

# MINISCREW ASSISTED RAPID PALATAL EXPANDER- AN ALTERNATIVE TO CONVENTIONAL EXPANDERS

Dr. Kalai Selvi A.<sup>1</sup>, Dr. Saravanan<sup>2</sup>, Dr. M.S. Kannan<sup>3</sup>

<sup>1</sup>Post Graduate Student,<sup>2</sup>Professor,<sup>3</sup> Professor and Head Of Department. Department of Orthodontics and Dentofacial Orthopaedics, Sree Balaji Dental College and Hospital, Pallikaranai, BIHER, Chennai

## ABSTRACT

*Expansion has been one of the oldest means and also conservative method of gaining space and correcting the intermaxillary and dental arch relationships primarily in transverse direction. As clinicians we all rely on some form of rapid or slow palatal expansion appliances to produce maxillary change. Various appliances and treatment techniques have been developed and used to correct the transverse discrepancies. The most common is rapid maxillary expansion (RME) performed with a tooth-anchored expander. However the predictability of orthopedic expansion is greatly reduced after 15 years of age. Due to this reason, it has been proposed that the MARPE is an effective alternative to maximize the skeletal effects in adults and also to avoid invasive surgical procedures like SARPE .*

**KEYWORDS:** MINISCREW, ASSISTED, RAPID, PALATAL, EXPANDER, ALTERNATIVE, TREATMENT, MAXILLARY, TRANSVERSE, DEFICIENCY

## 1. INTRODUCTION:

The bones of the maxilla develop entirely through intramembranous ossification. Growth occurs either by apposition of bone at the suture or by surface remodeling.

Melsen found that the suture of the maxilla fuses at age 16 years in female and 18 years in male, while snodell et al, found that the tranverse growth was completed for the majority of females at the age of 15 and at the age of 17 years for males.<sup>1</sup>

In a study Latham, had recognized 5 stages of midpalatal sutures- stage A, straight high-density sutural line, with no or little interdigitation,

stage B, scalloped appearance of the high-density sutural lines

stage c, 2 parallel, scalloped, high-density lines that were close to each other, separated in some areas by small low-density spaces,

stage D, fusion completed in the palatine bone, with no evidence of a suture and at

stage E, sutural fusion has occurred in the maxilla. The midpalatal suture cannot be identified, and the parasutural bone density is the same as in other regions of the palate.<sup>2&3</sup>

## 2. DISCUSSION:

### Rapid maxillary expansion (RME)

#### History

- Angell 1860 is considered the father of rapid maxillary expansion.
- Hass during the 1950's reintroduced rapid maxillary expansion

#### **Mechanism of RME** <sup>4</sup>

1. It mainly used if the post teeth are buccally inclined then RME.
2. his is best carried out prior to or during the pubertal growth spurt (Baccetti 2001), as after this time the suture becomes more heavily interlocked which may impede separation. Melsen 1975, Some say it can be used on patients > 15yrs
3. The aim of RME is to produce a greater degree of skeletal change. This is achieved by the use of a rigid appliance to limit tipping of the molars, and the application of heavy forces very rapidly, so as to exceed the rate of dental movement and produce splitting of the suture.
4. Clinical tips: **Bishara 1987**<sup>5</sup>

A. Postpone extraction of first premolars until palatal expansion is completed because these teeth together with the first molars are often used as abutment teeth for anchoring the appliance.

B. Avoid orthodontic movement of the maxillary posterior teeth prior to RME since Mobile teeth may tip faster during expansion.

C. Position the screw as superiorly as possible in the palatal vault.

D. Start turning the jackscrew 15 to 30 minutes after the appliance is inserted to allow sufficient setting time for the cementing medium

E. 2turns daily → 0.5mm

F. Creates 10-20Iib pressure across the suture

G. Microfractures of interdigitating bone spicules. Monitor the midpalatal suture with weekly maxillary occlusal films. The suture will open within 7 to 10 days in most patients. If the suture does not split within 2 weeks, the lack of skeletal response may result in tipping of the teeth and possible fracture of the alveolar plates.

H. Suture opens wider and faster anteriorly because of buttress effect of distally placed zygomaticomaxillary sutures

I. The separation of the suture can also be visualised radiographically.

J. Transient side effect: patient will experience dizziness, pain and discomfort so it is better to warn him

K. Midline diastema opens

L. Central diastema then begins to close as a result of some skeletal relapse and stretch of the transeptal fiber that caused some reciprocal incisors movement

M. After the expansion is completed and the screw is immobilized for 3 to 6 months and place a palatal holding arch between the maxillary first molars to minimize relapse tendencies.

N. There appears to be no difference in the amount of expansion of the back teeth obtained when using a banded or bonded rapid maxillary expansion brace. Harrison and Ashby, Cochrane 2008.

O. During the orthodontic treatment phase, incorporate some expansion in the maxillary arch wire.

P. In a patient with a severely constricted palate, the clinician might consider some of the following options:

- Initiate expansion as early as possible,
- Expand the palate in two phases, For patients with narrow palates, clinicians may choose

a telescopic screw, an interchangeable screw, or construct two appliances with progressively larger screws.

