

# International Journal of Research in Health and Allied Sciences

Journal home page: [www.ijrhas.com](http://www.ijrhas.com)

Official Publication of "Society for Scientific Research and Studies" [Regd.]

ISSN: 2455-7803

## REVIEW ARTICLE

### BONE BORNE MAXILLARY EXPANDER - AN ALTERNATIVE TO SURGICALLY ASSISTED MAXILLARY EXPANSION

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#### ABSTRACT:

Crowding or protrusion of teeth is the most common reason for patients seeking orthodontic treatment and can be a result of underlying transverse deficiency. Conventional methods of maxillary expansion can result in undesirable side effects especially if used after fusion of sutures. These side effects can be overcome by the use of Bone-borne expanders in young adults. The purpose of this case report, therefore, is to discuss the clinical case of a 17 year old male who was diagnosed with maxillary constriction and treated with a mini-implant supported expansion appliance.

**Key words:** Crowding, Protrusion

Received: 12 November, 2020

Accepted: 21 November, 2020

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**This article may be cited as:** Bakshi R, Sachdeva R, Sharma N. Bone borne maxillary expander - An alternative to surgically assisted maxillary expansion. Int J Res Health Allied Sci 2020; 6(6):69-73.

#### INTRODUCTION

Transverse maxillary deficiency is a common cause for bilateral or unilateral crossbites and crowding.<sup>1</sup> Correction of the transverse discrepancy requires palatal expansion which can be achieved by any of these treatment modalities: Rapid maxillary expansion (RME); Slow maxillary expansion (SME) Surgically assisted rapid palatal expansion (SARPE) or Mini-implant assisted rapid palatal expansion (MARPE). The type of appliance to be used remains a controversy, decision can be made based on the patients age and the type of malocclusion.<sup>2</sup>

The best timing for correction of transverse discrepancy is critical since the cessation of growth in transverse dimension occurs before that in vertical and sagittal growth. In children and adolescents, conventional orthodontic expansion has been successful if used before closure of suture whereas in adults the possibility of successful expansion decreases as suture closes and is mainly because of dentoalveolar tipping with little or no skeletal movement. It can also bring about some undesirable side effects which include severe pain, root resorption,

buccal cortex dehiscence and relapse of the expansion<sup>3-6</sup>. Surgically assisted expansion has been a treatment of choice in such cases as it produces better treatment results in adults and also prevents complications by surgically releasing the closed forces. However, despite its benefits, many patients do not opt for the treatment because of the invasiveness of the procedure, biological and financial costs of the treatment. Also the hospitalization and general anaesthesia required for the treatment may scare away many patients<sup>7</sup>

More recently, it has been observed that it is possible to expand the maxilla in adult patients without performing osteotomies. With the introduction of TADs, we are able to bring about changes similar to surgically assisted maxillary expansion without the invasive procedure of surgery. Placement and removal of the TADs do not require surgical procedures, general anesthesia and can be done by the orthodontist themselves. With this technique we can perform disjunction of the midpalate suture so that the maxillary processes may separate to correct the

transverse maxillary discrepancy. Bone-borne devices transmit the expansion forces directly to the palatal bone, thus providing parallel expansion of the palatal halves and tooth tipping as well as minimizing the related complications. The aim of this case report is to present the treatment of an adult patient with transversal maxillary deficiency using a temporary anchorage device supported expansion.

**CASEREPORT:**  
**DIAGNOSIS**

A 17-year-old male patient reported to the Department of Orthodontics at ITS Dental College with a chief complaint of irregular teeth. No medical complications with a history of deviated nasal septum was reported. Facial analysis revealed a symmetrical face with an increased clinical FMA, potentially

competent lips and a convex profile, upper and lower midline shift towards right side. (Fig1A-D)

Intraoral clinical examination and dental cast analysis revealed narrow maxillary and mandibular arches, a deep palatal vault with crowding in upper and lower arch, asymmetrical maxillary and mandibular arches, bilateral cross bites, Class II molar relation bilaterally end on canine-relationship both sides, anterior open bite. Intermolar and Inter canine widths decreased with values of 41mm and 28mm respectively. (Fig 2A-E) Cephalometric analysis showed a Class I skeletal pattern (ANB=2), Hyperdivergent skeletal pattern (SN:Go Me=53). proclined upper incisors(U1:SN=114) ;retroclined lower incisors (IMPA=80). Occlusal radiographs also revealed a narrow maxillary arch. (fig 3A-B).

