CASE REPORT

Nonsurgical Maxillary Expansion in Adults: Report of Two Cases

[1]Arshad Hussain, [2]Shereen Fatima, [3]Mohammed Haneef

ABSTRACT

Correction of maxillary transverse discrepancy requires expansion of palate by combination of orthopedic and orthodontic movements. Isolated maxillary transverse deficiency can be treated either orthodontically or surgically with assisted rapid maxillary expansion (RME).

Nonsurgical expansion modalities include rapid maxillary expansion and slow maxillary expansion. Haas popularized the idea of orthodontic palatal expansion in the 1960s, and since then transverse deficiencies have been treated successfully in children and adolescents.

The use of palatal expanders in adults was widely frowned upon and was generally considered to be unsuccessful. Handelman published a clinical review in 1997, proving a nonsurgical expansion in adults was possible.

Keywords: Nonsurgical maxillary expansion, Palatal expansion, Rapid maxillary expansion.

How to cite this article: Hussain A, Fatima S, Haneef M. Nonsurgical Maxillary Expansion in Adults: Report of Two Cases. J Orofac Res 2015;5(4):151-154.

Source of support: Nil

Conflict of interest: None

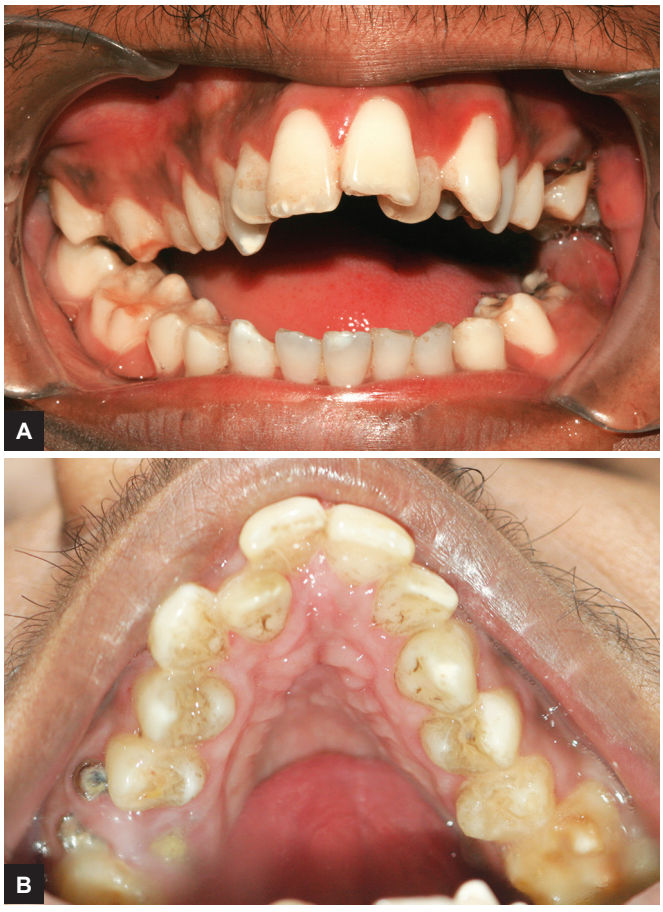
INTRODUCTION

Rapid maxillary expansion (RME), or palatal expansion as it is sometimes called, occupies a unique niche in dentofacial therapy.[1,2] The concept that RME can be successful in adults has raised questions in the literature.[1,3] The consensus is that, once patients are out of their teens, RME is questionable; instead, surgically assisted rapid maxillary expansion (SARME) is necessary.[2,3] This view is based in part on anatomic studies of the mature face, which shows mid-palatal suture and adjacent circum-maxillary articulations becoming more rigid and beginning to fuse by the mid-twenties.[1,2]

In this article, we report the treatment's outcome in the case of two adult patients who were treated with RME; also, we do a brief review of the literature.

