

Rapid Maxillary Expansion for the Treatment of Nasal Obstruction in Children Younger Than 12 Years

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Objective: To assess short- and long-term effects of rapid maxillary expansion (RME) on nasal flow in young children. Since RME has been reported to positively influence nasal obstruction in subjects with respiratory problems by reducing nasal resistance, a similar efficacy of RME could be expected in children with deciduous and/or mixed dentition who are affected by maxillary constriction and nasal obstruction from a different cause.

Design: Prospective study of children younger than 12 years, with different grades of malocclusion and oral breathing. Data included active anterior rhinomanometry in both the supine and orthostatic positions, as well as radiographic cephalometric measurements.

Setting: Tertiary care university hospital. Data were prospectively collected from 2005 to 2007.

Patients: Nasal flow and resistance were measured in 65 children younger than 12 years, with mixed or de-

ciduous dentition and different grades of malocclusion and oral breathing.

Main Outcome Measure: Efficacy of RME for resolution of maxillary constriction.

Results: After RME, an improvement of nasal flow and resistance has been recorded in patients, in the supine position, who presented both anterior and posterior obstruction. Less notable changes were shown in isolated forms of obstruction and in the orthostatic position.

Conclusion: In cases of maxillary constriction and nasal airway obstruction, RME has proved to be efficient for the improvement of nasal respiration in children via a widening effect on the nasopharyngeal cavity.

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RAPID MAXILLARY EXPANSION (RME) is an orthodontic and orthopedic procedure currently indicated for the treatment of bilateral crossbite with maxillary constriction. Maxillary constriction is one of the features that characterize the so-called skeletal developmental syndrome, represented by bilateral dental maxillary crossbite, high palatal vault, nasal obstruction derived from elevation of the nasal floor, turbinate hypertrophy, and mouth breathing.¹ When the maxillary dental arch is rapidly expanded, maxillary and palatine bones disarticulate along their common midpalatal suture and move laterally so that part of the lateral nasal walls are shifted outward with a small increase of transalar width.

An increased nasal resistance has been described in subjects with maxillary constriction.² By expanding the anterior portion of the nasal cavity, RME has also been

reported to reduce nasal resistances to levels compatible with a normal nasal respiration.^{2,3} However, high individual response variability,⁴ along with a weak correlation between expansion and nasal airway resistance, has also been reported.^{2,5} Although this orthodontic procedure is likely to mostly reduce nasal resistance values in the case of obstruction located anteroinferiorly in the nasal cavity, beneficial effects have also been reported in the case of obstructions located at the posterosuperior level.⁶ In a pediatric population, adenotonsillar hypertrophy exacerbates the obstruction at the level of retropalatal (posterior to the soft palate) and retroglossal (posterior to the base of the tongue) regions, thus contributing to the development of craniofacial abnormalities, malocclusions, respiratory nasal obstruction, and obstructive sleep apnea syndrome (OSAS). Previous studies have outlined the relationships between the dentofacial characteristics and the an-

terior and/or posterior obstructive sites in patients with OSAS, as well as the effect of RME in patients with OSAS.⁷⁻¹⁰ The improved nasal flow determines a lower subatmospheric inspiratory pressure that, in turn, would reduce the pharyngeal collapse. The modified tongue posture within a larger oral cavity may also improve the retroglossal obstruction. The expansion of the posterior aspect of the maxilla also directly affects the soft palate function and the soft-tissue architecture.

Studies about the effects of RME on nasal airflow and resistance and internal nasal dimensions in a pediatric population are few,^{11,12} as most of them have regarded subjects with permanent dentition in whom, despite a minor degree of expansion with respect to a younger population, a more stable and definitive result could be obtained.³⁻⁵ However, it is commonly observed that children usually show more remarkable functional (respiratory and orthodontic) problems due to the craniofacial dysmorphism, maxillary constriction, and nasal obstruction.

