The rapid maxillary expander efficacy in the obstructive sleep apnea syndrome treatment

Guimarães A[1], Albergaria M[2], Maló L[3], Vale F[4]

1 – MIMD student, FMUC

2 – Post-Graduation in Orthodontics student, FMUC

3 – Post-Graduation in Orthodontics co-cordinator, FMUC

4 – Post-Graduation in Orthodontics cordinator, FMUC

FACULDADE DE MEDICINA DA UNIVERSIDADE DE COIMBRA

Introduction

The obstructive sleep apnea syndrome (OSAS) is a breathing disorder caused by repeated partial or complete upper airway obstruction (Fig. 1). This condition causes the cessation of breathing for 10 seconds or more, with changes in the normal pulmonary ventilation, resulting in a deficit of oxygenation. In prolonged episodes can lead to a progressive increase in the partial pressure of carbon dioxide in blood and consequent decrease in arterial pH [(1,2,3)].

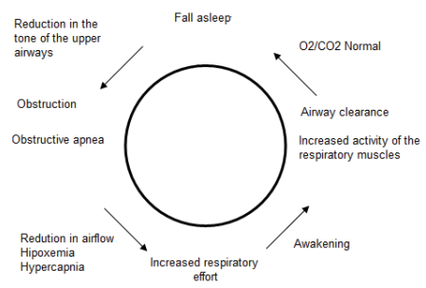

Figure 1 - Pathophysiological stages of OSAS

The orthodontic treatment has been considered an important option in the treatment of mild OSAS, representing also a viable alternative to the use of other therapeutic procedures like the continous positive airway pressure (CPAP)[(4)].

Some intra-oral appliances, particularly the rapid maxillary expander (RME), may be used in case of severe OSAS if the other therapeutic modalities are not indicated[(5)].

Methods

The research was conducted in compliance with the criteria described in the following table:

Type of studies	Studies of systematic review, meta-analysis, randomized controlled trials, cohort studies, with the aim of assessing the effectiveness of RME
Type of participants	Children and adolescents, under 18 years old, with OSAS and subjected to maxillary expansion
Type of intervantion	A comparison was made between the intervention (application of rapid maxillary expander) or lack thereof
Type of results	Improvement in the condition of OSA was considered as corresponding to the normalization of apnea-hypopnea index (AHI)
Research strategy	Reasearch over the following databases: MEDLINE / PubMed, Embase, CINAHL, LILACS, and Cochrane OvidSP Plus data with the keywords: "Palatal Expansion Technique" [MeSH] AND "Sleep Apnea, Obstructive" [MeSH]. Articles in Portuguese and English with publication date between January 1st 2000 and January 2014 were accepted

