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Review Article

Rapid maxillary expansion appliance an orthodontic solution for obstructive sleep apnea syndrome (OSAS): a brief outlook

Dr. Sanjay Kumar[1], Dr. Vibha Rani[2]
[1]Associate Professor, Dept. of Dentistry, IGIMS, and Patna, pin code: 800014: Bihar.
[2]Assistant Professor, Dept. Of Physiology, Patna Medical college and hospital, Patna, Bihar.

***Corresponding author**
Dr. Sanjay Kumar
Email: devasthanam786@yahoo.co.in

Abstract: Obstructive sleep apnea syndrome is a common complain of patient visiting dental clinics. It is an upper air way respiratory obstruction and frequent bouts of temporarily cessation of air flow during sleep. There are too many articles published with definitions of (OSAS), classifications, sign and symptoms, investigations, diagnosis and their treatment etc. Due to costly CPAP etc instruments and failure of oral surgical procedures, patients has increased interest in oral appliances but least experimented rapid palatal expansion appliances in the treatment of obstructive sleep apnea syndrome. Due to this rapid maxillary expansion appliance (RME) is an orthodontic- orthopedic appliance of choice for facilitation of maxillary expansion by mainly the splitting mid palatine suture. The positive effects of expansion are observed mainly on upper air way system. This positive improvement in air way is observed due to pyramidal shaped rupture of maxilla involving all meati, mainly the inferior meatus which condition the maximum air. This appliance could be the valuable appliance in the treatment of OSAS.
Keywords: Obstructive sleep apnea syndrome, rapid maxillary expansion appliance

INTRODUCTION

Obstructive sleep apnea (OSA) syndrome is characterized by repetitive episodes of upper air way obstruction that occur during sleep, usually associated with a reduction in blood oxygen saturation. Rapid palatal expansion appliance occupies a unique orthopedic appliance in dentofacial therapy. By its tooth movements and mechanics it must basically come within the field of orthodontics, yet its ramifications take it into such other surgical disciplines as oral surgery, ENT and plastic surgery. At this stage in orthodontics history numerous articles pointing to the interrelations of orthodontics and rhinologic treatment procedures appeared in the literature. Sir G.V. I brown a noted rhinologist was one of vociferous proponents of suture opening for purpose of increasing nasal permeability [5].

Rapid maxillary appliance is an orthodontic-orthopedic appliance which is usually used in orthodontic treatment for the purpose for space gain in the dental arch. These are usually two types banded type and bonded type. The basic parts of a RME are central oblong shaped screws through which four metal struts are emerging that are soldered to the band placed to the teeth. (fig.no.1, 2,) [1, 7].

Mechanism of action of RME appliance in the improvement of airway: [1, 7]

The maxillary rapid palatal expansion appliance in growing children affects the three-dimensional increase in the oro-pharyngeal air-way by means of rupturing mid-palatal suture (transverse expansion), protrusion of maxilla (antero-posterior expansion) and compensatory increase in depth of the oral cavity.

Indications: [1, 2]

Dental uses

- For correction of cross bites-bilateral and unilateral.
- In cases of arch length deficiency to increase the arch length.
- In older patients along with surgical intervention. For correction of cross bites-bilateral and unilateral.
- In cases of arch length and tooth material discrepancies
- Facial orthopedic correction steep palate with septal deviation and mouth breathing due to enlarged adenoids
- Cleft lip and palate.

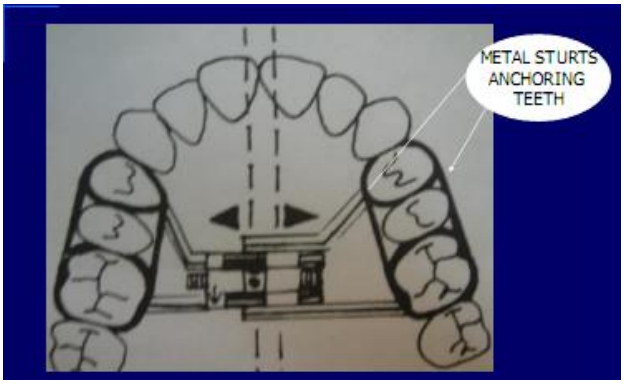

Fig-1:Typical maxillary expansion device

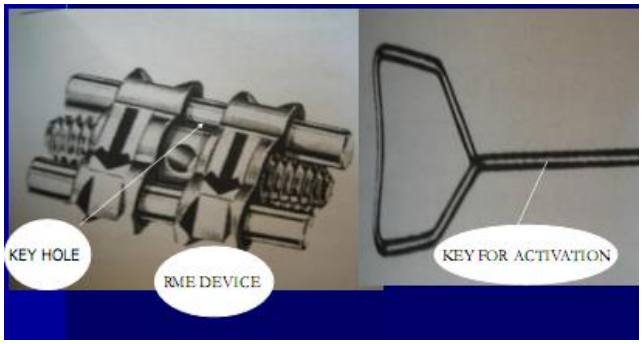

Fig-2: Typical expansion screw with key

Medical uses [1, 5, 7]