Anterior and posterior nasal obstructions may be objectively evaluated by anterior active rhinomanometry (AAR) both in the orthostatic and supine positions, allowing the functional assessment of the anterior and posterior nasal spaces, respectively^{13,14}; or the acoustic rhinometry test,^{11,12} which represents a reliable technique for assessing the geometry of the nasal cavity because changes in the cross-sectional area of the nose may alter the acoustic impedance of the acoustic pulse delivered into the nasal airway, although it seems unable to correctly detect constriction and expansion less than 3 to 4 mm.¹⁵

As far as subjective nose breathing is concerned, an 80% RME-induced change from mouth to nose breathing and improvement of the nasal abnormalities have been reported.¹⁶

Cephalometric analysis, which is usually used for diagnostic purposes in orthodontics and for controlling the results from orthodontic procedures, has also been indicated for the assessment of the following: RME-induced skeletal and dental changes¹⁷; RME-induced modifications at the posterior and anterior nasal space level^{13,12,17,18}; and modifications of the oronasopharyngeal spaces in patients with OSAS.¹⁰

The aim of the present study was to evaluate the short- and long-term effects of RME on nasal flow and resistance in children with deciduous and/or early mixed dentition and to correlate them with anteriorly and/or posteriorly localized nasal obstruction. For this purpose, the AAR test was carried out, both in the orthostatic and supine position, for the evaluation of short-term and long-term modification of nasal obstruction, while cephalometric indexes were used for a long-term assessment of eventual modifications of the nasal spaces.

METHODS

The study population comprised 65 children between 5 and 10 years old (mean [SD], 7.85 [2.15] years) affected by primary snoring and nasal respiratory obstruction and initially seen by an orthodontist for pathologic occlusions. The mean (SD) skeletal age of the patients, as determined from cervical vertebrae,¹⁹ was 8.1 (2) years. Of the 65 children, 40 had a deciduous dentition, while 25 had mixed dentition. Maxillary con-

striction, together with a high palatal vault and oral breathing (typical features of the skeletal development syndrome),¹ was identified as bilateral crossbite (8 patients), unilateral crossbite (14 patients), and class I (5 patients), class II (33 patients), and class III (5 patients) malocclusion.

Clinical examination was finalized to get evidence of a mechanical or mucosal cause, or both, for the respiratory distress. For this purpose, anterior and posterior deviation of the nasal septum, elevation of nasal floor, turbinate hypertrophy, obstruction at the retropalatal and retroglossal regions, due to adenoids and tonsillar hypertrophy according to the Mackenzie classification,²⁰ were searched. According to the type of nasal obstruction, patients were classified as the following:

- Subgroup A: Anterior obstruction due to septum deviation and turbinate hypertrophy (24 children)
- Subgroup B: Posterior obstruction due to adenotonsillar hypertrophy (10 children)
- Subgroup C: Mucosal obstruction due to turbinate hypertrophy (11 children)
- Subgroup D: More than 1 cause of obstruction (20 children).

A group of 50 patients of the same age, without nasal abnormalities and pathologic occlusions, was recruited to collect normal age-related data for rhinomanometric parameters.

A rapid palatal expander, consisting of 2 bands cemented on the second deciduous maxillary molars and fixed bands on the maxillary molar regions, connected to each other by extension from the expansion central screw (Leone, Florence, Italy), was applied in all the young patients. Parents were instructed to activate the RME appliance once a day by 2 quarter turns of the screw during the whole active treatment. Maxilla was considered over-expanded when a midline diastema appeared, so that the posterior occlusion reverted to a borderline scissor bite. At this time (approximately 10-14 days later), the screw was fixed with brass wire and kept in this position for 1 year (retaining period).

Before RME (pre-RME) and 10 to 14 days after RME (early post-RME), AAR was carried out in all patients of the study group. In 38 patients, a longitudinal study was carried out by performing AAR 1 year after blockage of the screw, as indication for the long-term results (late post-RME). In 13 patients of this latter group, before (pre-RME) and 1 year (late post-RME) after blockage of the expander, a cephalometric study was also performed to describe the craniofacial features and to quantify the anteroposterior dimensions of the nasopharyngeal space.

ACTIVE ANTERIOR RHINOMANOMETRY

AAR was carried out with a Rhino-kit (Menfis BioMedica, Bologna, Italy), assembled with a pediatric mask, software for the analysis of endonasal pressure (from -1000 Pa to +1000 Pa) and nasal flow (from -1000 mL/s to +1000 mL/s), and a 25-cm Rhino-set polyvinyl chloride tube (Menfis BioMedica) for the connection between the mask and the patient's nostril. Nasal resistance values were derived from the ratio between endonasal pressure and flow, in milliliters per second. From each examination, 8 flow values (inspiratory-expiratory right nostril and inspiratory-expiratory left nostril, in the orthostatic and supine positions) and 4 resistance values (right nostril-left nostril in the orthostatic and supine positions) were considered.

