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Case Report

Correction of Transverse Discrepancy Using Rapid Maxillary Expansion with Hyrax Appliance: A Case Report

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Abstract

A 14 years young patient presented for the correction of a malocclusion that included a transverse maxillary deficiency. The patient had required to expand his upper jaw to correct his malocclusion. Recent evidence indicates that rapid palatal expansion (RPE) technique can be used without surgery in young adults; the decision was, therefore, made to treat the patient with RPE. RPE of the maxillary arch was achieved by means of a Hyrax appliance. The post-treatment radiographs revealed an opening of the midpalatal suture. It is still believed by clinicians that young adult patients require orthognathic surgery for palatal expansion, despite recent evidence supporting a nonsurgical approach after closure of the midpalatal suture.

Key words: Hyrax rapid expansion technique, Maxillary expansion, Transverse discrepancy, Posterior crossbite

INTRODUCTION

Maxillary width deficiencies are an orthodontic challenge which is detected before or during the adolescent growth spurt. Correction of these deficiencies with a maxillary rapid palatal expander was first popularized more than 40 years ago by Haas.[1] However, once patients are past their growth spurt, the age being 12–13 years in females and 14–15 years in males, the protocol for rapid palatal expansion (RPE) is questionable.[2] Expansion of the maxillary arch in mature patients is not feasible, according to some authors.[3-5] Proffit reports that "by the late teens, interdigitation, and areas of bony bridging across the suture develop to the point that maxillary expansion becomes impossible," a belief based on Melsen's study on histological suture appearance.[6]

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Other recent evidence suggests that it is indeed possible to successfully expand the palate in young adults.[7-11] This article reviews the RPE in young adults and provides a rationale for using this approach based on a case the authors successfully treated by RPE alone. Clinicians are thus faced with a dilemma when treating patients after the palatal sutures have closed. The palatal sutures are reported close as early as when a patient reaches 12–13 years of age.[12] Furthermore, other sutures adjacent to the midpalatal suture reportedly are too rigid to expand past the late teens.[3,4,6,13]

CASE REPORT

A 14-year-old male patient diagnosed as skeletal Class I malocclusion with contracted maxilla having Angle's Class I malocclusion with bilateral posterior crossbite, severe crowding present in maxillary anteriors with palatally placed 12 and 22, mild crowding of mandibular anteriors with edge-to-edge bite having vertical growth pattern, and convex profile with incompetent lips [Figures 1-3]. Clinical examination and orthodontic records revealed a skeletal deficiency in the transverse dimension of the maxillary

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Figure 1: Pre-treatment intraoral

Figure 2: Pre-treatment extra-oral

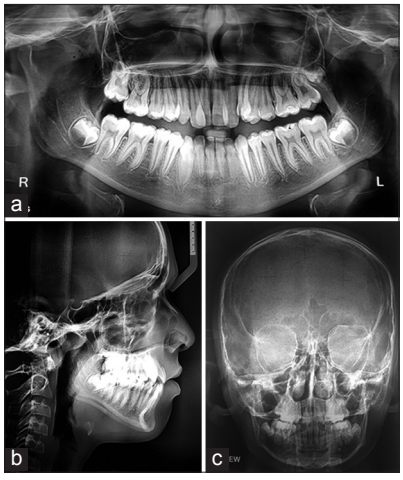

Figure 3: Pre-treatment radiograph, (a) Orthopantogram, (b) Lateral cephalograph, (c) posteroanterior view

arch; it was decided that nonsurgical RPE should be performed before placing full fixed orthodontic appliances. The patient was informed of all possible sequels, risks, and benefits including possible termination of the nonsurgical treatment and use of surgical expansion should the nonsurgical RPE procedure fail.

Orthopantogram, lateral cephalographs, and posteroanterior view of skull were taken to record the midpalatal suture

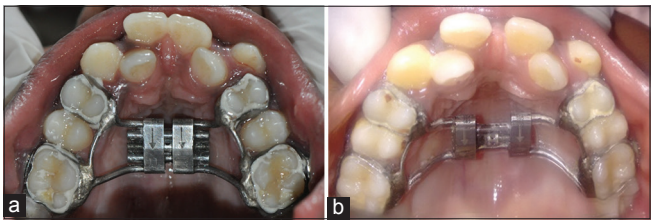

Figure 4: Maxillary expansion. (a) After placing hyrax appliance. (b) After expansion with hyrax appliance

Figure 5: Progress - intraoral (before alignment and leveling)

before treatment for clinical assessment. A maxillary Hyrax appliance (Dentaurum, Germany) was designed for the patient and banding with upper premolar and molar during the expansion procedure.

