

Expansion In Orthodontics - Review Article

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ABSTRACT:

Arch expansion is a method of gaining space. An apparently complex yet relatively simple procedure in orthodontics is Palatal expansion. The correction of transverse maxillary deficiency can be an important component of an orthodontic treatment plan. Expansion of palate was first achieved by Emerson C. Angell in 1860.

INTRODUCTION:

Expansion of the palate is used to correct the maxillary discrepancy. Expansion is occurred by a combination of orthopaedic and orthodontic tooth movements.

There are three modalities of expansions used:

- rapid maxillary expansion,
- slow maxillary expansion,
- surgically assisted maxillary expansion.¹

SLOW MAXILLARY EXPANSION (SME):

SME procedures produce less tissue resistance around the circummaxillary structures and, therefore improve bone formation in the intermaxillary suture, which theoretically should eliminate or reduce the limitations of RME. Slow expansion has been found to promote greater post-expansion stability,² if given an adequate retention period. It delivers a constant physiologic force until the required expansion is obtained. The appliance is light and comfortable enough to be kept in place for sufficient retention of the expansion. Prefabrication eliminates extra appointments for impressions and the time and expense of laboratory fabrication. For SME, 10 to 20 newtons of force should be applied to the maxillary region only 450 to 900 gm of force is generated, which may be insufficient to separate a progressively maturing suture. Maxillary arch-width increases ranged from 3.8 to 8.7 mm with slow expansion of as much as 1 mm per week using 900 gm of force.³

APPLIANCES IN SME:

Coffin Appliance:

Given by Walter Coffin-1875. It is a removable appliance (fig1) capable of slow dento alveolar expansion. The appliance consists of an omega-shaped wire of 1.25 mm thickness, placed in the midpalatal region. The free ends of the omega wire are embedded in acrylic covering the slopes of the palate. The spring is activated by pulling two sides apart manually.

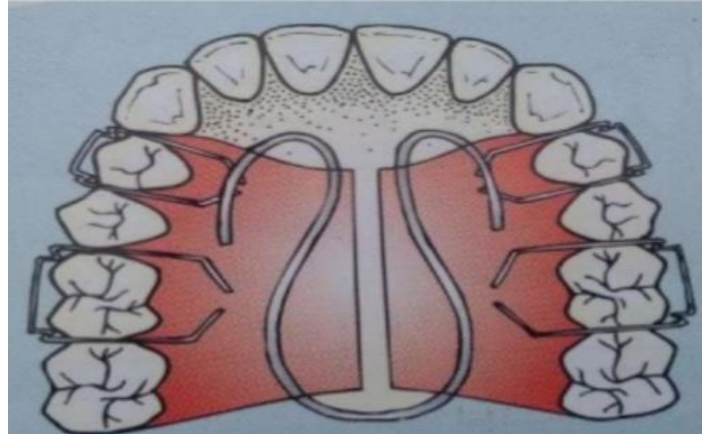


Fig1: coffin appliance

RAPID MAXILLARY EXPANSION:

Also known as rapid palatal expansion or split palate, it is a skeletal type of expansion that involves the separation of the mid-palatal sutures and movement of the maxillary shelves away from each other. The concept of maxillary expansion has also been extended to the nasal cavity. RME appliances are fixed and generate 3-10 pounds of force (Zimring and Issacson, 1965) and produce an increase in the transverse width of the maxillary basal bone.

INDICATIONS OF R.M.E:

- Cases with transverse discrepancy=4mm
- Maxillary molars are buccally inclined
- To facilitate max. protraction in class 3
- In cleft lip and palate patients with collapsed maxillae
- Moderate maxillary crowding

TYPES OF R.M.E APPLIANCE:

- Removable appliances
- Fixed appliance
 - Tooth borne
 1. Isaacson type (fig2)
 2. Hyrax type (fig3)
 - Tooth and Tissue borne
 1. Derichsweiler type (fig4)
 2. Hass type (fig5)

ISAACSON TYPE:

This appliance has a special spring-loaded screw called a MINNE expander, consists of a coil spring having a nut that can compress the spring, expander is activated by closing the nut so that the spring gets compressed



Fig 2: Isaacson type

HYRAX:

It consists of screw called HYRAX (hygiene rapid expander), the screws have heavy gauge wire extension that are adapted to follow the palatal contour & are soldered to bands on premolars



Fig 3: HYRAX

DERICHSWEILER:

The first premolars and molars are banded, wire tags are soldered onto the palatal aspect of the bands, wire tags get inserted into a split palatal acrylic plate incorporating screw at the centre.

