Content available at: https://www.ipinnovative.com/open-access-journals

IP Indian Journal of Orthodontics and Dentofacial Research

Journal homepage: https://www.ijodr.com

Case Report

Maximize the maxilla via MARPE -A case report

Nausheer Ahmed[1], Deeksha Y N[1], Abrar Younus A[1]*, Uroosa Aymen[1], K Shreya Shetty[1]

[1]Dept. of Orthodontics, Government Dental College and Research Institute, Bangalore, Karnataka, India

Abstract

Maxillary transverse deficiency generally requires the widening of the palate. In mixed dentition patients, Rapid Maxillary Expansion (RME) is a reliable treatment modality. However in adults patients are frequently suggested to opt for more invasive procedures, like the Surgically Assisted Rapid Palatal Expansion (SARPE) expansion. The pursuit of minimally invasive expansion devices that facilitate purely orthopedic movement has prompted researchers to integrate mini-implants with traditional Rapid Maxillary Expansion (RME). Microimplant-Assisted Rapid Palatal Expansion (MARPE) optimizes skeletal expansion while reducing undesirable dentoalveolar consequences, thereby eliminating the necessity for orthognathic surgery. In this case report, we have descripted a mini-implant–supported expansion of the maxillary arch in a patient with a bilateral posterior crossbite.

Keywords: Microimplant-assisted rapid palatal expansion, SARPE, RME, Mid palatal suture

Received: 05-05-2025; **Accepted:** 10-06-2025; **Available Online**: 28-06-2025

1. Introduction

Maxillary transverse deficiency (MTD) is a prevalent form of malocclusion characterized by a high palatal vault, the presence of unilateral or bilateral posterior cross-bite, an excessive buccal corridor space, and dental crowding.[1] Reports indicate that nearly 30% of adult orthodontic patients and 9.4% of the overall population exhibit a maxillary transverse deficiency. A prior study indicated that the occurrence of maxillary transverse deficiency varies between 8% and 23% in mixed and deciduous dentitions, while it is observed to be below 10% in adults.

Transverse maxillary deficiency in children and young adolescents can be effectively treated using Rapid Palatal Expansion (RPE). The RPE-hyrax apparatus applies bilateral forces from the expansion screw to the first upper molars and premolars, facilitating the separation of the midpalatal suture, which remains incompletely fused, by exerting pressure on the palatal bone. The ideal age for utilizing Rapid Palatal Expansion (RPE) is generally regarded as being under 15 years as the midpalatal suture and adjacent joints start to merge and become more inflexible, leading to heightened resistance against expansion forces with increasing age.In addition to the intended maxillary expansion, this rigidity may lead to several adverse effects, including buccal crown tipping, root resorption, gingival recession, alveolar bone dehiscence, a decrease in buccal bone thickness, marginal bone loss, discomfort, restricted skeletal expansion or failure, and the potential for post-expansion relapse.[2]

The management of a constricted maxillary arch necessitates the use of orthopedic forces or surgical procedures to facilitate expansion. Patients with limited or no remaining growth frequently exhibit hesitance towards surgical options, hence the prompt efforts to address these deficiencies through non-surgical means led to development of MARPE. The MARPE appliance by Dr. Won Moon et al. represents a significant advancement in the correction of transverse malocclusion.[3] Miniscrew-assisted rapid palatal expansion (MARPE) was introduced to facilitate maxillary expansion without the need for surgical procedures. The rigid component of the MARPE device is anchored to miniscrews that are inserted into the para-midpalatal region. Consequently, this appliance can effectively transmit the

*Corresponding author: Abrar Younus A
Email: abraryounus94@gmail.com

https://doi.org/10.18231/j.ijodr.2025.025

expansion force directly to the palatal surface of the maxilla, thereby enhancing the skeletal impact.

Thus, this case report aimed to describe the treatment protocol for a patient with Maxillary constriction using MARPE.

2. Case Presentation

A 17-year-old female patient presented to the department with the primary concern of misaligned upper front teeth. The patient's medical history indicated no systemic conditions that could hinder orthodontic treatment.