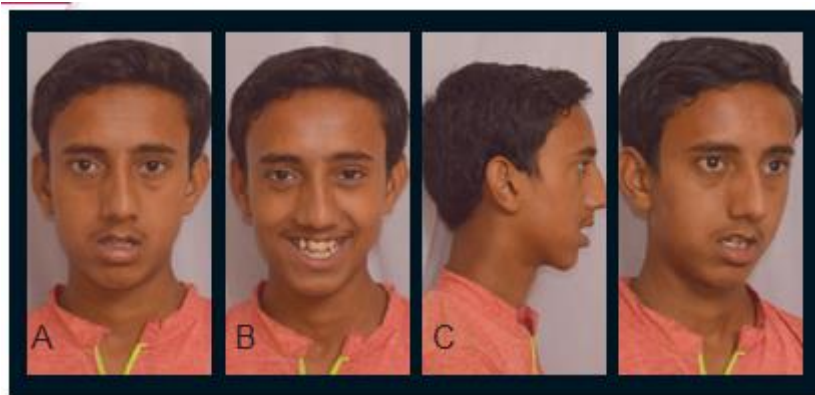


FIG 1(A-D): PRETREATMENT EXTRAORAL PHOTOGRAPHS



FIG 2(A-E): PRETREATMENT INTRAORAL PHOTOGRAPHS



FIG 3(A-B): PRETREATMENT CEPHALOGRAM AND OCCLUSAL RADIOGRAPH

**TREATMENT OBJECTIVE:**

- To achieve lip competency.
- To expand the maxillary arch
- To achieve normal Inter-Canine & Inter-Molar width.
- To resolve the crowding in upper and lower anterior segment.
- To correct the inclinations of upper & lower anteriors.
- To achieve ideal overjet & overbite.
- To obtain class I molar and canine relationship

**TREATMENT PLAN :**

Arch length discrepancies in upper and lower arches could be solved by extracting four premolars. But the negative impact of retraction on patients' profile, supported the decision for a non-extraction treatment approach. The orthodontic treatment plan included surgically assisted palatal expansion followed by fixed mechanotherapy for levelling and aligning of maxilla and mandible. Due to the patient being unwilling to undergo the surgical procedure, in order to substantiate the non- surgical approach, an efficient treatment alternative which can provide skeletal expansion with minimum dentoalveolar side effects had to be selected. Therefore, an alternate treatment plan which would also provide for an increase in arch length beside correcting the transverse discrepancy was explained to the patient regarding the use of a temporary anchorage device assisted expansion which was acceptable to the patient.

**Appliance DESIGN**

Four self-tapping mini-screws (1.6 mm in diameter, 8mm in length) were inserted bilaterally between the first and second premolar and between upper second premolars and first molars on the palate at 45 degrees. At the first appointment, an impression of the upper jaw was taken using alginate. A dental cast was obtained, the arms of the Hyrax screw were bent on the cast in the laboratory and acrylic was added on the dental cast. The acrylic was 4-5 mm behind the upper central incisors, extending cervically to the premolars and molars and covering the second and third rugae.



Holes were drilled into the acrylic in the same positions where the TADs were placed into the oral cavity and composite was cured onto the implants and acrylic. (FIG 4)

**Activation of appliance**

After removal of the excess composite, the Hyrax was activated with one or two 90° turns, producing an immediate, pronounced increase in tension. The patient was instructed to activate the expander until the desired expansion (2-3mm overcorrection) is achieved. After expansion was complete, it was decided to keep the Hyrax expander in place for about six months of retention. The patient is at present in the levelling and alignment phase of treatment at present. (FIG 5A-E).

The obtained results were analysed comparing intraoral photographs,(FIG 5A-E) dental study models and radiographs(FIG 6A-B).(lateral cephalogram and occlusal radiographs) before and after expansion.

Transverse development of the arch with relief of crowding was observed in the intraoral photographs. Frontal and right lateral photographs showed correction of crossbites on both sides. Class I molar and canine relationship were achieved on left side and end on molar-relationship on right side.

When occlusal measurements were compared in the models; a 4mm(approx) increase of intercanine-width and 8mm(approx) increase of intermolar width was seen(FIG-7).

**Table 1**

	Pre expansion	Post expansion
<b>Intercanine width</b>	28.51mm	32.29mm
<b>Intermolar width</b>	41.23mm	49.31mm
<b>Upper airway</b>	8mm	14mm
<b>Midpalatal suture expansion</b>	2mm	7.06mm

**DISCUSSION**

The correction of transverse issues is one of the most complex vectors to solve because if improperly diagnosed and treated, dental displacements, alveolar inclinations and periodontal damage may occur. Rapid palatal expansion has been the treatment of choice in children and young adults for narrow maxillary arches.

