

Correction of transverse maxillary deficiency and anterior open bite in an adult Class III skeletal patient

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Abstract

Transverse maxillary deficiency may be associated with sagittal or vertical problems of the maxilla or mandible. It may contribute to unilateral or bilateral posterior crossbite, anterior dental crowding, and unesthetic black buccal corridors on smiling. An adequate transverse dimension is important for stable and proper functional occlusion. Surgically assisted rapid palatal expansion has been the treatment of choice to resolve posterior crossbite in skeletally mature patients. The following case report presents an adult Class III skeletal patient with an anterior open bite and bilateral posterior crossbite which was treated by surgically assisted rapid maxillary expansion with satisfactory outcomes.

Key words: Crossbite, rapid maxillary expansion, transverse maxillary deficiency

INTRODUCTION

In recent times, there is an increase in the number of adult patients seeking orthodontic treatment especially due to esthetic concern.^[1] Treating malocclusion is challenging in Class III adult patients with transverse maxillary deficiency. Adequate management of transverse deficiencies requires careful pretreatment plan to obtain stable and proper functional occlusion.^[2] Approximately,

8–18% of the patients seeking correction of dentofacial deformity have a transverse maxillary deficiency.^[3] In the case of skeletally immature patients, orthopedic rapid maxillary expansion (RME) that involves opening of the midpalatal suture is mainly the procedure of choice to correct this condition. With age, there is an increase in sutural fusion by bony interdigitation.^[4,5] After the closure of suture, orthopedic transverse maxillary expansion is almost impossible, and the expansion achieved by RME is primarily dental with no basal skeletal movement.^[6] Surgically assisted RME (SARME) is an efficient method to treat maxillary transverse deficiency in the case of skeletally

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mature and nongrowing patients. It is a combination of orthodontic and surgical procedures which causes considerable expansion of the maxillary apical base and the palatal vault, providing adequate dental arch space for the alignment of teeth. This technique may include bilateral osteotomy of the zygomatic pillars and the palatal suture with or without separation of the pterygoid processes.^{17,81} The objective of this study is to present a case report of an adult Class III skeletal patient with anterior open bite and posterior cross bite treated with SARME.

CASE REPORT

A 20-year-old female patient sought to orthodontic correction with the chief complaint of discontent facial esthetics. On extraoral examination, the patient had

a straight profile, dolichofacial form, and incompetent lips [Figure 1]. Intraoral examination showed an anterior open bite of 6 mm, upper and lower anterior crowding, Class III molar relationship and metal crown restorations with respect to 46 and 47 [Figure 2]. Pretreatment lateral cephalogram revealed a Class III skeletal base with vertical growth pattern [Figure 3]. SARME for planned for the correction of posterior crossbite. HYRAX expansion device was inserted and surgical expansion of upper maxillary arch was performed [Figure 4]. The patient was called after 1 week for suture removal [Figure 5]. The protocol for HYRAX activation was three-fourth-turn on the first postoperative day, followed by one-fourth-turn in the morning and another one-fourth-turn in the evening. Overcorrection of posterior cross bite was achieved in about 3 weeks. The HYRAX screw was kept passive as a retainer for about 5 months. Bonding of both upper and lower arch was done with 0.022 MBT appliance which was later followed by extraction of lower left lateral