CASE REPORT

A 24-year-old male patient with a previous history of surgical treatment for right temperomandibular joint ankylosis was referred to our department with a collapsed maxillary arch (Figs 1A and B). And a 22-year-old female patient with a previous history of surgical treatment for discontinuity in mandible, as a result of surgery performed when the patient was 1 year old, was referred to our department for correction of a collapsed maxillary arch (Figs 2A and B) and treated for maxillary arch transverse width discrepancy.



Figs 1A and B: (A) Preoperative frontal view, and (B) preoperative occlusal view

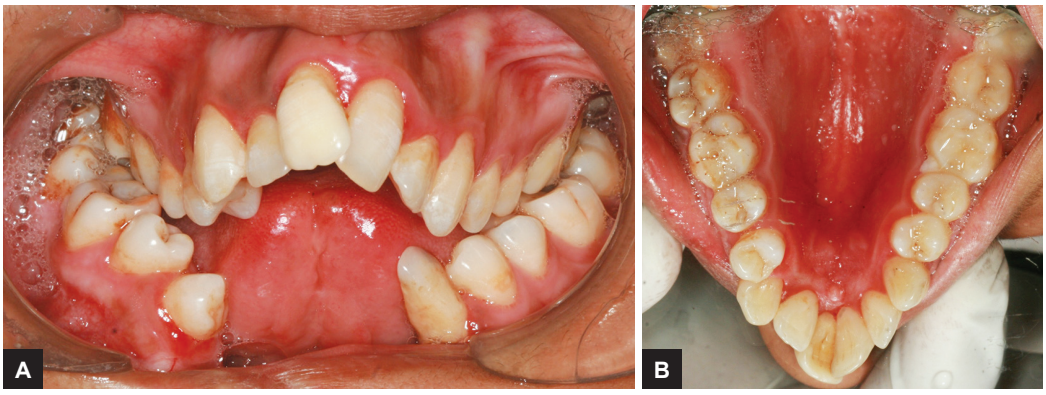
[1]Assistant Professor, [2]Reader, [3]Consultant

[1]Department of Orthodontics, Al-Badar Rural Dental College and Hospital, Kalaburagi, Karnataka, India

[2]Department of Oral and Maxillofacial Surgery, Al-Badar Rural Dental College and Hospital, Kalaburagi, Karnataka, India

[3]Department of Oral and Maxillofacial Surgery and Implantology Private Practice, Telangana, Hyderabad, India

Corresponding Author: Mohammed Haneef, Consultant Department of Oral and Maxillofacial Surgery and Implantology Private Practice, Telangana, Hyderabad, India, Phone: +919700322177, e-mail: drhaneefmdf@gmail.com



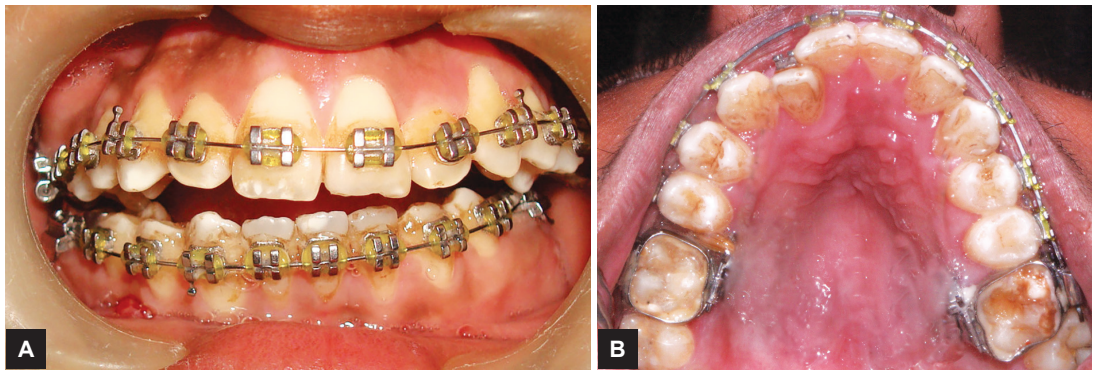
Figs 2A and B: (A) Preoperative frontal view, and (B) preoperative occlusal view

We used a tooth-borne hyrax expander banded to the 1st premolar and the 1st molar. The device was activated by a full turn initially, followed by half a turn every alternate day, and the expansion continued until the palatal cusps of the maxillary molars or premolars were slightly in occlusion with the buccal surfaces of the mandibular teeth. After expansion, the appliance was maintained for a period of 6 months. Post the removal of the appliance, a follow-up was done till 1 year.