Inspiratory and expiratory nasal pressures and flows in both nasal cavities, in the orthostatic and supine positions, were measured at fixed intervals, ie, pre-RME, early post-RME, and late post-RME. The AAR test and activation of the appliance were delayed in the case of acute rhinitis. No decongestant therapy was allowed in the immediate period before and during RME. Based on a norm of total nasal flow in a pediatric population with normal nasal breathing (mean [SD], 1 [13] Pa/mL/3 s), an arbitrary, absolute qualitative grading of nasal obstruction

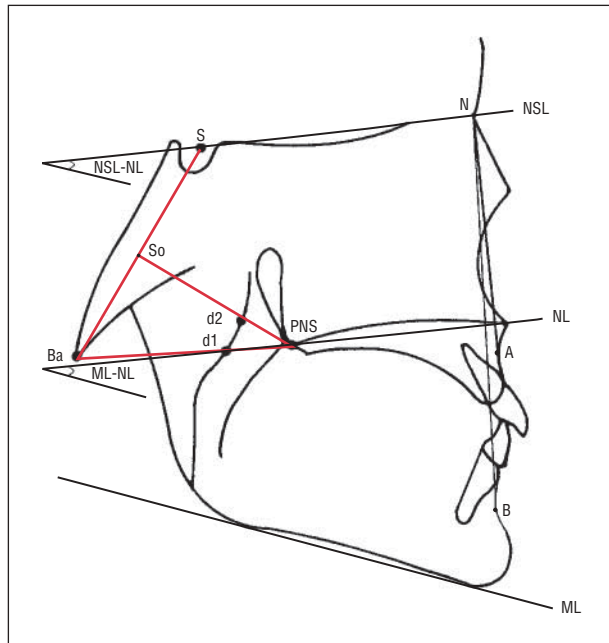


Figure 1. Cephalometric analysis on sagittal and vertical planes. Angles: sella-nasion–A point, maxillary prognathism; sella-nasion–B point, mandibular prognathism; A point–nasion–B point, relationship between maxillary bone and mandible with respect to the anterior cranial base; NSL–ML, mandibular inclination with respect to cranial base; and ML–NL, mandibular to superior maxilla inclination. Gradients: inferior nasopharyngeal gradient, PNS–Ba/PNS–d1; superior nasopharyngeal gradient, PNS–So/PNS–d2. A indicates the most retruding part of the superior maxilla; B, the most retruding part of the mandible; Ba, basion; ML, mandibular line; N, nasion; NL, nasal line; NSL, nasion–sella line; PNS, posterior nasal spine; S, sella; and So, midpoint between S and Ba.

was generated, considering the mean (SD) total flow to be at 150 (35) Pa, as calculated from the total inspiratory flow (right inspiratory + left inspiratory flow): absence of obstruction (>400 mL/s); low-grade obstruction (300–400 mL/s); substenosis (200–300 mL/s); and stenosis (0–200 mL/s).

CEPHALOMETRY

With the head in a cephalostat, lateral head plates were taken with the subject in the orthostatic position at a distance of 1.5 m, with central dental occlusion and a relaxed tongue position. Cephalometric linear and angular measurements were carried out with an accuracy of ± 0.5 mm and $\pm 0.5^\circ$. Random choice and double measurement of radiograms were performed to reduce biasing errors. Moreover, to reduce trace errors, a 0.5-mm pen was used. Landmarks and lines are described in **Figure 1**. The angles were measured on the sagittal (definition of malocclusion class) and vertical (definition of face divergence or face height) planes. The sagittal plane included the following:

- SNA (sella–nasion–A point), the most retruded point of maxillary bone, which defines the grade of prognathism of maxilla in respect to the anterior cranial base
- SNB (sella–nasion–B point), the most retruded point of the mandible, which defines the grade of mandibular prognathism to the anterior cranial base
- ANB (A point–nasion–B point), which defines the sagittal relationship between the 2 maxillary bones, as class I (0° – 4°), class II ($>4^\circ$); and class III ($<0^\circ$).

The vertical plane included the following:

- NSL–NL (nasion–sella line–nasal line), which corresponds to the inclination of the maxilla to the anterior cranial base

- NSL–ML (nasion–sella line–mandibular line), which corresponds to the inclination of the mandible to the anterior cranial base
- ML–NL (mandibular line–nasal line), which defines the vertical relationship between maxilla and mandible, ie, the facial divergence.