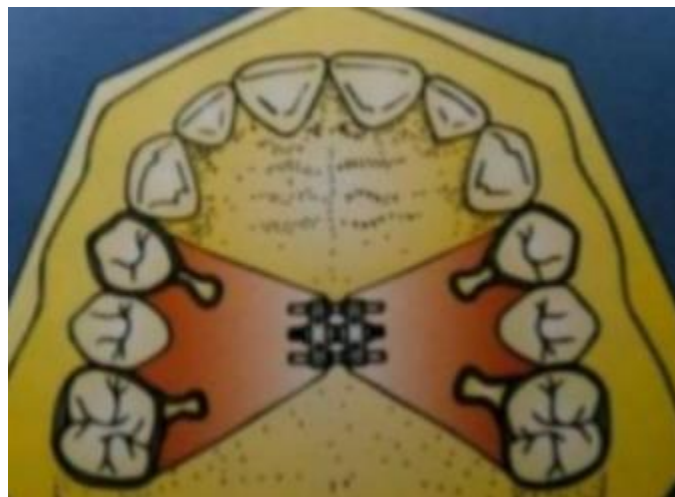


Fig 4: DERICHSWEILER

HASS TYPE:

The first premolar & molar of either side are banded, a thick stainless-steel wire of 1.2 mm diameter is soldered on buccal and lingual aspects connecting premolar and molar, lingual wire extends both anteriorly and posteriorly, free ends

embedded in acrylic and screw is incorporated.



Fig 5: HASS TYPE

Mid palatine sutures play a key role in R.M.E?

- shape of mid palatal suture in Infancy - y shape (fig 6)
- shape of mid palatal suture in Juvenile - t shape
- shape of mid palatal suture in Adolescence-jigsaw puzzle (fig7).

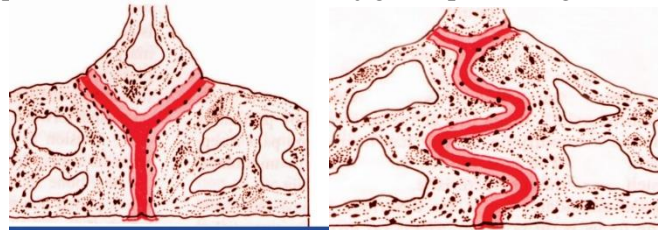


Fig 6: Midpalatine suture in infancy,

Fig 7: Midpalatine suture in early adolescence

TO INTERCEPT MAXILLARY CROWDING IN THE MIXED DENTITION:

Crowding of the permanent incisors with associated rotations and/or anterior crossbite is commonly observed during eruption of permanent lateral incisors. The rationale of interceptive treatment in the early mixed dentition is to generate adequate space for the spontaneous alignment of the upper permanent lateral incisors, when crowding is limited to few millimetre, normal growth could provide adequate space, but when the palate is narrow, and the crowding exceeds this amount RPE could represent an effective procedure. Space would be gained not only at the alveolar bone but also in the basal bone when canines and premolars are crowded too.⁴

RETENTION AND RELAPSE OF RME:

Expansion through maxillary suture widening by rapid maxillary expanders has been claimed to promote stability after retention. Stability has been attributed to the skeletal component of Arch enlargement obtained by the expansion appliance as opposed to dental expansion as a result of edgewise appliance mechanotherapy.

The causes of Relapse are:

- High stress accumulated between the articulations of the cranio facial complex.
- Tension produced in the palatal mucosa.
- Imbalance between the buccal and lingual pressures, which is Created as a result of maxillary expansion.
- The application of a fixed retainer immediately and subsequent to rapid maxillary expansion, then followed by an intermittent removable retention appliance is highly recommended.

SURGICALLY ASSISTED RAPID PALATAL EXPANDER(SARPE):

Surgically assisted RPE is an alternative method which reduces resistance of the closed midpalatal suture to correct maxillary constriction in an adult. It helps to achieve effective maxillary expansion in a skeletally

mature patient.

INDICATIONS OF SARPE:

- To increase the maxillary arch perimeter
- To correct posterior crossbite, and when no additional surgical jaw movements are planned,
- To widen the maxillary arch as a preliminary procedure, even if further orthognathic surgery is planned,
- To widen maxillary hypoplasia associated with clefts of the palate.

COMPLICATION:

Palatal tissue irritation is a frequent complication of SARPE.

Irritation occurs due to impingement of appliance or rapid rate of expansion^{5,6}

Other complications include haemorrhage, gingival recession, root resorption, sinus infection, extrusion of teeth, relapse and unilateral expansion.^{7,8}

MICRO IMPLANT ASSISTED R.M.E:

To achieve maximum skeletal expansion by overcoming the undesirable dento-alveolar effects, a non-surgical MICROIMPLANT-assisted R.M.E technique was introduced.⁹

Miniscrews are employed onto the maxillary expanders that recruits palatal and nasal cortices which provides anchorage that facilitates opening of midpalatal suture and helps to overcome resistance from circum maxillary sutures.

Paramedian area 3mm lateral to the suture in 1st premolar region is considered the most appropriate site for placement of miniscrews, anterior screws are placed in rugae.¹⁰

TREATMENT OBJECTIVES:

- To establish acceptable buccal occlusion
- To minimize buccal tipping
- To maximize skeletal expansion
- To maintain sound periodontal and bone support

As the appliance is tooth and tissue borne, it is used in late teens to mid-twenties. clinical observations suggest that MARPE prevents many adverse effects of RPE and is preferred as effective alternative for the same.

Conclusion:

Most dental transverse measurements changed significantly as a result of RME. The maturity of the maxilla-facial structures determines the time and success rate of the treatment with RME.

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