FIG 4: APPLIANCE PLACEMENT IN THE ORAL CAVITY



FIG 5A-E) POST-TREATMENT INTRA-ORAL PHOTOGRAPHS

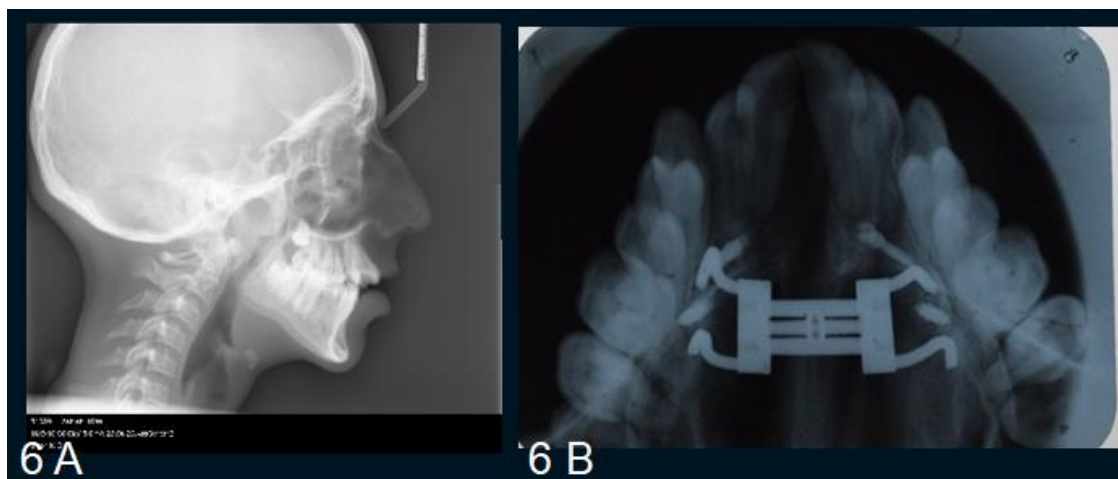


FIG 6(A-B): POST EXPANSION LATERAL CEPHALOGRAM AND OCCLUSAL RADIOGRAPH



FIG 7: PRE AND POST EXPANSION OCCLUSAL PHOTOGRAPH

As the age advances, the resistance to skeletal expansion increases and results in undesirable changes<sup>9</sup>. Surgically assisted expansion is advocated in such patients but is not selected by the patients owing to the invasiveness of the procedure, the complications associated and the financial burden associated with the hospitalization. In contrast, the bone-borne anchorage of Mini implant supported expanders avoids unwanted dental effects such as root resorption and buccal tipping of the teeth<sup>6</sup>. Placement and removal of implants also require neither surgical procedures nor general anaesthesia and are feasible for orthodontists to do themselves.

The use of mini implant supported expansion as an alternative to do this correction has been shown in this case report which is both effective as well as easy to perform TAD's assisted expansion in adults .In addition to an efficient solution for maxillary transverse deficiency in a substantial number of patients, seems to have an important impact on the reduction of upper airway resistance. The robust skeletal anchorage provided by the palatal expander offers novel mechanical possibilities for the treatment of a wide range of malocclusions. In our case, a substantial amount of expansion was achieved with the relief of crowding. The findings of our studies are

in accordance with studies conducted earlier by Peter Ngan et al<sup>7</sup> and Weissheimer et al<sup>8</sup>.

Outcome of the treatment is dependent on many factors like the design used, stress distribution and expansion pattern<sup>1</sup>. In another study done by Lagrave`re et al<sup>10</sup>, two implants were positioned on the palatal slope between the second premolar and the first molar area, which concentrated the force on the posterior region. In our study, the expander was supported by four implants, two placed between the premolars and two between the second premolar and the first molar area, providing a force distribution. Also, use of the acrylic plate distributed the stress throughout the palate, decreasing the concentration of the stress around the implants.

### CONCLUSION

Direct fixation of the hyrax expander using TADs to the palatal bone is a good alternative to surgically assisted palatal expansion allowing palatal expansion in patients in whom interdigitation of the midpalatine suture has already occurred. It is shown to be stable, comfortable to the patient with compliance. Mini-implant supported expansion can be considered as a preferred and effective alternative for the young adults with transverse maxillary deficiency.

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