The patient was instructed to turn the screw only once a day for the first few days to loosen the sutural juncture with minimal pain and discomfort. The patient turned the screw once a day for 10 days. The expansion measured on the Hyrax appliance was approximately 1.6 mm at the expansion screw. No midline diastema was present and the patient did not report any pain. The patient was then instructed to continue turning the expansion screw twice a day, once in the morning and once in the evening for the next 7 days. 1 week later, the expansion measured 6 mm and there was still no midline diastema present. The patient was then instructed to continue turning the screw twice a day for 3 days, then once a day for 2 days. 24 days after initial activation, the expansion measured on the Hyrax appliance was 7 mm and the patient presented with a midline diastema of 3 mm [Figures 4-8]. A post-treatment maxillary anterior occlusal radiograph was taken to verify that the midpalatal suture had opened. The acrylic was placed through the expansion screw to avoid any further movement. The patient's midline diastema corrected with fixed appliance therapy. The patient reported minor discomfort for one short period when he thought he had mistakenly activated the appliance more than twice on the same day. Following RPE, a 3-month retention phase

Figure 6: Progress - intra oral (after alignment and levelling)

Figure 7: Treatment progress (after alignment and levelling)

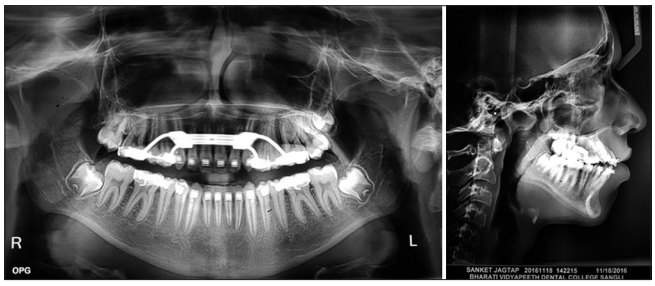

Figure 8: Progress radiographs

was allotted to allow for osteogenic formation in the midpalatal suture.

After 3 months, fixed orthodontic MBT 0.022 slot mechanotherapy used for the correction of dental malocclusion. In settling stage, Class II elastics and Class III elastics used for proper intercuspation [Figure 9-11]. For retention, clear retainer was used [Figure 12-15] [Tables 1-4].

DISCUSSION

When RPE is being considered for a young adult, the palatal suture is often evaluated on an occlusal film. Radiographic

Table 1: Sagittal skeletal relationship

Parameters	Pre-treatment	Mid treatment	Post-treatment
SNA	70	72	72
SAB	73	71	71
ANB	−3	1	1
YEN angle	124	123	122
W angle	56	56	55
BETA angle	35	35	34
WITS appraisal	−2 mm	−1	−1

Table 2: Dental relationship

Parameters	Pre-treatment	Mid treatment	Post-treatment
Upper incisor to NA (mm/deg)	6 mm/30	10/35	10/35
Lower incisor to NB (mm/deg)	5 mm/23	6/26	6/27
IMPA	89	93	94

Table 3: Vertical skeletal relationship

Parameters	Pre-treatment	Mid treatment	Post-treatment
SN to mandibular plane	40	40	42
Jarabak ratio	57	57	56
FMA	41	43	44
Nasolabial angle	110	97	95

Table 4: Soft tissue

Parameters	Pre-treatment	Mid treatment	Post-treatment
GSnPg	10	17	17
Nose prominence	15	15	15
GSn/SnMe	0.8	0.9	0.7
CmSnLs	110	97	95
Ls-SnPg	3	5	5
Li-SnPg	4	6	6
Stms-Stmi	2	1	2
E line			
Upper lip	7	5	5
Lower lip	5	3	7
S line			
Upper lip	3	2	3
Lower lip	2	6	6

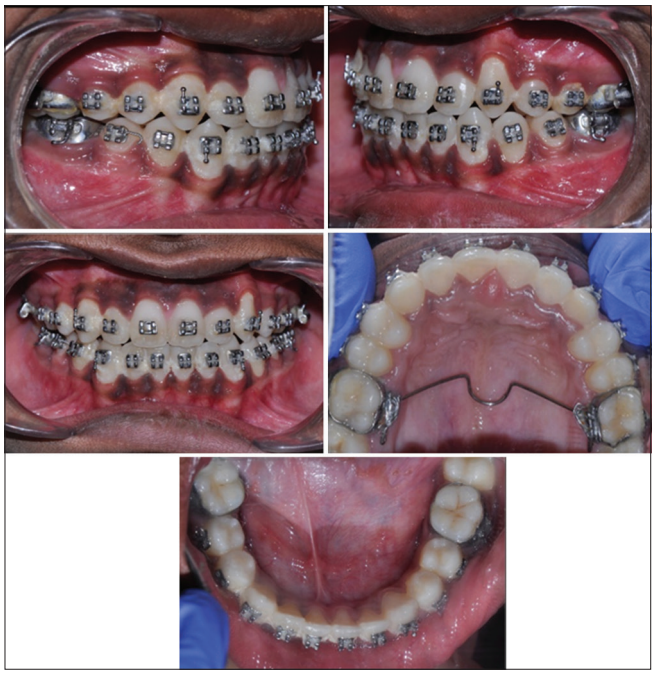

Figure 9: Treatment progress (before settaling)