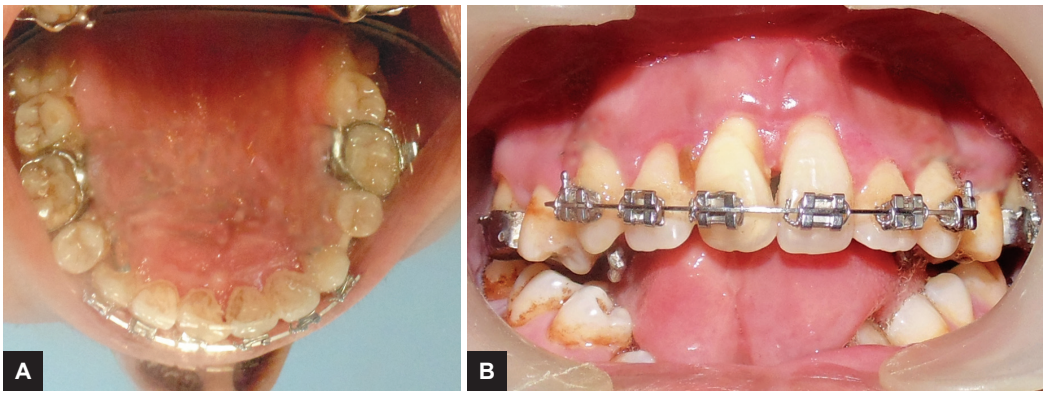
By using the method described by Handelman in 1997,[1] at the start of the treatment 4–4 maxillary arch width and 6–6 maxillary arch width for case 1 and 2 were measured, and it was found to be 19 and 31 mm in case 1 and 17 and 28 mm in case 2 (Table 1). We achieved interpremolar expansion of 13 mm and intermolar expansion of 8 mm in case 1 (Figs 3A and B, Table 1) and interpremolar expansion of 16 mm and intermolar expansion of 14 mm (Figs 4A and B, Table 1) in case 2.

Table 1: Results

	Case 1		*Case 2*	
Maxillary arch width	*Preop*	*Postoperative (1-year follow-up)*	*Preop*	*Postoperative (1-year follow-up)*
4–4	19 mm	32 mm	17 mm	33 mm
6–6	31 mm	39 mm	28 mm	42 mm



Figs 3A and B: (A) Postoperative frontal view, and (B) postoperative occlusal view



Figs 4A and B: (A) Postoperative occlusal view, and (B) postoperative frontal view

DISCUSSION

Maxillary expansion was first described by Angel in 1860 and was later popularized by Haas in 1961.[1-4] It involved expansion of the palate by a combination of orthopedic and orthodontic movements.

The three types of modalities that have been described in the literature for correction of transverse deficiency of maxilla[2,3,5] are slow maxillary expansion, RME, and SARME. Many different types of RME devices have been described in the literature[2,4,6] (Table 2) along with their indications, contraindications, and hazards (Table 3).

Maxillary occlusal radiograph is the commonly used method for evaluation of midpalatal suture ossification, as the opening of this suture along with dentoalveolar expansion forms the basis for nonsurgical RME. However, this two-dimensional imaging modality has its own inherent technological limitation;[7,8] the other methods for evaluation include the use of computed tomography (CT) scan, ultrasonographic imaging, and more recently cone-beam computed tomography (CBCT) scanning. Cone-beam computed tomography provides three-dimensional visualization of oral and maxillofacial structures at a relatively low cost, no superimposition of adjacent structures, easy accessibility, and low radiation exposure.[7,8]

Chronological age, cephalometric analysis, hand–wrist radiograph, cervical vertebrae maturation, midpalatal suture maturation, midpalatal suture density ratio, and histological studies have been used as a predictor of skeletal response to RME.[7,8]

