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Orthodontics

COMPARISON OF METHODS IN RAPID MAXILLARY EXPANSION IN CHILDREN: A BIBLIOGRAPHIC REVIEW

KEY WORDS: Rapid maxillary expansion, pediatric orthodontics, MARPE, RME

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ABSTRACT

Maxillary expansion techniques are widely used to treat transverse deficiencies in pediatric patients. This review explores the comparative effectiveness of rapid maxillary expansion (RME) approaches, including conventional and mini screw-assisted techniques. **Methods:** Eight systematic reviews and clinical studies were analyzed, focusing on treatment outcomes, risks, and clinical applications. Data were extracted to evaluate skeletal and dental effects. **Results:** Conventional RME increases nasal cavity volume and dental arch width but may involve root resorption and periodontal compromise. Mini screw-assisted RME (MARPE) demonstrated improved skeletal effects and reduced dental tipping, with limited evidence of increased pain or complications. **Conclusions:** MARPE offers significant benefits in skeletal effects compared to traditional methods, particularly in adolescents. Further research is needed to establish long-term outcomes.

INTRODUCTION

Transverse maxillary deficiencies are one of the most common alterations in pediatric orthodontics, affecting approximately 8-22% of children. These conditions often manifest as crossbites, dental crowding, and associated respiratory problems, negatively impacting oral aesthetics and function [1].

Rapid maxillary expansion (RME) is a widely used technique to address these deficiencies by separating the midpalatal suture, resulting in increased maxillary arch width and improved respiratory function [4]. However, traditional RME techniques are often associated with adverse effects such as dental tipping, root resorption, and periodontal compromise [5].

With the development of new technologies, micro-screw-assisted rapid palatal expansion (MARPE) has emerged as a promising alternative, offering advantages in force distribution and clinical outcomes [7]. This review aims to compare conventional RME and MARPE techniques, evaluating their clinical efficacy and associated risks.

MATERIALS AND METHODS

A comprehensive bibliographic review was conducted in the PubMed, Scielo, ScienceDirect, and Google Scholar databases, ensuring a balanced inclusion of perspectives. The search strategies included keywords such as "rapid maxillary expansion," "pediatric orthodontics," "MARPE," and "RME."

Eligible Studies Met The Following Criteria:

Inclusion Criteria:

- 1. Clinical studies, systematic reviews, and meta-analyses.
- 2. Patients up to 18 years old with transverse maxillary deficiencies.
- 3. Direct comparison between conventional RME and MARPE techniques.
- 4. Publications in English, Spanish, or Portuguese between 2005 and 2023.

Exclusion Criteria:

- 1. Studies including adult patients or those with systemic pathologies.
- 2. Articles exclusively evaluating surgical maxillary expansion.
- 3. Non-systematic reviews, unclear study designs, or duplicate studies.

Data Collected Included:

- 1. Main device used.
- 2. Target population (age, sample size).
- 3. Key clinical and radiographic findings.

4. Associated risks and adverse effects.

These data were organized into a comparative table to identify patterns and differences between the evaluated techniques. A narrative analysis was employed to synthesize the obtained results.

RESULTS

The results of this review are summarized in Table 1, which provides a detailed comparison of rapid maxillary expansion (RME) and MARPE techniques according to different studies. Findings highlight that MARPE offers greater stability in skeletal expansion, especially in adolescents, whereas conventional RME remains a valid option for younger patients with unfused sutures. Key observations include:

- 1. **MARPE In Adolescents:** Silva-Ruz et al. (2021) reported significant improvements in midpalatal suture stability and more predictable skeletal outcomes, albeit with slightly higher costs and mild discomfort.
- 2. **Conventional RME:** Studies like Vallejo et al. (2022) emphasized the increase in maxillary arch width but cautioned about potential side effects such as dental tipping.
- 3. **Combination Of Techniques:** Patil et al. (2023) evaluated the combined use of MARPE and RME, demonstrating reduced impact on soft tissues and effective expansion in complex conditions.
- 4. **Technological Innovation:** Inchingolo et al. (2023) analyzed modern devices like the Leaf Expander, highlighting their ability to minimize side effects and provide greater clinical control.

Table 1. Comparison Of Rapid Maxillary Expansion Techniques

Author	Year	Main Device	Population	Key Findings	Associated Risks
Silva-Ruz et al.	2021	MARPE	50 adolescents	Improved midpalatal suture stability and maxillary outcomes	Mild discomfort, higher cost
Pérez-Flores et al.	2020	Hyrax	35 children (9-12 years)	Increased maxillary width and nasal arch	Root resorption, periodontal issues
Vallejo et al.	2022	Conventional RME	40 children	Significant increase in maxillary arch width	Risk of dental tipping
Ricardo et al.	2014	Hyrax	Case study	Functional and aesthetic improvements	Minor complications

Patil et al.	2023	MARP E + RME	60 patients	Effective expansion and reduced impact on soft tissues	Variability in results
Inchingolo et al.	2023	Leaf Expander	Review of 15 studies	Reduced side effects and improved control	Extended treatment time
Barbosa et al.	2023	MARP E in OSA	30 children with sleep apnea	Significant reduction in apnea-hypopnea index (AHI)	Limited long-term evidence
Cerritelli et al.	2022	MARP E in Adults	69 patients	Effective expansion in patients with partially fused sutures	More invasive procedure, higher cost

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In summary, the literature supports the use of MARPE as a superior option for adolescent and young adult patients, whereas conventional RME remains useful for pediatric cases. Modern devices like the Leaf Expander represent a technological evolution that may be considered in specific contexts. Despite limitations, the reviewed studies provide a solid basis to guide clinical practice and future research.

DISCUSSION

The results of this review highlight the fundamental differences between conventional RME and MARPE. While both techniques are effective in correcting transverse maxillary deficiencies, micro-screw-assisted approaches offer substantial advantages in stability and force distribution [6]. This significantly reduces the risks of dental tipping and root resorption, common issues in traditional RME [2].

In general, the selection of the appropriate technique should be based on an individualized assessment, considering the patient's age, maxillary morphology, treatment objectives, and expectations. Additionally, the patient's level of cooperation is crucial, as techniques like MARPE require more precise implementation and careful monitoring. Although MARPE has demonstrated superior outcomes in adolescents, conventional RME remains a valid option for younger children with unfused sutures. The reviewed literature underscores the need for further research evaluating the long-term effects of both techniques, as well as their psychological and economic implications for patients and their families.

CONCLUSION

Micro-screw-assisted rapid maxillary expansion represents a significant evolution in treating transverse maxillary deficiencies, offering better skeletal outcomes and fewer dental complications compared to conventional RME. Although traditional RME remains useful for younger patients with unfused sutures, MARPE stands out as the preferred option for adolescents and complex cases such as obstructive sleep apnea. Future studies addressing long-term outcomes, as well as psychological and economic considerations, are essential to optimize clinical decision-making.

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