



Different Approach to Transverse Palatal Expansion: MARPE (Miniscrew Assisted Rapid Expander) Over RME (Rapid Maxillary Expander)

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Abstract

Maxillary deficiency is among the huge culprits in orthodontic patients seeking treatment. Multiple treatment modalities are there to tackle this problem. The most common treatment approaches are rapid maxillary expansion (RME) and miniscrew/surgical assisted rapid palatal expansion (MARPE/SARPE). In this article we reviewed two different approaches of treatment, side effects of RME and also the non-surgical mini screw assisted expansion in both older and younger patients. The stability of expansion, skeletal and dentoalveolar effects in both treatment approaches were reviewed.

Keywords: Maxillary Deficiency; RME; MARPE; Palatal Expansion; Non-Surgical Expansion; Expansion Stability; Dentoalveolar Effects; Skeletal Effects

Introduction

One of the most common problems in orthodontic patients is maxillary deficiency, this should be corrected once diagnosis has been made so as a normal transverse relationship and stable occlusion can be achieved. Maxillary deficiency is usually distinguished by unilateral or bilateral posterior cross bite, either complete or partial and in cases with simultaneous mandibular arch constriction, the cross bite might be absent [1].

Different treatment approaches have been taken, an example being the rapid maxillary expander (RME). Bishara and Staley [2] in 1987 found that RME in late adolescence or young adults might fail. Pain, ulcerations, palatal mucosa necrosis, accentuated buccal tipping of posterior teeth and gingival recession have been reported in the literature for cases in which RME failed. However, expansion using RME is mostly dental after adolescence [3].

As a result, miniscrew assisted rapid palatal expander (MARPE) came into existence as a non-surgical option with greater stability, orthopedic effects and few dentoalveolar side effects in young adults. This is a bone-tooth borne appliance which may have two or four screws. The anterior screws are placed in the rugae area, while the posterior screws are placed in the paramedian area (3 mm lateral to the suture) at the first bicuspid area. Choi, et al. [4] reported a success rate of 86.96% in skeletal preservation and dentoalveolar expansion and stability of periodontal structures during retention. The recommended protocol for MARPE activation is ¼ turn every day [5], so as tissue adaptation and reduction of patient discomfort is achieved, taking into account the increase in the mid-palatal suture rigidity with age [6].

Objectives of the Study

The main objective of this review is to highlight the difference between RME and MARPE in maxillary expansion.

Materials and Methods

We searched the databases EBSCO, SCIELO, PubMed/MEDLINE and Google Scholar. A total of 20 articles were first reviewed and after scrutinizing the articles and checking the criteria for inclusion and exclusion, 10 articles made it to the systematic review. Among the 10 articles, 5 were concerned with RME and the other 5 were for MARPE. T.R was concerned with the RME selection and AA was concerned with the MARPE articles.

Results and Discussion

Different articles and systemic researches have been searched about RME.

An article with title: Three-dimensional evaluation of upper airway following rapid maxillary expansion, done for 70 patients, by Hakan Ela; Juan Martin Palomob., *et al.* in 2014, they concluded that all of the transverse skeletal widths (medial orbital, lateral nasal, maxillary, and mandibular) and interdental (intermolar, inter-premolar and intercanine) parameters were significantly enlarged in the RME group. There is significant increase in nasal passage airway volume in RME group compared with non- RME group. Also, there is no difference in oropharyngeal airway passage volume [7].

Effects of rapid maxillary expansion on the midpalatal suture: is a systemic review with 12 studies done by ShiYao Liu, TianMin Xu and Wei Zou., *et al.* in 2015, they found that Suture opening with RME around 12 - 52.5% of the total screw expansion. After RME treatment, recalcification of the suture occurs which indicates the stability of treatment. They found that there is no evidence if the opening is parallel or triangular and in conclusion there are low quality articles, so no accurate conclusion [8].

In another systemic review and meta-analysis with the title of: Rapid Maxillary Expansion for Pediatric Obstructive Sleep Apnea, of 17 articles done by Macario Camacho; Edward T. Chang; Sungjin A. Song; Jose Abdullatif; Soroush Zaghi; Paola Pirelli; Victor Certal; Christian Guilleminault., *et al.* in 2016, they agreed that there is Improvement in oxygen saturation and spontaneous resolution of obstructive sleep apnea following RME treatment [9].

In Pubmed, Cochrane, Scopus, Lilacs and Web of science, there is a systemic review titled with: Transverse Skeletal Effects of Rapid Maxillary Expansion in Pre and Post Pubertal Subjects, by 6 different articles, done in 2018. They concluded their review that using skeletal age not chronological age as a reference in treatment of

skeletal crossbites. Using RME in pre puberty subjects will increase in maxillary and lateral nasal widths and being stable on long term while having less effects on post puberty subjects. Moreover, it affects nasal form and function and the mouth breathers will have more chances to have normal nasal breathing [10].

Ana Julia Guerra, Idiberto Jose Zotarelli Filho, Carlos Alberto Costa Neves Buchala they titled their review by: Systematic review of major considerations of rapid maxillary expansion, done in 2018. They mention indication and contraindication of RME. Its indication is incomplete maxillary bone maturation and transverse maxillary deficiency while its contraindications when there is excessive maxillary prognathism, bimaxillary protrusion, isolated crossbites and excessive vertical development of the face [11].

Different authors have worked with MARPE and came up with interesting results.

In a systematic review of 25 articles done by Di Luzio C., *et al.* [6] in 2017, they concluded that the mini screw-assisted rapid palatal expander (MARPE) is characterized by a decrease in the excessive load performed by conventional appliances on the buccal periodontal ligament of teeth to which they are anchored. Moreover, considerable decrease in accidental movement of anchoring teeth as the support for palatal expansion is osseous and avoids multiple surgeries.

Shin H., *et al.* [12] in their preliminary study (2019) titled, predictors of midpalatal suture expansion by miniscrew-assisted rapid palatal expansion in young adults. Where 31 patients were treated with MARPE and showed that age, palatal length and MPSM stage can be predictors of midpalatal suture expansion by MARPE in young adults.

Another retrospective cohort study of 69 patients done by Sung-Hwan Choi., *et al.* [4] in 2016 concluded that non-surgical MARPE can be a clinically acceptable and stable treatment modality for young adults with a transverse maxillary deficiency.

An article titled, skeletal and dentoalveolar changes in the transverse dimension using microimplant-assisted rapid palatal expansion (MARPE) appliances in 2019 by Chen Zong., *et al.* [13], reviewed 22 patients for MARPE and concluded that the use of MARPE appliances such as MSE can be used to correct transverse maxillary deficiency in adolescent or young adult patients with

minimal dentoalveolar side effects. A total expansion of 5.4 mm can be achieved in which near 60% was contributed by skeletal expansion. More parallel expansion can be expected anteroposteriorly and more expansion vertically at the palatal compared to the nasal floor.

Lastly, Hideo Suzuki, *et al.* [14] in their article in 2016, (Miniscrew-assisted rapid palatal expander (MARPE): the quest for pure orthopedic movement) reviewed 37 articles and came up with a conclusion showing that rapid maxillary expansion can be recommended for patients at the final pubertal growth stage, in addition to adult patients with maxillary constriction. It represents a treatment solution that can potentially avoid surgical intervention. When performed in association with rapid palatal expanders, it might enhance the skeletal effects of the latter.

Conclusion

Stable maxillary expansion (both skeletal and dentoalveolar) was achieved without surgery when using MARPE. Whereby, RME was mostly dentoalveolar in post pubertal patients.

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