

CASE REPORT***Correction Of Maxillary Transverse Deficiency By Mini-Implant Assisted Rapid Palatal Expansion***Malvika Agarwal¹, Santosh Kumar², Adeel Ahmed³, Shraddha Gupta⁴**Abstract**

Transverse maxillary deficiency is a relatively common clinical problem. It has been reported that 9.4% of whole population and nearly 30% of adult orthodontic patients have a maxillary transverse deficiency related to a posterior crossbite. A 16 year old female patient reported to the department of Orthodontics and Dentofacial Orthopedics at Kothiwal Dental College and Research center with a chief complaint of irregularly placed upper front teeth. This case report deals with the treatment of this particular case with mini-implant assisted rapid palatal expansion. A significant amount of skeletal maxillary expansion was achieved without any surgical intervention.

Keywords: rapid palatal expansion, maxillary transverse deficiency, mini-implant

Introduction

Although rapid palatal expansion (RPE) has been a reliable treatment modality in prepubertal and pubertal patients, there have been controversies regarding nonsurgical expansion in adults.

Surgically assisted RPE (SARPE) has been the treatment of choice to resolve the high resistance from the bony palate and the circum-maxillary sutures.

The difficulties in dealing with the transverse discrepancy are associated with the limited range of tooth movement in the transverse dimension, described by Proffit et al as the “transverse envelope of discrepancy.”¹

Since many patients are reluctant to undergo multiple surgical procedures, the demand for nonsurgical treatment might increase.

However, even though nonsurgical palatal expansion is feasible, ample orthopedic expansion of the basal bone rather than dentoalveolar tipping is essential to

prevent detrimental periodontal effects such as bony dehiscence and to establish proper posterior occlusion.

In this regard, the appliance should be designed appropriately to maximize the skeletal effects.

Case report

A 16 years old female reported to the Department of Orthodontics and dentofacial orthopedics, kothiwal dental college and research centre, Moradabad. with the chief complaint of irregularly placed upper front teeth.

Extra-oral examination (**Figure-1**) revealed mesoprosopic symmetrical face, straight profile, competent lips and normal nasolabial angle. The patient showed no symptoms of TMJ disorder. The smile of the patient was narrow with increased buccal corridor space. Intraorally (**Figure-2**) the patient had superclass II molar relation on right and end on molar relation on left side, proclined and protruded lower and upper incisors, palatally placed 15, highly placed 13, 23, 43, crowding in upper and lower anterior region. Pretreatment lateral and posteroanterior cephalometric readings are depicted in table-1. PA cephalogram shows maxillomandibular differential of 5mm. Pont's analysis showed constriction in premolar and molar region.

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Fig. 1.1-Frontal view



Fig. 1.2- Smiling view



Fig.1.3- Lateral view

Figure 1- pretreatment extraoral photographs



Fig.2.1- Frontal view



Fig.2.2- Right lateral view



Fig.2.3- Left lateral view



Fig.2.4- Maxillary occlusal view



Fig.2.5- mandibular occlusal view

Figure 2-pretreatment intraoral photographs



Figure 4- pretreatment lateral and postero-anterior cephalogram



Figure 5- pretreatment orthopantomogram

Angles	Mean	Actual	Inference
Lateral cephalogram			
SNA	82°+2	84°	Orthognathic maxilla
SNB	80°+2	80°	Orthognathic mandible
ANB	2°+2	4°	Skeletal class I pattern
Mandibular plane	17-28	30°	Vertical grower
1 to N-A (mm)	4mm	5mm	Protruded upper incisors
1 to N-A (angle)	22°+2	31°	Proclined upper incisors
1 to N-B (mm)	4mm	6mm	Protruded lower incisors
1 to N-B (angle)	25°+2	31°	Proclined lower incisors
Interincisal angle	131°+2	113°	Proclined incisors
FMA	25°+4	30°	Vertical grower
PA cephalogram			
Maxilla-mandibular differential	23mm	18mm	5mm skeletal expansion is required
N-N	NA	21mm	
J-J	NA	49mm	
Ma-Ma	NA	49mm	
UB6-UB6	NA	44mm	

Table 1 Pretreatment cephalometric measurements**Treatment Objectives**

1. To correct the maxillary skeletal deficiency with sufficient maxillary expansion.
2. To establish good esthetics with correct alignment of upper and lower anterior teeth.
3. To reduce the bimaxillary proclination.
4. To establish good intercuspation in maxillary and mandibular posterior segment.
5. To establish correct molar relationship.
6. To maintain the correct skeletal jaw relationship.
7. To improve the facial esthetics with a more balanced upper and lower lip.