Results

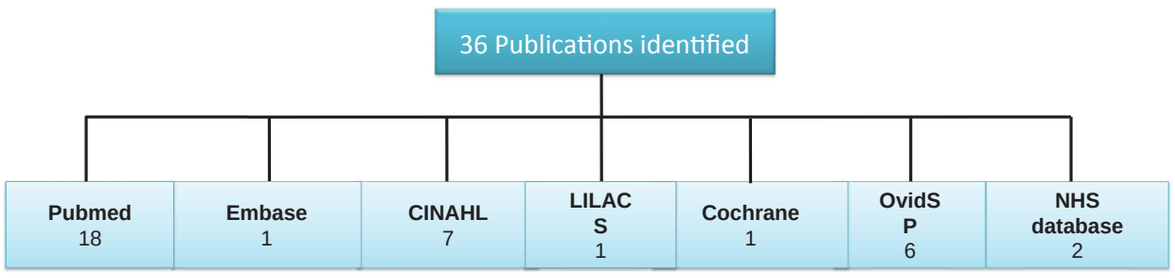

Figure 2 - Diagram of the results of the electronic search by database

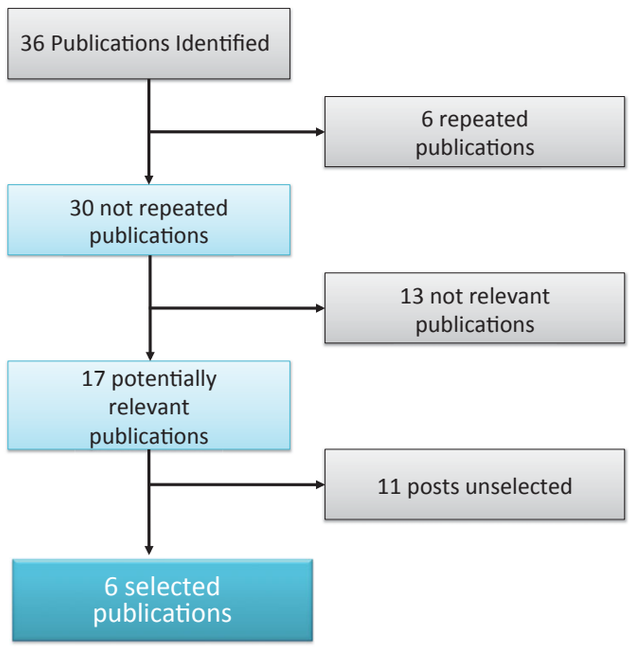

Figure 3 - Diagram of the methodology used for selecting the studies

Author, Year	Article Title	Study Design	Number of participants	Average Age	Device used	Methodology	Indexes reviews	AHI (nº/h)			Conclusions
								Baseline	6 months	Follow up	
Villa M. P. et al.,2007[5]	"Rapid maxillary expansion in children with obstrutive sleep apnea syndrome: 12-month follow-up"	Cohort	14	6,9 ± 2,2 (4,5 - 10,5)	RME two fixed bands	Dental anchorage: 2nd primary molars. Activation Protocol: activation screw rotated 2x daily for 10 days	- AHI (nº/h) - OAI (nº/h)- OHI (nº/h)- SaO2 (nº/h)- ArI (nº/h) - REM (%) -NREM (%) Daytime symptoms Nocturnal symptoms	5,8± 6,8	2,7± 3,5	1,5± 1,6	AHI decreased to values close to normal
Miano S. et al., 2009 [6]	"NREM sleep instability changes following rapid maxillary expansion in children with obstructive apnea sleep syndrome"	Cohort	9	6,4 ± 1,97 (4 - 8)	RME two fixed bands	Dental anchorage: 2nd primary molars. Activation Protocol: activation screw rotated 2x daily for 10 days	- AHI -SaO2 (nº/h) -Saturation decreased de SaO2 (%)- SaO2 Nadir (%)	17,4± 2,1	--	5,4± 6,25	AHI decreased to values compatible with mild OSAS
Pirelli P. et al., 2010 [7]	"Orthodontics and obstructive sleep apnea in children"	Cohort	60	7,3 (6 – 13)	Fixed RME	Dental anchorage: 1st molars/ permament or 2nd primary molars premolars. Activation protocol: 3 consecutive activations, 2x daily on day 1. 1 activation, 2x a day afetr the 1st day	- AHI - SaO2 Nadir (%) -longer duration of obstructive apnea -duration of desaturation - Sleep efficiency(%)	16,3± 2,5	--	0,8± 1,3	AHI decreased to values close to normal
Carvalho F. R. et al., 2007 [8]	"Oral appliances and functional orthopaedic appliances for obstructive sleep apnoea in children"	Systematic review	14	7,1 ± 2,6 (4-10)			- AHI -Noturnal symptoms - Daytime symptoms	7,1± 4,6	--	2,6± 2,2*	AHI decreased to values close to normal

Table 1 - Results of the studies included. Legend: - Value not included in the study. * - Measured after treatment.

Clinical implications

In order to adopt the best therapeutic method, it's extremely important to know the etiology of OSAS. If the problem results from changes in the facial morphology, particularly from the presence of a constricted maxillary arch, the use of oral appliances, such as RME, are indicated.

RME demonstrates unpredictable results if the children present maxillary endognatia, an adeno-tonsillar hypertrophy with a significant Mallampati score of 3 or 4, any neuromuscular and cardiorespiratory acute or chronic diseases or even any major craniofacial anomaly.

Conclusion

Rapid maxillary expansion is a beneficial and stable procedure in the treatment of OSAS cases with inadequate respiratory capacity and transverse maxillary deficiency. However, further studies are needed to assess the truly effectiveness of such devices in the treatment of OSA.

Bibliography

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