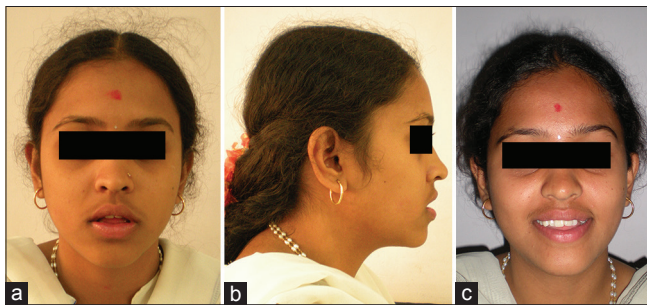


Figure 1: (a-c) Pretreatment extraoral photographs



Figure 3: Pretreatment lateral radiograph

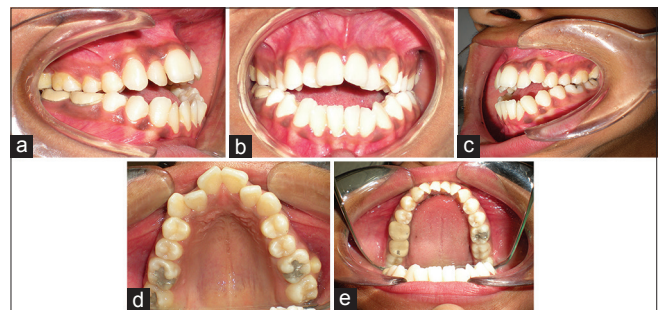


Figure 2: (a-e) Pretreatment intraoral photographs

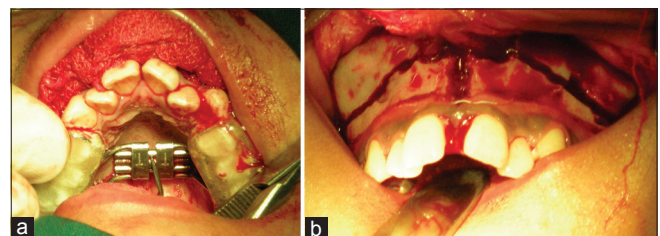


Figure 4: (a-b) Surgically assisted rapid maxillary expansion

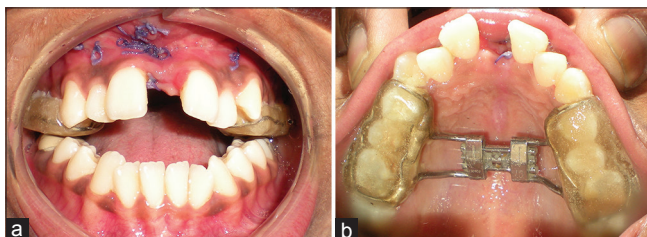


Figure 5: (a-b) One week after surgery



Figure 6: Bonding of upper and lower arch

incisor [Figure 6]. Initial leveling and alignment was done with 0.016" NiTi, 0.016 × 0.022 NiTi, 0.017 × 0.025 NiTi, 0.017 × 0.025 stainless steel (SS), 0.019 × 0.025 NiTi, and 0.019 × 0.025 SS wires. Soldered transpalatal arch was given to maintain transverse width [Figure 7]. Adequate overjet was achieved with Class III elastics and by retracting the lower anterior teeth into the extraction space [Figure 8]. Debonding was done after obtaining satisfactory overjet, overbite, and occlusion [Figures 9 and 10] Post treatment cephalometric radiograph was taken [Figure 11] and pre

and post treatment cephalometric readings [Table 1] were compared. Superimposition of pre and post treatment radiograph was also done to evaluate post treatment skeletal and dental changes [Figure 12]. Fixed 3 × 3 bonded retainers were given in both the arches.

DISCUSSION

The patient described here is an adult female patient with a narrow maxillary arch with both transverses as well as vertical discrepancy. Transverse deficiency should be



Figure 7: Soldered transpalatal arch



Figure 8: After lower lateral incisor extraction



Figure 9: (a-c) Posttreatment extraoral photographs

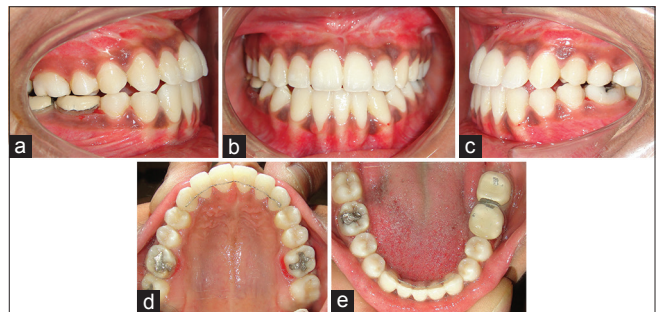


Figure 10: (a-e) Posttreatment intraoral photographs



Figure 11: Posttreatment radiograph

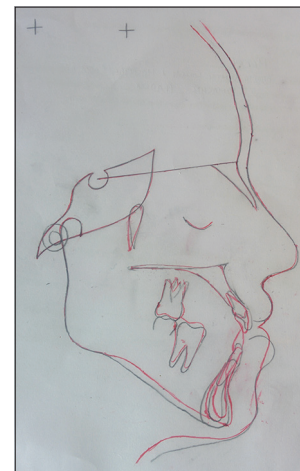


Figure 12: Cephalometric superimposition

Table 1: Cephalometric readings (pre- and post-treatment)