The ML–NL and NSL–ML cephalometric angles were measured pre-RME and late post-RME for evaluating the variations of mandible position due to both the expansion and passage from oral to nasal breathing.

The posterior nasal space was measured at 2 different levels, assessing the distance between the posterior nasal spine and the retropharyngeal soft tissues, according to Linder-Aronson and Woodside²¹: the first level between the posterior nasal spine (PNS) and the midpoint (So) of the sella–basion line (S–Ba) and the second one between the PNS and Ba. The 2 lines intersect the posterior nasopharyngeal wall as lines d2 superiorly and d1 inferiorly, respectively. Gradients, instead of linear measurements, have been used to minimize errors. The PNS–So/PNS–d2 and PNS–Ba/PNS–d1 ratios are considered the pharyngeal gradients, at the superior (superior nasopharyngeal gradient [SNG]) and inferior (inferior nasopharyngeal gradient [ING]), respectively. According to the hypothesis that RME increases nasopharyngeal space, gradients should consequently decrease. The ML–NL angle, which is usually increased in subjects with nasal obstruction with prevailing oral breathing,²² should hence diminish when nasal space increases after RME.

STATISTICAL ANALYSIS

Statistical analysis was carried out to verify 1 premise and 7 hypotheses. The premise was that all groups were homogenous regarding mean nasal flow values. The subjects were placed into 1 of the following 3 groups:

- Group 1: 28 children for whom analysis considered pre-RME and early post-RME data
- Group 2: 38 children for whom analysis considered pre-RME, early post-RME, and late post-RME data
- Group 3: 13 children of group 2 for whom the analysis also included the cephalometric data obtained before and 1 year after screw stabilization.

The *t* test for paired samples was used to evaluate the evidence of intervention's efficacy. The null hypothesis constituted no difference (difference=0) in the mean before and after the intervention. Two-sided 95% confidence intervals (CIs) were also calculated. Normality or log-normality was checked before each test, and necessary data managing was carried out to satisfy all underlying assumptions.

- Hypothesis 1: RME would induce an increased nasal flow and reduced nasal pressure in the orthostatic and supine positions at an early stage, as verified by comparing flows and pressures pre-RME and early post-RME in groups 1 and 2.
- Hypothesis 2: Modifications of nasal flow after RME are influenced by the type of nasal obstruction (as in subgroups A through D), as verified by comparing flow values pre-RME and early post-RME in groups 1 and 2 for subgroups A through D and the orthostatic and supine positions.
- Hypothesis 3: Nasal flow increase and resistance decrease 1 year after expansion, as verified by comparing nasal flows and resistances pre-RME and late post-RME in group 2 and the subgroups.
- Hypothesis 4: Persistence of early RME-induced effects after 1 year of the retaining period, as verified by comparing nasal flows and resistances in group 2 early and late post-RME for subgroups and positions.

- Hypothesis 5: Increased posterior nasal space, as verified by comparing SNG and ING pre-RME vs late post-RME in group 3, as related to a decrease in gradient values.
- Hypothesis 6: Passage from oral to nasal breathing after 1 year of treatment, as verified by a reduction in ML-NL and NSL-ML cephalometric angles pre-RME vs late post-RME in group 2.
- Hypothesis 7: Correspondence between improvement of nasal flow and decreased nasopharyngeal gradients, as verified in group 3 by comparing nasal flow variations with gradient variations (SNG and ING) late post-RME vs pre-RME.

RESULTS

TOTAL NASAL FLOW

At early post-RME, nasal flow improved in 33 (50%) of all patients in the orthostatic position and in 43 (66%) in the supine position (**Figure 2**). In group 2 patients at early post-RME, nasal flow improved in 23 (60%) in the orthostatic position and in 10 (27%) in the supine position, while at late post-RME, nasal flow improved in 35 (91%) in the orthostatic position and in 25 (65%) in the supine position with respect to pre-RME values (**Figure 3**) and in 24 (62%) in the orthostatic position and 13 (33.3%) in the supine position with respect to early post-RME values.

In the orthostatic position, 4 (13%) of the improved group 1 patients showed a 3-grade improvement, while a 2-grade improvement was observed in 7 (26%) and a 1-grade improvement in 17 (61%). In the supine position, a 3-grade improvement was observed in 1 (3%), a 2-grade improvement in 8 (29%), and a 1-grade improvement in 19 (68%).

