed from a clinical perspective based on the following signs and symptoms: current history of clenching and/or grinding the teeth or sounds confirmed by others; detection of facets of abnormal dental wear not compatible with functional wear; headaches; tiredness or muscle fatigue upon waking up; clicks and noises in the temporomandibular joint (TMJ); hypersensitive

teeth or hypertrophy of the masticatory muscles[2] Bruxism is often asymptomatic and becomes clinically significant when it interferes with sleep or results in dental erosion, headaches, jaw muscle pain and/or fatigue, and rigidity or difficulty in opening the jaw upon waking up. [3] Its main complications are the risk of developing symptoms due to temporomandibular changes (muscle and joint pain), muscle hypertrophy, dental erosion and fractures, and even teeth loss. [3]

The main risk factors for bruxism are: sleep disturbances, such as obstructive sleep apnea syndrome (OSAS) or parasomnia; abnormal dental occlusion; psychiatric disturbances; neurologic diseases such as cerebral palsy or epilepsy; and gastroesophageal reflux disease (because the stimulation of intraesophageal acid can induce rhythmic masticatory muscle activity during sleep and masseter muscle activity when awake). [3] In fact, several authors have suggested that OSAS is the main risk factor for bruxism. In addition, the treatment of sleep apnea with continuous positive airway pressure (CPAP) in adults has been shown to improve bruxism. [4,5]

In children, hypertrophy of the palatine tonsils and adenoids is the main cause of OSAS[6]; therefore, several studies have been conducted to compare the prevalence of bruxism before and after tonsil and adenoid removal surgery.

Figure 1
Administered questionnaire

Questionnaire to investigate the relationship between bruxism and adenotonsilllectomy

Date of surgery: ☐☐ ☐☐ ☐☐☐☐ NP: ☐☐☐☐☐☐☐☐☐☐

Sex: Male ☐ Female ☐ Age: ☐☐ years

In the last 4 weeks, during sleep...	**BEFORE**		**AFTER**	
Did someone hear sounds of the child clenching or grinding the teeth?	Yes ☐	No ☐	Yes ☐	No ☐
Did the child snore?	Yes ☐	No ☐	Yes ☐	No ☐

Observations

GENERAL QUESTIONS	**BEFORE**		**AFTER**	
Does the child breath with the mouth open?	Yes ☐	No ☐	Yes ☐	No ☐
Does the child clench or grind the teeth during the day?	Yes ☐	No ☐	Yes ☐	No ☐
Does the child complain of tooth pain or sensitivity?	Yes ☐	No ☐	Yes ☐	No ☐

Palatine tonsils – Brodsky Classification

BEFORE Grade I ☐ Grade II ☐ Grade III ☐ Grade IV ☐

AFTER Grade I ☐ Grade II ☐ Grade III ☐ Grade IV ☐

There are several theories on the pathophysiology of this association: children with apnea have frequent nocturnal micro-arousals associated with an increase in parafunctional activity, including masticatory activity, with activation of the masticatory muscles that in turn leads to bruxism. [7] Moreover, children with airway obstruction place their jaws in a more anterior position to improve the patency of the airway, which stimulates receptors and increases the tone of the upper airways. [8] In addition, mouth breathing can interfere with the sleep cycle and affect brain oxygenation, thereby causing involuntary contraction of the facial muscles. [8]
The objective of the present study was to determine the prevalence of bruxism in children with obstructive sleep-related breathing disorders (OSRBD) and evaluate the impact of adenotonsillectomy on the improvement or resolution of the disorder.