Table 2: Types of rapid maxillary expansion devices[2,4,6]

I.	Tooth- and tissue-borne devices	(1) Hyrax expander
		(2) Isaacson expander
		(3) Bonded palatal expander
		(4) IPC rapid palatal expander
II.	Tissue-borne devices	(1) Haas expander
		(2) Derichsweiler expander

IPC: Inman power component

Table 3: Indications, contraindications, and hazards[1,2,4,6]

I.	Indications for RME	(1) Lateral discrepancies
		(2) Anteroposterior discrepancies
II.	Contraindications of RME	(1) Anterior open bite
		(2) Steep mandibular planes
		(3) Convex profiles
		(4) Skeletal asymmetry
		(5) Severe skeletal discrepancy
III.	Hazards of RME	(1) Oral hygiene
		(2) Length of fixation
		(3) Instrument failure
		(4) Infection
		(5) Periodontal problems

RME: Rapid maxillary expansion

Table 4: Classification of midpalatal suture maturation[7]

I.	Stage A	Almost a straight high-density sutural line with no or little interdigitation
II.	Stage B	Irregular in shape and appears as a scalloped high-density line except in some small areas where two parallel, scalloped, high-density lines are close to each other and separated by small low-density spaces
III.	Stage C	Appears as two parallel, scalloped, high-density lines that are close to each other, separated by small low-density spaces in the maxillary and palatine bones. The suture can be arranged in either a straight or an irregular pattern
IV.	Stage D	Fusion of the midpalatal suture in the palatine bone, with maturation progressing from posterior to anterior. The suture cannot be visualized at this stage, and the parasutural bone density is increased; in the maxillary portion of the suture, fusion has not yet occurred, and the suture still can be seen as two high-density lines separated by small low-density spaces
V.	Stage E	Fusion of the midpalatal suture, and bone density is the same as in other regions of the palate

A novel classification method for assessment of midpalatal suture morphology (Table 4) using CBCT has been proposed; the authors have speculated that, at stages A and B, the RME approach would have less resistant forces and probably more skeletal effects than at stage C, because there is only initial ossification along the midpalatal suture. Early stage C may indicate that the timing of RME is critical because the start of fusion of the palatine portion of the suture could be imminent. Patients in stages D and E might be better treated by SARME because fusion of the midpalatal suture already has occurred partially or totally.[7]

The main objective of RME is to correct maxillary arch narrowness, but its effects are not limited to maxilla alone.[6] When heavy forces are applied to posterior teeth, forces are transferred to the sutures, and when this force exceeds the limit of orthodontic tooth movement and sutural resistance, the sutures open up along with displacement of dentoalveolar complex.

Wehrbein et al found that 9 out of 10 individuals (18–38 years) examined during postmortem could have undergone successful RME, because less than 5% of the midpalatal suture was obliterated and also because the "radiologically closed" midpalatal suture is not the histological equivalent of a fused or closed suture.[9]

Earlier research by Persson et al found that if a 5% midpalatal sutural closure is set as a limit for splitting the intermaxillary suture, this 5% closure will not have reached in most patients younger than 25 years of age.[9]

Krebs, in the early 1960s, used metallic bone markers, estimating that only 50% of the expansion after RME was skeletal.[1,3]

Iseri and Ozsoy[10] also used metallic bone markers and confirmed these findings, and they noted that only 40% of maxillary expansion was in the maxillary bone.[3]

Garrett et al[11] used CBCT on the skeletal effects to the maxilla after RME in adolescents (average age: 13.8 years). They concluded that, at the level of the first premolars, 55% of the expansion was skeletal, and at the level of the first molars, only 38% was skeletal; the remainder was dentoalveolar.[3]

Kartalian et al used CBCT to evaluate the dentoskeletal complex before and after RME in growing subjects. They concluded that only 40% skeletal expansion takes place and the rest is achieved by expansion of dentoalveolar complex.[3]