In group 2, in the orthostatic position, 11 (30%) of the improved patients showed a 3-grade improvement, while a 2-grade improvement was observed in 11 (30%) and a 1-grade improvement in 15 (40%). In the supine position, a 3-grade improvement was observed in 6 (16.5%), a 2-grade in another 6 (16.5%), and a 1-grade in 25 (67%).

The subjective sensation of improved nasal breathing was correlated with the objective data in 35% of all patients.

NASOPHARYNGEAL GRADIENTS AND ANGLES (GROUP 3)

At late post-RME, SNG decreased in 70% (n=9) of the patients, while ING decreased in 77% (n=10) (**Figure 4**). The ML-NL and NSL-ML were unchanged.

STATISTICAL RESULTS

The study groups were homogenous for mean age.

- Hypothesis 1: Significant flow increase and resistance reduction were found, especially in the supine position. Total nasal flow significantly improved ($P=.01$); the inspiratory resistance significantly decreased 0.63 Pa (95% CI, 0.06-1.20 Pa; $P=.03$); and the expiratory resistance in the supine position significantly decreased 0.39 Pa (95% CI, 0.01-0.78 Pa; $P=.04$).

- Hypothesis 2: Subgroup D patients obtained a significant mean increase equal to +64.8 mL/s of nasal inspira-

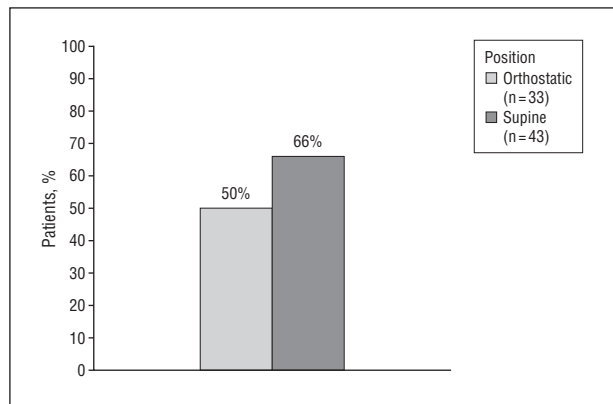


Figure 2. Hypothesis 1: early post-rapid maxillary expansion (RME) nasal improvement. Percentage of all patients with improved nasal flow, by comparing pre-RME vs early post-RME values in the orthostatic ($P=.01$) and supine ($P=.01$) positions.

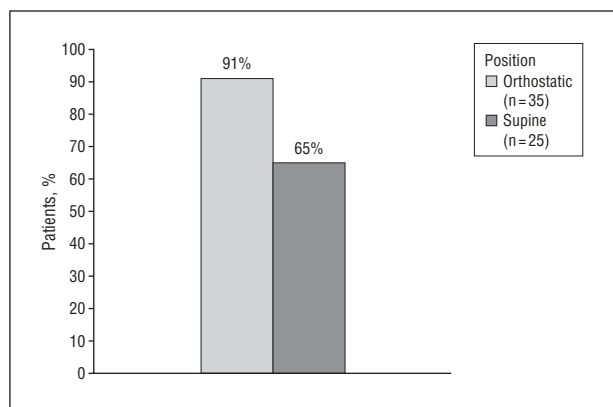


Figure 3. Hypothesis 3: late post-rapid maxillary expansion (RME) nasal improvement. Percentage of group 2 patients with improved nasal flow, by comparing pre-RME vs late post-RME in the orthostatic ($P=.02$) and supine ($P=.004$) positions.

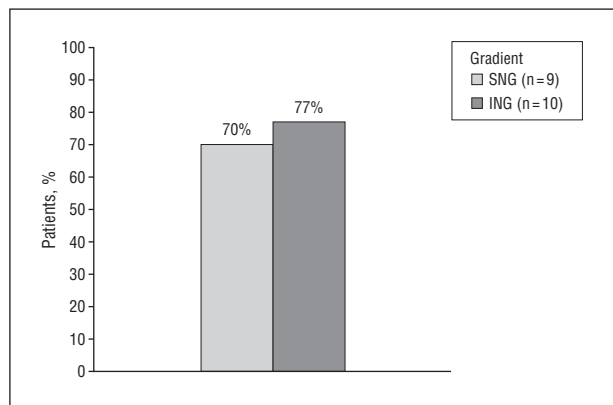


Figure 4. Percentage of group 3 patients with decreased superior nasopharyngeal gradient (SNG) ($P=.02$) and inferior nasopharyngeal gradient (ING) ($P=.008$) values.

tory flow in the supine position (95% CI, 21.7-107.9 mL/s; $P=.005$).