- Cases of inadequate nasal capacity exhibiting chronic nasal respiratory infection problem.
- Correction of axial inclination of posterior teeth.
- In case of long and narrow nose (leptorhine nose): this is calculated by nasal index (N.I) =greatest width of the pisiform apertures (P.A) x100/height of the nasal skeleton (distance between nasion point (N) to the anterior nasal point (ANS):N.I=PAx100/N-ANS (mm): Inference: if nasal index is less than 47, it is considered as narrow nose.[7].
- In case of nocturnal enuresis.
- Correction of deviated nasal septum.
- Person with snorting problem
- History of recurrent ear, nose or sinus problems.
- Allergic rhinitis and or chronic rhinitis

Contraindications [4]:

- Skeletal asymmetry of maxilla or mandible with severe antero-posterior and skeletal discrepancy.
- Patient with severe tendency to gingival hyperplasia such as seen in dilantin therapy.
- Relative contraindication with older age group patients due to suture ossification vertical.
- In uncooperative patients.

Changes produced by RME: [1, 2, 4, 7]

Dento-alveolar changes (fig.no.3)

- The alveolar processes bend and move laterally with the maxillae, while the palatal processes swing inferiorly at their free margin. The effect is a dental arch expansion and an increase in intranasal capacity.

Orthopedic changes (Basal bone changes fig no.3)

- The maxillary suture was found to separate superoinferiorly in a nonparallel manner.
- It is pyramidal in shape with the base of the pyramid located at the oral side of the bone and apex towards the apex of the nose.
- The magnitude of the opening varies greatly in different individuals and at different parts of the suture.

➢ In general, the opening is smaller in adult patients. The actual measurement ranges from practically no separation to 10 mm or more.

⌂ Activation of RME appliance: there are various regimes of activation depends upon the scientists, (fig.no.4) [1, 2, 7]

a) Zimring and Isaacson: In young growing patients two turns each day for 4-5 days followed by one turn till desired results.

b) Timms: 90 degree rotation in the morning and one at evening in growing patients (upto 15 yrs.) till required results. In age group between 15-20 yrs 45 degrees 4 times in a day till desired results is achieved.

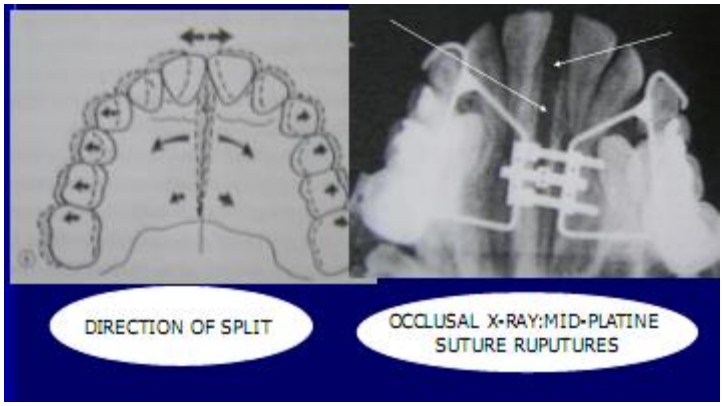

Fig-3: Dento-alveolar and orthopedic changes

Fig-4: Activation of appliance in patient mouth

Based on duration: [3]

1. Rapid expansion means: 0.5-1.0 mm/expansion per day.
2. Slow expansion: 1 mm/week.
3. Implant /bone screws associated expansion screw: directly applied to the bone.

In no situation rotation should not exceeds 180 degree in a day.

According to Sir Melsens on histological studies done on human cadavers and he concluded that suture ossification closure occurs at 16 yrs in females and 18 yrs in boys [2].

Summary:

RME is frequently used in the treatment of maxillary constriction with a bilateral posterior crossbite. Maxillary constriction together with a high palatal vault, are two characteristics of the skeletal development syndrome. It increases nasal permeability, improves mouth breathing and corrects the bilateral dental maxillary crossbite along with a high palatal vault [6]. The research in this field is required, for the appliance to be used as common in case of obstructive sleep apnea syndrome in growing patients.

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