- Overexpand the maxillary arch,
- Prolong the period of fixed retention,
- Consider extraction of teeth in one or both jaws to facilitate constriction of the dental arches,

## 2. Rapid Maxillary expansion in adults

<sup>6</sup>Proffit states that “by the late teens”, interdigitation and areas of bony bridging across the suture develop to the point that maxillary expansion becomes impossible. The conventional expanders were effective in children and young adolescent patient, but when used during late adolescent and adults it caused more dental tipping, less to no skeletal expansion, more periodontal effects such as compression of the periodontal ligament of the supporting teeth, alveolar bone resorption, alteration in the thickening of buccal bone plate and lingual bone plate<sup>7</sup>. The only option for palatal expansion in adults was SARPE but it is an invasive procedure associated with post-operative pain and tissue impingement, swelling and micro trauma of TMJ, leading to patients discomfort hence the option is declined by many adults

With the advent of TADs adult expansion is possible without surgical intervention. These appliance anchor the expansion screw directly to the palatal bone, avoiding direct tooth contact. The mini implant assisted rapid palatal expander or MARPE is a completely bone-borne expansion device which would enhance the skeletal effects produced by maxillary advancement, as they are anchored at the basal bone of the maxilla, thus resulting in pure orthopedic movement while minimizing the effects produced on teeth.

## 3. Miniscrew Assisted Rapid Palatal Expansion

In 2010, Lee et al treated a 20-years-old patient with severe transverse discrepancy and mandibular prognathism. Before performing orthognathic surgery in patient Lee used an expansion appliance with miniscrews to avoid another surgery to approach transverse problem. Expansion was achieved with minimal damage to teeth and periodontum and with stable outcomes confirmed by clinical and radiographic examinations. Recently on the basis of Lee's studies, Park and Hwang, Moon and MacGinnis developed the maxillary skeletal expander (MSE) with four miniscrews installed parallel to the mid palatal suture and to itself<sup>8</sup>.

MARPE (Tausche, 2008)<sup>9</sup> is a simple modification of a conventional RPE appliance. The main difference is the use of micro-implants in the slot provided in the palatal jack screw to ensure expansion of the underlying basal bone thereby minimizing dento-alveolar tipping. An impression is made with the bands on the first premolars and first molars and a conventional hyrax expander is constructed on the cast. Four rigid connectors of stainless steel wire with helical hooks are soldered on the base of hyrax screw body. Two anterior hooks are positioned on the rugae region and the other two posterior hooks are placed on the parasagittal area. Orthodontic miniscrews are placed in the center of the helical hooks. This is a tooth-borne and a bone-borne expander

However there are different designs of bone-borne palatal expanders using micro-implants: Type1 is with miniscrews placed lateral to midpalatal suture . Type 2 is with miniscrews placed at the palatal slope. Type 3 is with miniscrews as in type 1 but with additional conventional Hyrax arms. Of all types proposed, type 2 seems to be the most efficient bone-anchored maxillary expander because the stress is distributed widely throughout the palate. Moreover the stress around the microimplants decrease and results in dentoalveolar expansion without buccal inclination of the dentition, because the expander is not connected to teeth.<sup>10</sup>

#### **4. Fabrication of maxillary skeletal expander**

Depending upon the constriction of the palatal vault, the screw size must be determined (8mm, 10mm, 12mm) The stainless steel arms that emerges from the body of the appliance must be adapted to the palatal contour and then it should be soldered at mesial and distal palatal aspect of first molar bands. The body of the expander should be placed as posterior as possible, close to the junction of hard and soft palate. The greatest resistance against suture opening is located in the sutures between maxilla and pterygoid plates, and forces should be applied more posteriorly to overcome initial resistance and promote parallel opening of the midpalatal suture Once the fabrication is completed, the appliance must be cemented in place, using glass ionomer cement.

The placement of miniscrews is rather simple from a surgical point of view. First the patient is asked to rinse with chlorhexadine and this is followed by local anesthesia infiltration of the palatal mucosa. Then the four mini-implants must be inserted into the palate with mini handle driver. The screw must be inserted at 90 degree angle; the screw insertion should follow an order of 1-2-3-4 . This pattern of insertion is recommended, to prevent distortion/moving of the device and lifting up of one side of the appliance when the opposite side being installed. Patients must be educated regarding the usage and activation. Patients are prescribed oral antibiotics and chlorhexidine rinse for 5 days to prevent infections. After this an healing period of one week is generally allowed before activation of the expander. The activation protocol may be different depending on the degree of expansion sought. Anyway the protocol provides for a period (3-6 months) of passive stabilization after active expansion to allow bone formation in the separated palatal suture, ensuring in this way stable results.<sup>11</sup>

#### **Advantages of using MARPE**

- It is an effective substitute for SARPE
- Good vertical control for patients with high mandibular plane angle.
- Simple design and Easy to fabricate.
- Added comfort for the patients with precision fit and minimum size.
- It also increases nasal airway for patients with airway obstruction.<sup>12</sup>

#### **5. CONCLUSION:**

MARPE can be an effective treatment modality for the correction of maxillary transverse deficiency in patients with complex craniofacial discrepancies and secure the safety and stability of the transverse correction. To avoid multiple surgeries, nonsurgical maxillary expansion can be performed to achieve both skeletal and dentoalveolar expansion for transverse correction. MARPE showed much lesser values of dental tipping in adults when compared to that of Hyrax appliance.

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**CONFLICT OF INTEREST: NIL**

**ETHICAL CLEARANCE: NOT APPLICABLE**

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