- Hypothesis 3: The efficacy of treatment was verified, because the mean inspiratory flow significantly improved both in the orthostatic (61.4 mL/s) (95% CI, 12.0-110.8 mL/s; $P=.02$) and supine 69.5 mL/s (95% CI, 23.8-115.2

mL/s; $P = .004$) positions. Mean endonasal resistance values significantly decreased only in the orthostatic position (0.50 Pa) (95% CI, 0.10-0.90 Pa; $P = .02$). No influence was given by the pathologic condition.

- Hypothesis 4: The immediate and late values were similar with a high correlation rate.

- Hypothesis 5: On average, SNG decreased 0.57° (95% CI, 0.23° - 1.22° ; $P = .02$), while ING decreased 0.72° (95% CI, 0.23° - 1.22° ; $P = .008$).

- Hypothesis 6: The difference between mean pre-RME vs late post-RME ML-NL and NSL-ML cephalometric angles (30.45°) was close to 0° (-0.05°), with a large P value ($P = .91$) and 95% CI very close to 0° (-0.90° to 0.81°); hence, angles were not significantly changed.

- Hypothesis 7: A positive correlation between SNG and nasal flow in the supine position was found ($r = 0.63$), and a negative correlation between ING and nasal flow in orthostatic position was found ($r = -0.62$).

COMMENT

The role played by RME in the reduction of nasal obstruction and the specific site of RME action at the nasal level are still under debate, and attempts to establish a cause-and-effect relationship between nasal obstruction and malocclusion are being pursued. Maxillary constriction is usually associated with craniofacial morphologic alterations in the anterior part of the nasal cavity as well as in the pharyngeal space. Maxillary expansion has been shown to mainly induce widening of the anterior part of oropharyngeal and nasal spaces,^{4,23,24} but the benefit that OSAS has been reported to receive from RME would suggest that, through the expansion of the posterior aspect of the maxilla, the function of the nasopharyngeal space would also be positively influenced.²⁵

Previous studies on the modification of nasal resistance during RME were mainly carried out in populations with permanent dentition and documented that, although the midpalatal suture is still patent,²⁶ the RME-induced orthopedic effect represents one-third of the amount of screw activation, while in mixed and deciduous dentition, the skeletal gain is presumed to reach 50% of screw activation.¹⁸ It has also been shown that early application of RME could be of absolute importance because it precedes the sutural age of the young patients in whom the effect is two-thirds skeletal and one-third dental, contrary to adolescents in whom the dental component would prevail, making a greater obstacle in the repair of bony suture dislocation and a greater likelihood of periodontal problems.^{27,28} In a pediatric population, a significant nasal flow improvement after RME was observed, but changes in neither cephalometric transverse nasal dimensions nor cross-sectional nasal areas could be detected.^{11,12}

In our study, a younger population with deciduous and mixed dentition was chosen for assessing the RME efficacy to gather information when multifactorial, co-existing alterations, such as orthodontic, orthopedic, and rhinologic disturbances, are present. From an orthodontic and orthopedic point of view, RME produces a greater orthopedic effect on deciduous and mixed dentition by

transferring the anchorage to deciduous molars. Despite the possibility of periodontal involvement, the future eruption of permanent teeth will be followed by apposition of new alveolar bone, which reestablishes the local integrity.²⁸ From a rhinologic point of view, the concomitancy of more than 1 cause in nasal obstruction during the pediatric age would allow evaluation of the role played by RME in the modification of nasal obstruction at different levels. In this age range, the physiological high position of the maxilla determines a thickening of the palatal bone, which will subsequently thin out, with the downward progression of the maxilla. Therefore, the elevation of the nasal floor may be frequent, determining, along with congenital or acquired septum deviations and compensatory turbinate hypertrophy, a prevailing anterior nasal obstruction. The posterior nasal obstruction may be concomitant, related mainly to retropalatal and retroglossal lymphatic hypertrophy. The worst grades of obstruction, such as those found in class III and IV lymphatic hypertrophy, may also be generated by obstructive-related inflammatory processes and by malocclusion.