Materials and Methods

This retrospective study evaluated the prevalence and clinical course of bruxism in children aged between two and 12 years who underwent adenotonsillectomy due to OSRBD between January and November 2021 at the Beatriz Ângelo Hospital.
A questionnaire containing closed-ended questions was administered by telephone (see Figure 1) and was answered by the child's caregiver during a period of time that varied from three to 12 months after surgery.
The inclusion criteria were children aged between two and 12 years with a clinical diagnosis of OSRBD (snoring, mouth breathing, gaps in breathing, attention deficit, daytime sleepiness, hyperactivity), with grade III or IV tonsillar hypertrophy according to the Brodsky classification.
The exclusion criteria were as follows: children with a personal or family history of cleft palate or other craniofacial syndromes, children currently undergoing or having previously undergone orthodontic treatment, and children whose caregivers were unaware of bruxism.

Results

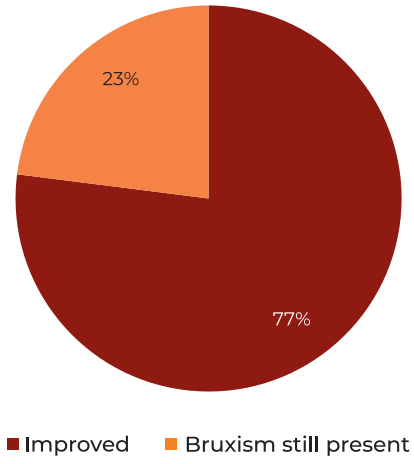
Between January and November 2021, 54 children with a mean age of 6.7 ± 2.6 years underwent adenotonsillectomy due to a sleep breathing disorder.
Table 1 shows the distribution of the children with bruxism by sex, age, and grade of tonsillar hypertrophy according to the Brodsky classification before surgery.
Twenty-two of the 54 children (41%) showed evidence of bruxism in the questionnaire. There were no significant statistical correlations between the prevalence of bruxism and parameters of sex (Pearson's chi-square test; P-value=0.65), age (Mann Whitney test;

Table 1
Characterization of the study sample before surgery

	Bruxism (n)	Without bruxism (n)
Sex		
Female	11	18
Male	11	14
Age (years)		
2-5	9	14
6-9	11	11
10-12	2	7
Tonsillar hypertrophy		
Grade III	18	26
Grade IV	4	6

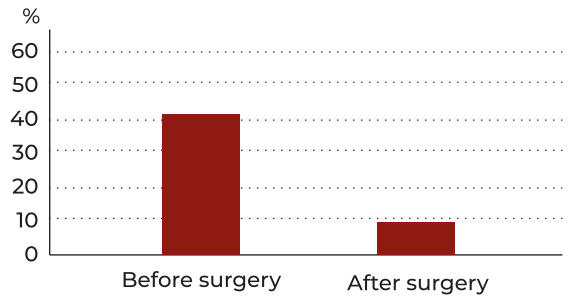
P-value=0.34), or grade of tonsillar hypertrophy (one-way ANOVA test; P-value=0.08).
Seventeen of the 22 children (77%) with bruxism before surgery improved after surgery and only five children (23%) still had complaints (Figure 2).

Figure 2
Bruxism after surgery



The prevalence of pre-surgery bruxism was 40.7%, which decreased to 9.3% after tonsillectomy (Figure 3). There was a statistically significant difference in the prevalence of bruxism before and after surgery (Pearson's chi-square test, P-value=0.0015).