Handelman in 1997[1] reported the success of RME in five adult patients and reported the expansion to be predictable and stable. Later, Handelman in 2011[3] concluded that RME in adults is a clinically successful and safe method for correcting transverse maxillary deficiency. They compared 47 adults and 47 children treated with RME and a control group of 52 adult orthodontic patients who did not require RME.[9]

In 2011, he reiterated that 50 to 60% of expansion in children and adolescents occurs in alveolus and not at the midline suture and is the basis for the success. He also reported that adult expansion was the result of displacement of the alveolar process, which carried the teeth buccally.[3]

Ribeiro et al achieved RME with the use of a modified Haas-type appliance in which the first premolar and molars were banded, the second molars incorporated by bonding a wire segment extending from the appliance's acrylic base.[5]

A study by Alpern et al assessed 82 patients under the age of 25 who underwent successful RME. Of the 82 patients, 12 were female (mean age of 16 years, 6 months), with the oldest being 20 years of age. The oldest male to undergo expansion without surgery was 25 years of age.[9]

Pithon reported a case of a 28-year-old female in whom palatal expansion was achieved using a banded type of hyrax screw.[5]

Capelozza et al[12] reported successful nonsurgical RME in 38 adult patients, judged by the clinical evidence of creation of midline diastema.[1,5]

CONCLUSION

Recent clinical, histological, and radiological evidence indicates that in those patients who are in their late teens or their early twenties, palatine suture is not fused enough to inhibit nonsurgical RME.

A comprehensive review of the clinical outcomes indicates that it is time for a paradigm shift. Nonsurgical RME is a viable procedure for young adults who are well into their early twenties, without the extensive morbidity associated with SARME.

REFERENCES

1. Handelman CS. Nonsurgical rapid maxillary alveolar expansion in adults: a clinical evaluation. Angle Orthod 1997; 67(4):291-308.
2. Kumar SA, Gurunathan D, Muruganadham, Sharma S. Rapid maxillary expansion: a unique treatment modality in dentistry. J Clin Diagn Res 2011 Aug;5(4):906-911.
3. Handelman C. Palatal expansion in adults: the nonsurgical approach. Am J Orthod Dentofacial Orthop 2011 Oct;140(4): 462-469.
4. Agarwal A, Mathur R. Maxillary expansion. Int J Clin Pediatr Dentisty 2010 Sep-Dec;3(3):139-146.
5. Deb U, Shaw A, Shukla S, Mishra M. Nonsurgical expansion in adult patient – A case report. J Int Dental Assoc 2011;1(1): 27-30.
6. Gill D, Naini F, Mcnally M, Jones A. The management of transverse maxillary deficiency. Dent Update 2004 Nov;31(9): 516-523.
7. Angelieri F, Cevidanes LHS, Franchi L, Gonccalves JR, Benavides E, McNamara Jr JA. Midpalatal suture maturation: classification method for individual assessment before rapid maxillary expansion. Am J Orthod Dentofacial Orthop 2013 Nov;144(5):759-769.
8. Gumussoy I, Miloglu O, Bayrakdar IS, Dagistan S, Caglayan F. Ultrasonography in the evaluation of the midpalatal suture in rapid palatal expansion. Dentomaxillofac Radiol 2014;43(8):20140167. Epub 2014 Aug 29.
9. Stuart DA, Wiltshire WA. Rapid palatal expansion in the young adult: time for a paradigm shift? J Can Dent Assoc 2003 Jun;69(6):374-377.
10. Iseri H, Ozsoy S. Semirapid maxillary expansion – A study of longterm transverse effects in older adolescents and adults. Angle Orthod 2004 Feb;74(1):71-78.
11. Garrett BJ, Caruso JM, Rungcharassaeng K, Farrage JR, Kim JS, Taylor GD. Skeletal effects to the maxilla after rapid maxillary expansion assessed with cone-beam computed tomography. Am J Orthod Dentofacial Orthop 2008 Jul;134(1): e1-e11.
12. Capelozza Filho L, Cardoso Neto C, da Silva Filho OG, Ursi WJ. Non-surgically assisted rapid maxillary expansion in adults. Int J Adult Orthod Orthognath Surg 1996;11(1):57-66.