2.1. Extra-oral examination

Convex profile with slightly negative lip step and Incompetent lips were noted as shown in **Figure 1**.

2.2. Intra-oral examination

Class II molar relationship bilaterally, with anterior open bite, bilateral posterior crossbite and crowding in upper and lower anteriors as shown in **Figure 1**.

Figure 1: Pretreatment extraoral and intraoral photographs

2.3. Cephalometric examination

The cephalometric evaluation indicated a Class I malocclusion, characterized by an SNA of 75 degrees, an SNB of 74 degrees, and an ANB of 1 degree. The mandibular plane angle, measured as Go-Gn-SN, was 46 degrees, with an inclination angle of 83 degrees. The patient exhibited proclination of both upper and lower incisors, with U1 to SN measured at 118 degrees and IMPA at 0 degrees, as detailed in **Table 1**.

Table 1:

Parameter	Pre-treatment	Post-treatment
SNA	75◦	78◦
SNB	74◦	75◦
ANB	1◦	3◦
Go-Gn-SN	46◦	38◦
UI- SN	118◦	103◦
IMPA	0◦	-4◦
Inclination angle	83◦	81◦
UI-NA (Degrees/mm)	40◦ /12 mm	25◦ /5mm
LI-NB (Degrees/mm)	30◦ /8mm	23◦ /4 mm
Inter-incisal Angle	105◦	128◦

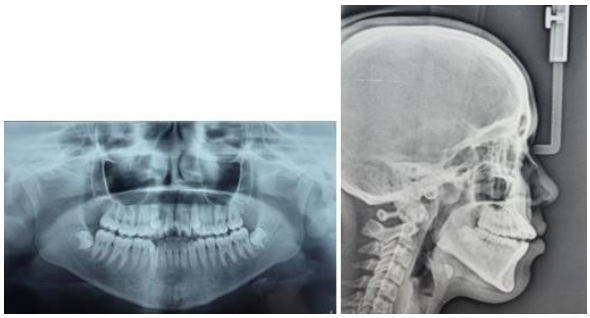

Figure 2: Pretreatment radiographs

2.4. Treatment objectives

1. To correct the bilateral posterior crossbite
2. To correct the anterior open bite
3. To level and align arches
4. To achieve an ideal overbite and overjet
5. To attain a pleasing profile and smile

2.5. Treatment plan and alternatives

The selected treatment approach for this patient involved the use of MARPE (Miniscrew Assisted Rapid Palatal Expansion) to facilitate maxillary expansion aimed at addressing the posterior crossbite. Other treatment alternatives was surgically assisted rapid Palatal expansion (SARPE). This method has the potential to rectify the transverse skeletal discrepancy; however, the patient declined this plan due to the additional financial implications and the necessity of undergoing a surgical procedure and the complications.

2.6. Treatment progress

The MARPE appliance was provided with two mini-implants measuring 2×8 mm (**Figure 3**). The activation procedure began with a single turn each day over a period of two weeks. The crossbite bilaterally was corrected after expansion. The expander was stabilized for a duration of five months following the completion of the expansion process to ensure retention.

Figure 3: MARPE appliance placement

The MARPE appliance was taken out following a stabilization period of six months. Bonding was performed utilizing the preadjusted edgewise appliance featuring a slot size of 0.022×0.028 inches (**Figure 4**). Even after expansion due to arch length tooth material discrepancy upper and lower first premolar extraction was done, then leveling and alignment was achieved by beginning with 0.016-in nickel-titanium and developing to 0.019×0.025-inch stainless steel within a period of 6 months