Treatment Alternatives

Two treatment plans were formulated and discussed with patient and her parents and the consent was taken.

The first treatment plan was to start the treatment by extraction of upper right 2nd premolar as it is completely palatally blocked out. Then placement of mini-implant assisted rapid palatal expander for expansion and space gaining. Then extraction of upper left and lower premolars for relieving severe crowding. Case will be ended in class I molar relationship.

The second treatment plan was extraction of all 1st premolars and upper right 2nd premolar as space required in upper arch is greater than the width of two

premolars, followed by retraction and alignment of upper and lower teeth therefore establishing a normal over jet, overbite and a class I molar relationship.

The first option was found out to be more appropriate, as extracting 5 teeth is not a right option. So, first treatment plan was followed

Treatment start and progress

A MARPE was fabricated with some modification of the conventional RPE (**figure- 6**). An impression was made and a conventional hyrax expander was constructed on the cast. Four rigid connectors of stainless steel wire with helical hooks were soldered on the base of hyrax screw body. Two anterior hooks were positioned on the rugae region, and the other 2 posterior hooks were placed on the parasagittal area. The hooks were adjusted for passive contact with the underlying tissues.

The MARPE was then placed and cemented on the patient's first premolars and molars. Orthodontic miniscrews (vectortas) with a 2 mm collar diameter and a 10 mm length were placed in the center of the helical hooks under local infiltration anesthesia (**figure-7**).

The wires were adjusted to maintain passive contact with the collar of the miniscrews. Nonsteroidal anti-inflammatory drugs were prescribed for pain control. The hyrax screws were turned twice a day starting the next day. The miniscrews were maintained in place with no notable positional change throughout the expansion phase.

Simultaneously, a 0.022 X 0.028 inch slot straight wire appliance (MBT Prescription; ORMCO) was placed in lower arches. Leveling and aligning were then commenced with the use of round 0.012 inch nickel titanium wire. Leveling and alignment is still being continued.

Expansion was terminated at 4 weeks, when the palatal cusps of maxillary posterior teeth touched the lingual cusps of mandibular posterior teeth, indicating significant increase in intermolar width and justifying the concept of overexpansion to compensate relapse (**figure-8**).

After 4 weeks of active expansion, the MARPE was maintained for 3 months to allow bone formation in the separated palatal suture. After 3 months a soldered transpalatal arch was placed immediately after appliance removal to prevent relapse (**figure-12**). This is being followed by placement of a 0.022 X 0.028 inch slot straight wire appliance (MBT Prescription; ORMCO) in the maxillary arch for levelling and alignment on 0.012 inch niti followed by 0.016 niti wire.

Treatment results

Adequate nonsurgical bodily expansion of the maxillary buccal segments was achieved. The patient had sound and stable periodontal support after expansion.

The smile of the patient is widened, decreasing the buccal corridor resulting in a more pleasing smile.¹ The post-expansion intraoral photographs depict the formation of a 5mm midline diastema indicating opening of midpalatal suture and thus skeletal expansion (**figure-8**). Separation of the midpalatal suture was confirmed with intraoral periapical radiographs (**figure-9**), occlusal

radiographs (**figure-10**) and PA cephalogram (**figure-11**).

The pre-treatment and post-expansion posteroanterior cephalometric changes are depicted in table-2. As can be appreciated in the table, a total of 7 mm expansion was achieved as indicated by change in intermolar distance (UB6-UB6). Out of this, a 5 mm of skeletal expansion was achieved indicated by the difference in maxillary alveolus width (Ma-Ma) and confirming the clinical finding of 5mm midline diastema which occurred post-expansion.