Figure 3
Prevalence of bruxism before and after surgery



Discussion

One of the main causes of OSRBD is tonsillar hypertrophy, for which adenotonsillectomy is the main treatment;[6] with several studies indicating an association between adenotonsillectomy and bruxism improvement. In the present study, the prevalence of bruxism among children with OSRBD and the impact of adenotonsillectomy on its improvement or resolution were evaluated. The condition's prevalence decreased from 40.7% to 9.3% after surgery.
The main limitations of the present study are that it was a retrospective study with a small sample, lacked multivariate analysis, and the fact that the diagnosis of bruxism was only clinical without electrophysiological monitoring.
However, our results are in line with those of other authors (Table 2). DiFrancesco *et al*. (2004) conducted a prospective study in which 69 patients with tonsillar hypertrophy and OSAS, aged between two and 12 years were evaluated. Before the surgery, 45.6% of the children with OSAS had bruxism, whereas after the surgery only 11.8% of them still had it. [5] Ali Eftekharian *et al* . (2007) conducted a prospective study in which 140 children with symptoms associated with adenotonsillar hypertrophy, aged between four and 12 years were evaluated. They were assessed through a questionnaire before adenoid and tonsil removal and two months after it; 25.7% had bruxism before the surgery and only 7.1% still had it after the intervention. [4]
Oh *et al*. (2021) identified the structural and functional craniofacial characteristics that were associated with a higher prevalence of bruxism. They conducted a study with 96 children, aged between six and 12 years, and investigated the association of bruxism with tonsillar hypertrophy, mouth breathing, and restricted tongue mobility, analyzing each risk factor in isolation as well as the three factors in combination. The results showed that 56% of the 25 children with tonsillar hypertrophy had bruxism and 50% of the 30 children with nasal obstruction while mouth breathing had the condition. [8]
Valera *et al*. (2003) identified muscle, functional, teeth, and skeletal changes in children aged between three and six years with adenotonsillar hypertrophy. In this study, the prevalence of bruxism was 43.2% in the group

of children with adenotonsillar hypertrophy and 0% in the control group.[10]

Gregório et al. (2008) conducted a polygraphic sleep study on 38 children diagnosed with OSAS and found the presence of bruxism in 34.3% of them.[11]

In another study by Grechi *et al.* (2008), 60 children with nasal congestion, aged between two and 23 years were evaluated, and the results showed that 65.2% had bruxism. [12]

Similarly, Ferreira *et al.* (2014) reported that in a sample of children with bruxism, 11.03% also had OSAS.[13]

Thus, there are several published studies in which a positive association between OSRBD and sleep bruxism was observed and the prevalence of bruxism in children with adenotonsillar hypertrophy varied between 26% and 56% (41% in our study) (Table 2).

Although the intention is not to propose adenotonsillectomy solely to improve bruxism complaints, it is important to know the effect of the surgery not only on OSRBD but also on bruxism. In fact, according to the studies that compared the prevalence of bruxism before and after the surgical procedure, bruxism improved in 72% to 77% of children who had complaints before the surgery[4,5]. In the present study, bruxism improved in 77% of the children.

Therefore, the present study confirms and highlights the association between OSRBD and bruxism and our findings can be taken into consideration in the decision to treat these children with surgery.

Conclusion

It can be concluded that there was a significant reduction in bruxism after surgery because 17 (77%) of the 23 children who had bruxism no longer exhibited it after tonsil and adenoid removal.

The knowledge of this association can enable pediatricians and dentists to refer children to the specialty of otorhinolaryngology (ORL) for the investigation of OSRBD in cases of bruxism and also encourage otorhinolaryngologists to investigate complaints of bruxism in children with OSRBD.

In conclusion, a combination of ORL and orthodontics consultations is important for optimal evaluation and therapeutic decision-making in cases of bruxism in the pediatric population.

Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

Data Confidentiality

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

Protection of humans and animals

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the 2013 Helsinki Declaration of the World Medical Association.

Table 2
Prevalence of bruxism according to several studies

N	Author	Year	% Bruxism in children with adenotonsillar hypertrophy /OSAS	% Bruxism after adenotonsillectomy
1	Valera *et al.* [10]	2003	43,2%	-
2	DiFrancesco *et al.* [5]	2004	45,6%	11,8 %
3	Ali Efterkharian *et al.* [4]	2007	25,7%	7,1 %
4	Gregório *et al.* [11]	2008	34,3%	-
5	Oh *et al.* [8]	2020	56%	-
6	F. Morgado *et al.*	2022	40,7%	9,3%

Abbreviation: OSAS, obstructive sleep apnea syndrome

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Availability of scientific data

There are no datasets available, publicly related to this work.

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