Figure 4: Bonding photographs

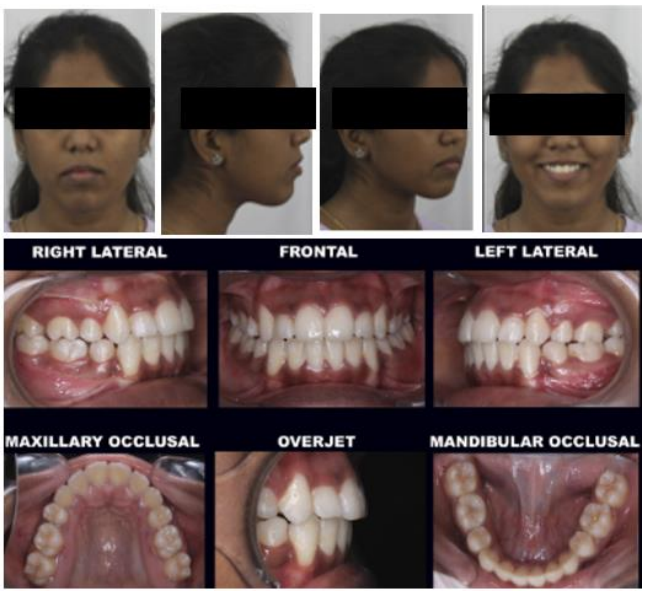

Figure 5: Post treatment photographs

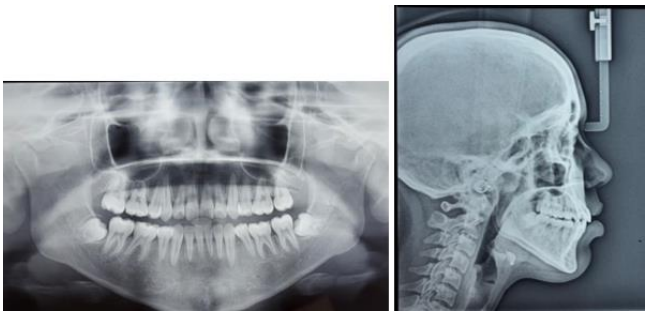

Figure 6: Post treatment radiographs

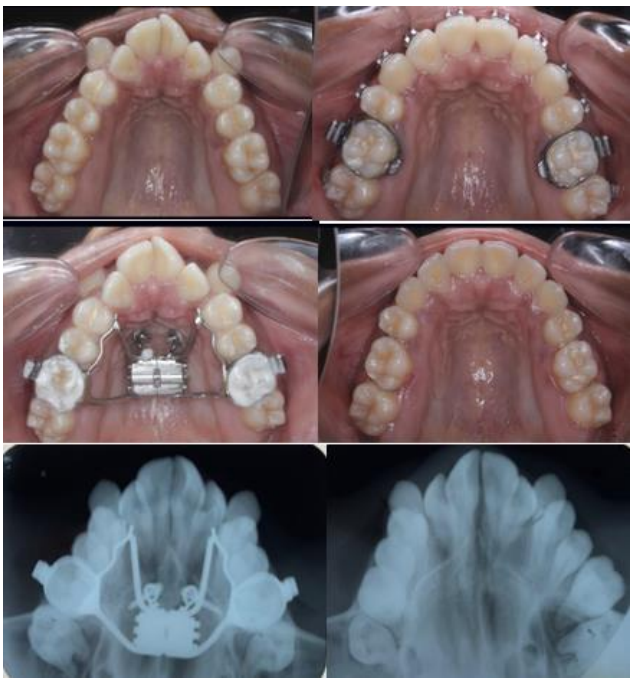

Figure 7: Pre and post treatment occlusal photographs and radiographs

2.7. Treatment results

The patient was satisfied with the outcome of the treatment, displaying a cheerful smile upon its completion (**Figure 5**). The palatal crossbite was successfully addressed, resulting in well-aligned arches with optimal overbite and overjet, coincident dental midlines and with bilateral class I molar and canine relationship.

3. Discussion

Transverse maxillary deficiency is a common orthodontic issue, affecting around 10% of the population. It is usually recognized by the occurrence of a unilateral or bilateral posterior crossbite. This condition arises from a mismatch between the maxillary and mandibular arches, which is often linked to a deep and narrow palate, dental crowding, excessive vertical growth of the alveolar bone, wide buccal corridors, dental attrition, periodontal damage and facial muscular imbalance. To attain a stable occlusion and prevent adverse consequences, it is crucial to establish a normal transverse skeletal relationship.[5]