Figure 10: Class III elastics on right side and Class II elastics on left side for setttaling

Figure 11: Progress radiographs. (a) Orthopantogram, (b) Lateral cephalograph, (c) Posteroanterior view

Figure 12: Post treatment – intraoral

studies have demonstrated that the midpalatal suture frequently begins to close during the early teens and that maxillary expansion is best performed before the end of adolescence.[1] It is generally assumed that the palatal suture is a straight-running oronasal suture and that the radiographic path projects through this suture.[1] Midpalatal sutures, however, do not always run straight.[6] This finding is based on earlier research, which found that if a 5% midpalatal sutural closure is set as a limit for splitting the intermaxillary suture, this 5% closure will not have been reached in most patients younger than 25 years of age.[14] Recent research indicates that a "radiologically closed" midpalatal suture is not the histological equivalent of a fused or closed suture.[15] Researchers attempting RPE in 38 patients ranging in age from the late teens to adulthood (7 males aged 17–23 years [mean age: 21 years, 4 months] and 31 females aged 15–44 years [mean age: 20 years, 6 months]) found that although nonsurgical expansion failed in some subjects because of painful reactions, RPE in younger adults was completed successfully.[9] The expansion was judged by clinical evidence of the creation of a midline diastema. Of the 38 patients, 33 were successfully treated with RPE alone in the age group of 15–28 years (mean age of 18 years, 9 months). The five individuals who required RPE with surgery ranged in age from 22 years to 44 years (mean age of 30 years, 7 months). It should be noted that most subjects in this study experienced a significant amount of pain, which can be attributed to the very rapid expansion regimen of 4 turns per day of the expansion screw until the appearance of a midline diastema. This is very rapid rate of expansion reportedly creates pain and discomfort; the authors of this article and other researchers.[1,8,11] Disagree with this protocol and prefers an expansion rate of a maximum of 2 turns per day.

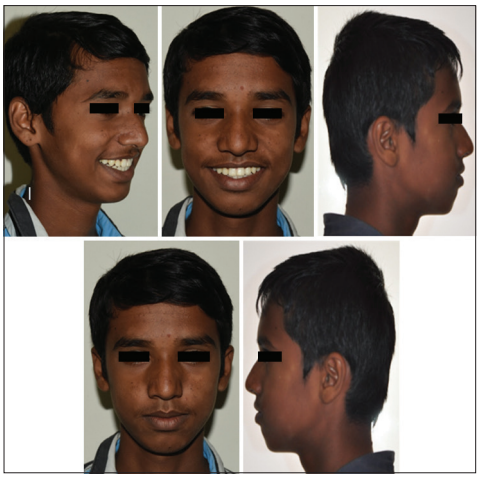

Figure 13: Post treatment - extraoral

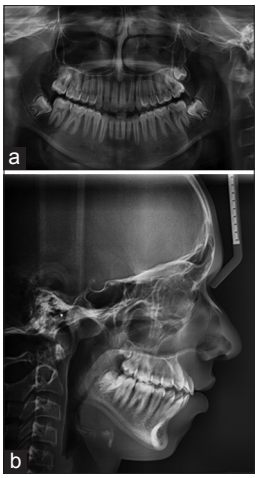

Figure 15: Post treatment. (a) Orthopantogram. (b) Lateral cephalograph

Figure 14: Post treatment- retention

Other similar studies also support the use of nonsurgical RPE in young adults. One such study assessed 82 patients under the age of 25 years who underwent successful RPE without surgery. Of the 82 patients, 12 were female (mean age of 16 years, 6 months), with the oldest being 20 years of age.[11] 15 patients ranging in age from 15 to 39 years (mean age of 22.3 years) were followed for 11 years; none of the patients experienced recurrence of their crossbite, although the authors reported concerns over the level of gingival recession that was observed.[8] Another recent report concluded that nonsurgical RPE in adults is a clinically successful and safe method for correcting transverse maxillary arch deficiency.[7] There was no relapse of the crossbite in the adults treated with RPE following discontinuation of retainers for at least 1 year (mean time of discontinuation of 5.9 ± 3.9 years). The method of expansion used in this study was a Haas-type expander with acrylic pads on the hard palate. The expansion screw was turned once per day, which is a different method of achieving expansion. With this technique, no midline diastema appeared in any of the patients. The authors demonstrated that the alveolar bone was, in fact, translated with minimal molar tipping and the maxillae were not separated in their sample of successfully treated adults. Nine of the 47 subjects experienced pain or tissue swelling, but all were able to complete their expansion regimen after a rest period of 1 week, with the appliance turned back a few times and a slower expansion schedule every other day. Some buccal gingival attachment loss was seen in the female subjects, but the attachment loss was deemed clinically acceptable.

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