Measurements	Pretreatment	Posttreatment
SNA	78	78
SNB	77	77
ANB	1	1
WITS (mm)	BO ahead of AO by 8	BO ahead of AO by 8.5
Saddle angle	127	126
Articular angle	143	142
N perpendicular to point A	0	-1
Facial axis	90	90
Y axis	60	60
MPA	29	30
SN- Go- Gn	35	36
Jarabak ratio (%)	60.8	60
Basal plane angle	33	26
Inclination angle	88	86
Gonial angle	126	127
Upper gonial angle	48	48
Lower gonial angle	78	79
Upper incisor to NA (angle/mm)	32,9	30,9
Upper incisor to SN	113	110
Upper incisor to palatal plane	60	57
Lower incisor to NB (angle/mm)	25,5	24,5
Lower incisor to a POG (mm)	5	5
Lower incisor to MPA	88	87
Interincisal angle	123	124

MPA – Mandibular protraction appliance

corrected with considerable palatal expansion. It is difficult to achieve a successful palatal expansion without osteotomy in the case of adults. On the other hand, a SARME significantly reduces the resistance of the midpalatal suture to a mechanical expansion force and makes it easier to widen the palate.^[9,10] Ideally, patients with both transverse and vertical defect require a two stage surgery.^[11] However, our patient was not willing to undergo another surgery, so we treated the case with SARME and fixed mechanotherapy. The SARME technique is based on studies by Ilizarov,^[7] in which expansion is only started after 5–7 postoperatively. This period allows the formation of an initial bone callus but not enough time for bone consolidation.

Bays and Greco^[12] evaluated the relapse of palatal expansion after SARME and recorded a mean relapse rate of 8.8% at the canines and 7.7% in the molar region. Strömberg and Holm^[13] and Pogrel *et al.*^[2] also reported a mean relapse rate of 4% to 17% at the both canine and molar regions one to 3 years after surgically assisted maxillary expansion. Phillips *et al.*^[14] reported a higher relapse rate than previous studies, relapse rate was greater at the posterior teeth when compared with that of anterior teeth. They recommended over expansion at surgery and later maintained the occlusal splint for at least 6 weeks after surgery, and using a lingual arch wire or an auxiliary labial

arch wire during the postsurgical orthodontic treatment. According to them, SARME appears to be the preferred procedure for adult patients with skeletal problems limited to the transverse dimension.^[14] Expanded upper dental arch has a strong tendency to return to its original form.

The results of the present case indicate that SARME is an effective approach for achieving an adequate expansion of the maxillary arch in the case of adult patients. However, we recommend the use of a transpalatal arch appliance to maintain the molar width during postsurgical orthodontic treatment and long-term observation of maxillary arch width after the retention. The surgical correction of skeletal open bite is difficult and is less stable when compared to surgical cases treated without skeletal open bite. From this viewpoint, a bimaxillary osteotomy or a Le Fort I intrusion osteotomy with mandibular autorotation is recommended for correction of skeletal open bites.^[15] However, the patient was not willing to undergo second surgery. Hence, we treated the case with the extraction of lower lateral incisor for correction of lower anterior crowding and used box elastics to correct the open bite. We were able to achieve an acceptable overjet and overbite in our case.

CONCLUSION

SARME should be used for correction of posterior crossbite with alignment and leveling of the teeth, improving occlusion without causing damage to anatomical and biological structures. The ortho-surgical approach must be considered as part of the treatment plan to correct transverse deficiencies in adults with advanced skeletal maturation. This procedure allows favorable and stable results.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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