

outcomes, physical development, and cardiovascular health [11].

Traditionally, studies on the changes in upper airway dimensions have consisted of analyzing the RME post-treatment effects with two-dimensional (2D) cephalometric radiographs. Recently, the reduction in radiation dose obtained with cone beam computed tomography (CBCT) and low-dose multislice computed tomography (CT) has allowed the development of software capable of computing nasal airway volume [12].

Airway changes induced by RME treatment have been studied by means of functional examinations such as rhinomanometry (a standard diagnostic tool used to evaluate the respiratory function of the nose objectively) and acoustic rhinometry (a new technique that evaluates nasal obstruction by analyzing the reflections of a sound pulse introduced via the nostrils). These diagnostic procedures indicate a significant decrease in nasal airway resistance with consequent improvement in nasal breathing [13–15].

Polysomnography (PSG), commonly referred to as a “sleep study,” is considered the gold standard for diagnosing conditions such as obstructive sleep apnea. This diagnostic regimen provides various quantitative parameters to evaluate respiratory function such as oxygen saturation and Apnea–Hypopnea Index (AHI) [16].

Other diagnostic tools also have been introduced in orthodontics, such as electromyography (EMG), which is used to analyze the activity of the masticatory and facial muscles. EMG, a simple method of detecting and registering electric activity of muscle fibers, has been shown to have good reproducibility [17, 18].

The aim of our consensus paper was to identify and qualify the evidence of reports evaluating changes in

airway dimensions and muscular function in patients treated with RME during the growth period. Studies using radiography, CBCT, magnetic resonance imaging (MRI), PSG, EMG, and ultrasound (US) were considered for this purpose. The focused questions were the following: What are the effects of RME therapy on airways, nasal cavity, and breathing function? Are these changes stable in the long term? Do children undergoing RME therapy to correct a transverse discrepancy have any long-term benefit in muscular activity?

Search methodology

In order to identify relevant studies about the impact of RME on a child's general health, a computerized database search was conducted using the Medline database (Medline/PubMed). The search covered the period up to March 2015. The terms used in the search were “rapid palatal or maxillary expansion” in combination with “general health,” “oral health,” “breathing,” “OSAS,” “facial musculature,” “muscle activity,” and “chewing” (Table 1). A total of 331 references were retrieved from the database search. Among them, 44 duplicate references were found.

For the full articles to be selected from the abstracts, they had to satisfy the following inclusion criteria: human-controlled clinical trial; growing subjects; and the use of radiography, CT, CBCT, MRI, PSG, EMG, or US to measure changes in airways, breathing, and musculature functions. The exclusion criteria were surgical expansion or other simultaneous treatment during the active expansion phase as well as systemically compromised subjects or cleft subjects.

The initial selection excluded all titles and abstracts not related to the topic or that involved any exclusion

Table 1 Search strategy

Search	Query	Items found
#14	(rapid palatal expansion) AND chewing	7
#13	(rapid maxillary expansion) AND chewing	8
#12	(rapid palatal expansion) AND muscle activity	3
#11	(rapid maxillary expansion) AND muscle activity	4
#10	(rapid palatal expansion) AND facial musculature	1
#9	(rapid maxillary expansion) AND facial musculature	1
#8	(rapid palatal expansion) AND OSAS	9
#7	(rapid maxillary expansion) AND OSAS	14
#6	(rapid palatal expansion) AND breathing	88
#5	(rapid maxillary expansion) AND breathing	105
#4	(rapid palatal expansion) AND oral health	27
#3	(rapid maxillary expansion) AND oral health	29
#2	(rapid palatal expansion) AND general health	4
#1	(rapid maxillary expansion) AND general health	4