When the maxilla and mandible do not align correctly in the transverse dimension, odontogenesis proceeds, resulting in the eruption of teeth in improper positions, which causes malocclusion. If maxillomandibular transverse discrepancies are not addressed in a timely manner, they may worsen and evolve into more intricate forms of malocclusion, which can impede facial growth and development.[2]

In mixed dentition RME OR SME can be used to correct the transverse deficiency however RME produces less predictable results in patients after 11 years of age due to high variability seen in the developmental stages of fusion of midpalatal suture.[4] In skeletally mature patients due to the complexity of interdigitation of midpalatal suture, decreased elasticity of bone and changes in the bony connections of the maxilla with neighboring bones, achieving the expansion presents significant difficulties.[5] Surgical Assisted Rapid Palatal Expansion (SARPE) is frequently recommended to address transverse maxillary deficiencies exceeding five millimeters, as it effectively mitigates sutural resistance, thereby enhancing the potential for expansion over an extended period stability and reduced buccal dental tipping, but the procedure is invasive, costly, linked to uneven or improper maxillary expansion, surgical complications, discoloration of incisors, mobility issues, periodontal problems, and potential loss of central incisors. With the introduction of orthodontic mini-implants, the exploration of pure orthopedic movement utilizing RME is conducted.[2]

Miniscrew-assisted rapid palatal expansion (MARPE) was introduced to facilitate maxillary expansion without the need for surgical procedures. The inflexible part of the MARPE device is secured to miniscrews positioned in the para-midpalatal area. This configuration enables the appliance to exert the expansion force directly onto the palatal surface of the maxilla, thus improving the skeletal response. Numerous studies have examined the effects of MARPE on expansion and its stability.

A retrospective analysis indicated that the efficiency of midpalatal suture opening with MARPE defined as the ratio of the expansion screw's opening to the separation of the suture, was 71% in the anterior region and 63% in the posterior region, respectively.[6] Park et al.[7] reported that maxillary skeletal expansion accounted for 37%, whereas alveolar expansion accounted for 22% of total expansion gained by MARPE these ratios exceed those associated with traditional Rapid Palatal Expansion (RPE), suggesting that MARPE facilitates skeletal modifications.

Celenk-Koca et al.[8] the miniscrew-supported expander demonstrated an expansion that exceeded 2.5 times that of the tooth-anchored expander. Similarly, Yılmaz et al.[9] demonstrated, through measurements of the maxillary intermolar and palatal widths, that the MARPE group exhibited a more pronounced skeletal expansion, which can be attributed to the design characteristics of MARPE expanders.

Moreover, the process of midpalatal suture separation was distinct from that seen in traditional Rapid Palatal Expansion (RPE). A parallel separation of the suture was noted, which contrasts with conventional RPE, which has as greater opening in the anterior region and a reduced opening in the posterior section, while MARPE demonstrated slight buccal tipping of the maxillary molars, a reduction in buccal bone thickness, and a decrease in the alveolar crest level on the maxillary first molar when compared to RME

In the research conducted by Cantarella et al.[6] the suture exhibited a uniform pattern of expansion at both the anterior nasal spine (ANS) and the posterior nasal spine (PNS). Similarly, Lin et al.[10] and Yılmaz et al.[9] corroborated that the midpalatal suture opened in a parallel manner. Conversely, Jia et al.[11] and Akin et al.[12] observed a V-shaped opening of the midpalatal suture, which contrasts with the previously noted parallel expansion pattern. This discrepancy may be attributed to the positioning of the device.

Research conducted by Celenk-Koca et al.,[8] Yılmaz et al.,[9] and Lagravère et al.[13] the study indicated that the angulation of teeth was significantly diminished in the MARPE group in comparison to the traditional RPE group.

In this case report, a patient with maxillary transverse deficiency underwent effective treatment using miniscrew assisted RPE, serving as a substitute for conventional approaches such as RME or involving surgery in late adult. This method successfully addressed the transverse discrepancy, leading to improved facial aesthetics and smile esthetics for the patient.