In our study, different subgroups were formed in relation to the pathologic condition, assuming that anterior obstructions were associated with septum deviation and elevation of the nasal floor (subgroup A); posterior obstructions with adenotonsillar hypertrophy (subgroup B); anteroposterior obstruction to mucosal hypertrophy (subgroup C); or coexisting pathologic conditions (subgroup D).

The analysis considered the early RME effects, studied by the AAR, as well as the late RME effects for which cephalometry was also used. In the majority of the study group, nasal flows and resistance significantly changed in the early expansion phase (early post-RME vs pre-RME) (hypotheses 1 and 3) and persisted at the end of the passive retaining period (hypothesis 4). Moreover, remarkable variations of grade of obstruction could be assessed. Early changes were mostly significant in the supine posture (hypothesis 1), while the late ones were evidenced in both postures (hypothesis 3). The reason for these variations could be related to the fact that the maximal expansion during the first 10 to 14 days, related to maximal maxillary diastasis, would induce in children an increase of posterior and anterior nasal space, contrary to adults, in whom only the anterior part gets the advantage. This is confirmed by the remarkable improvement found in subgroup D (hypothesis 2). The effect on the posterior nasal space has also been confirmed by the decrease of superior and inferior pharyngeal gradients, corresponding to an increase of the posterior nasal space (hypothesis 5). In fact, a 12% increase in the respiratory area to nasopharyngeal area ratio was already described by Basciftci et al.³ Although in our study, a negative correlation between the pharyngeal gradients and nasal flows was expected (hypothesis 7), this was only found in the superior pharyngeal gradient. As far as the effect of the posture on nasal flow and resistance is concerned, the greatest early variations were found in the supine position, while at the late assessment, they were also evident in the orthostatic position. The greater advantage for the supine posture could be due to an increase of the posterior nasal space but, more probably, can be explained by the initial worse degree of obstruction in this position. The

negative correlation between nasal flow improvement and reduction of superior pharyngeal gradients was demonstrated only in the orthostatic position. Therefore, it is likely that the apparent initial improvement in the supine position is, after 1 year, compensated by a similar improvement in the orthostatic position.

The reduction of cephalometric angles (ML-NL and NSL-ML) from the basal condition, which also occurs in children undergoing adenoidectomy,²² would be related to the change from oral to nasal breathing, with a consequent mandible autorotation and reduction of facial height. In our study, however, ML-NL and NSL-ML angles did not significantly change. This could be because while RME mechanics induce an increase in these angles,^{27,29} the passage from oral to nasal breathing would reduce them.²² It seems evident that the objective and subjective stable improvement of nasal breathing would play a compensatory role for the relationships between maxillary and mandibular arches with respect to the anterior cranial base.

The increase of the posterior nasal space could be in relation to the reduced nasopharyngeal soft-tissue hypertrophy for a 2-fold reason: the better nasal breathing and the physiological age-related reduction of lymphatic tissue, which was not evidenced in our study population that included children between 5 and 10 years old; hence, a period in which reduction of lymphatic tissue is not likely to occur.

The significant improvement of nasal airflow, which remained stable after 1 year of expansion, along with the increase in posterior nasal space, would suggest a fundamental role of RME not only for treatment of maxillary constriction but also of severe constrictions of the nasopharyngeal spaces associated with oral breathing, snoring, and OSAS in children.²⁶

The implementation of a randomized controlled trial would strongly be encouraged to confirm these results. Nevertheless, RME could already be proposed as one of the primary therapeutic options for the management of skeletal developmental syndrome, sleep disorders, snoring, and OSAS in children.

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Author Contributions: Dr Barbara had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Monini, Malagola, Villa, and Barbara. *Acquisition of data:* Tripodi, Tarentini, Malagnino, and Marrone. *Analysis and interpretation of data:* Lazzarino. *Drafting of the manuscript:* Tripodi, Tarentini, Malagnino, Marrone, and Barbara. *Critical revision of the manuscript for important intellectual content:* Monini, Malagola, Villa, and Lazzarino. *Statistical analysis:* Lazzarino. *Administrative, technical, and material support:* Monini, Tripodi, Tarentini, and Barbara. *Study supervision:* Malagola and Villa. **Financial Disclosure:** None reported.

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