Figure 6- MARPE- on model



Fig.7.1- Maxillary occlusal view



Fig.7.2- Right lateral view



Fig.7.3- Left lateral view

Figure 7- MARPE fitted in patient's mouth



Fig.8.1- Frontal view showing opening of midline diastema

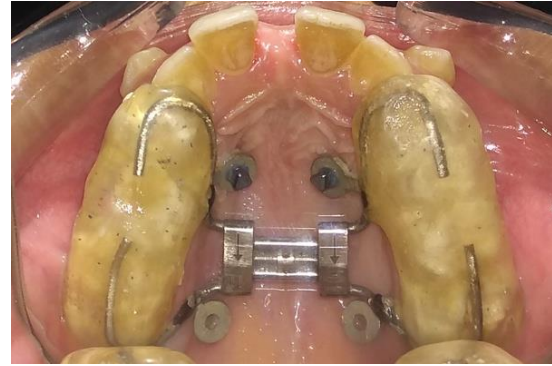


Fig.8.2- Maxillary occlusal view



Fig.8.3- Right lateral view



Fig.8.4- Left lateral view

Figure 8- Intraoral photographs after expansion

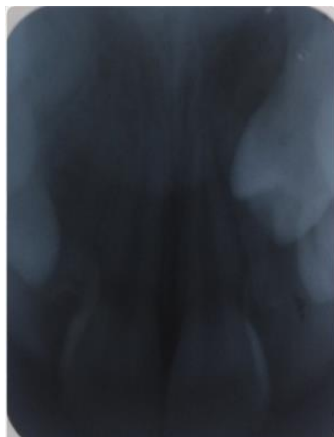


Figure 9.1- Pre-treatment



Figure 9.2- Post-treatment showing midline diastema

Figure 9- Intraoral periapical radiograph

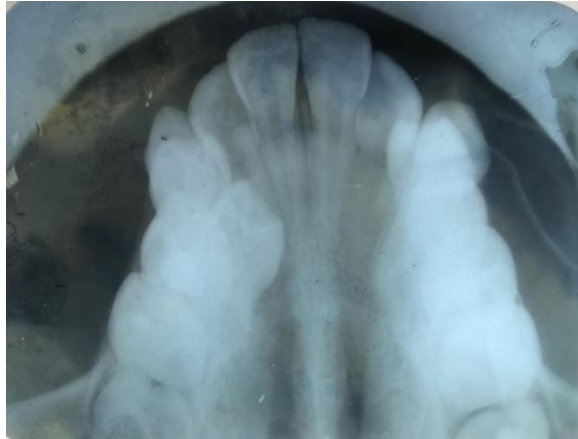


Figure 10.1- Pre-treatment

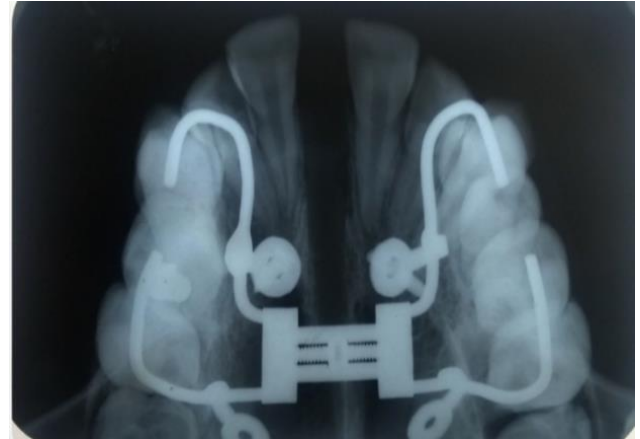


Figure 10.2- Post-treatment

Figure 10- Maxillary occlusal radiograph



Figure 11.1- Pre-treatment



**Figure 11.2- Post-treatment
P.A.cephalogram showing
fan shaped expansion**

Figure 11- Postero-anterior cephalogram

Measurement	Norms	Pre-treatment	Post-expansion
N-N	NA	21mm	23mm
J-J	NA	49mm	53mm
Ma-Ma	NA	49mm	54mm
UB6-UB6	NA	44mm	51mm