The use of miniscrew emerged as a practical non-surgical option for managing transverse malocclusion, providing a viable alternative to surgical procedure

4. Conclusion

MARPE represents a viable treatment option for individuals suffering from MTD, demonstrating a commendable success rate in facilitating the opening of the midpalatal suture in late adolescents. Additionally, MARPE offers specific clinical benefits over traditional RPE, as it achieves more significant transverse skeletal expansion and is linked to a reduced incidence of adverse periodontal effects, including those affecting the teeth inclination and alveolar height decrease.

5. Informed Consent

Written informed consent was obtained from the patients who agreed to take part in the study

6. Conflict of Interest

None.

7. Source of Interest

None.

References

1. Huang X, Han Yu. Effect and stability of miniscrew-assisted rapid palatal expansion: A systematic review and meta-analysis. *Korean J Orthod* 2022;52(5):334–44
2. Hoque T, Srinivasan D, Gnaneswar S, Chakravarthi S, Rajaram K. Microimplant Assisted Rapid Palatal Expansion: A Comprehensive Review. *J Clin Diagn Res*. 2021;15(8):ZE11–5.
3. Ahmed M, Nizar A. Miniscrew assisted rapid palatal expander (MARPE)- A literature review. *Int J Sci Res*. 2023;12(5):11–3.
4. Choi SH, Shi KK, Cha JY, Park YC, Lee KJ. Nonsurgical miniscrew-assisted rapid maxillary expansion results in acceptable stability in young adults. *Angle Orthod*. 2016;86(5):713–20
5. Kapetanović A, Theodorou C. Efficacy of Miniscrew-Assisted Rapid Palatal Expansion (MARPE) in late adolescents and adults: a systematic review and meta-analysis. *Eur J Orthod*. 2021;43(3):313–23.
6. Cantarella D, Dominguez-Mompell R, Mallya SM, Moschik C, Pan HC, Miller J. et al. Changes in the mid-palatal and pterygopalatine sutures induced by micro-implant-supported skeletal expander, analyzed with a novel 3D method based on CBCT imaging. *Prog Orthod*. 2017:18(1):34
7. Park JJ, Park YC, Lee KJ, Cha JY, Tahk JH, Choi YJ. Skeletal and dentoalveolar changes after miniscrew-assisted rapid palatal expansion in young adults: A cone-beam computed tomography study. *Korean J Orthod*. 2017;47(2):77–86.
8. Celenk-Koca T, Erdinc AE, Hazar S, Harris L, English JD, Akyalcin S. Evaluation of miniscrew-supported rapid maxillary expansion in adolescents: a prospective randomized clinical trial. *Angle Orthod*. 2018;88(6):702–9.
9. Yılmaz A, Arman-Özçırpıcı A, Erken S, Polat-Özsoy Ö. Comparison of short-term effects of mini-implantsupported maxillary expansion appliance with two conventional expansion protocols. *Eur J Orthod*. 2015;37(5):556–64.
10. Lin L, Ahn HW, Kim SJ, Moon SC, Kim SH, Nelson G. Tooth-borne vs bone-borne rapid maxillary expanders in late adolescence. *Angle Orthod*. 2015;85(2):253–62.
11. Jia H, Zhuang L, Zhang N, Bian Y, Li S. Comparison of skeletal maxillary transverse deficiency treated by microimplant-assisted rapid palatal expansion and tooth-borne expansion during the post-pubertal growth spurt stage. *Angle Orthod*. 2021;91(1):36–45.
12. Akin M, Akgul YE, Ileri Z, Basciftci FA. Three-dimensional evaluation of hybrid expander appliances: a pilot study. *Angle Orthod*. 2016;86(1):81–6.
13. Lagravère MO, Carey J, Heo G, Toogood RW, Major PW. Transverse, vertical, and anteroposterior changes from bone-anchored maxillary expansion vs traditional rapid maxillary expansion: a randomized clinical trial. *Am J Orthod Dentofacial Orthop*. 2010;137(3):304.e1–12.

Cite this article: Ahmed N, Deeksha YN, Younus AA, Aymen U, Shetty KS. Maximize the maxilla via MARPE -A case report. *IP Indian J Orthod Dentofacial Res*. 2025;11(2):133-137.