Table 2 Pre-treatment and post-expansion cephalometric measurements



Figure 12- Transpalatal arch to maintain expansion

Discussion

It has been a general perception that the predictability of orthopedic expansion is greatly reduced after 15 years of age, when SARPE may have to be used.²

According to proffit, nonsurgical expansion even in prepubertal patients leads to only 50% of skeletal expansion. Also, there are higher chances of thinning of the buccal alveolar wall, which could develop a bony dehiscence in non-skeletal expansion even in preadolescent patients.¹

In our case we have achieved 71.4% of skeletal expansion which is in accordance to study conducted by Lee KJ et al.³ It is showing that by directing the forces directly to the bony structures we can get more skeletal expansion.

No bony dehiscence was observed in our case. Taken together, the maximum skeletal effect during and after

expansion is a crucial factor whether the expansion is surgical or nonsurgical.

Berger et al⁵ stated that the 1-year stability of SARPE in post pubertal subjects was not significantly different from that of nonsurgical expansion in pre pubertal patients.

Therefore, it can be speculated that the treatment effects and the stability of nonsurgical expansion in adults are comparable with those of SARPE, when the orthopedic expansion is secured.

Conclusion

This report proposes effective incorporation of orthodontic miniscrews for transverse correction; this can eliminate the need for invasive surgeries in patients with complex craniofacial discrepancies

and secure the safety and stability of the transverse correction.

The stability of the expansion and the periodontal status were favorable from the follow up clinical and radiologic findings.

References

1. Proffit WR, Fields WH, Sarver DM. Contemporary orthodontics. Fifth edition. 2013.
2. Choi SH, Shi KK, Cha JY, Park YC, Lee KJ. Nonsurgical miniscrew- assisted rapid maxillary expansion results in acceptable stable in young adults. The Angle Orthodontist. 2016 Mar 3;86(5):713-20.
3. Lee KJ, Park Y C, Park J Y, Hwang W S. Miniscrew-assisted nonsurgical palatal expansion before orthognathic surgery for a patient with severe mandibular prognathism. Am J OrthodDentofacialOrthop 2010;137:830-9.
4. Melsen B, Melsen F. The postnatal development of the palatomaxillary region studied on human autopsy material. Am J Orthod. 1982;82:329–342.
5. Berger JL, Pangrazio-Kulbersh V, Borgula T, Kaczynski R. Stability of orthopedic and surgically assisted rapid palatal expansion over time. Am J OrthodDentofacialOrthop 1998;114:638-45.
6. Tausche E, Hansen L, Hietschold V, Lagravere MO, Harzer W. Three-dimensional evaluation of surgically assisted implantbone-borne rapid maxillary expansion: a pilot study. Am J OrthodDentofacialOrthop 2007;131(Suppl):S92-9.
7. Ramieri GA, Spada MC, Austa M, Bianchi SD, Berrone S. Transverse maxillary distraction with a bone-anchored appliance: dento-periodontal effects and clinical and radiological results. Int J Oral Maxillofac Surg 2005;34:357-63.
8. Wehrbein H, Yildizhan F. The mid-palatal suture in young adults. A radiological-histological investigation. Eur J Orthod 2001;23:105-14.
9. Handelman CS, Wang L, BeGole EA, Haas AJ. Nonsurgical rapid maxillary expansion in adults: report on 47 cases using the Haas expander. Angle Orthod 2000;70:129-44.
10. Stuart DA, Wiltshire WA. Rapid palatal expansion in the young adult: time for a paradigm shift? J Can Dent Assoc 2003;69:374-7.
11. Baccetti T, Franchi L, Cameron CG, McNamara JA Jr. Treatment timing for rapid maxillary expansion. Angle Orthod 2001;71:343-50.
12. Wehrbein H, Merz BR, Diedrich P. Palatal bone support for orthodontic implant anchorage—a clinical and radiological study. Eur J Orthod 1999;21:65-70.