

Modified SARME (Surgically Assisted Rapid Maxillary Expansion) in Conjunction with Orthodontic Treatment- A Case Report

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ABSTRACT

Transverse maxillary hypoplasia or maxillary constriction in conjunction with unilateral or bilateral posterior cross bites is a common finding in cleft palate patients. These situations are also commonly encountered in adults who have not had recourse to orthodontic treatment in childhood. In adults, after ossification of the mid palatal suture is complete, the accepted means of correcting transverse skeletal discrepancies is by Surgically Assisted Rapid Maxillary Expansion (SARME). The disadvantage of this technique in the Indian scenario is reduced patient acceptance and increased treatment costs. Le Fort-I down fracture and mid palatal suture sectioning requires hospitalization and increases morbidity. A case of a 21-year-old non-cleft male who presented with Class I malocclusion with transverse skeletal discrepancy and bilateral posterior cross bites is presented. A modified SAARME technique was performed without pterygomaxillary disjunction, as an outpatient procedure. The results obtained were satisfactory and the desired amount of transverse skeletal correction was achieved. The patient was discharged the same day. The technique can be used to successfully treat a large number of patients in India with maxillary skeletal transverse problems with increased predictability, reduced costs and morbidity and higher rates of acceptance.

Keywords: Posterior cross bites, Pterygomaxillary disjunction, Transverse maxillary hypoplasia

CASE REPORT

A 21-year-old healthy male reported to the Department of Orthodontics with a complaint of irregular upper front teeth and inability to chew food properly.

Examination revealed a skeletal Class I pattern with moderate upper and lower arch crowding and bilateral posterior crossbites on account of a transverse maxillary deficiency [Table/Fig-1,2]. There was a Class I molar and canine relation on the left and a Class II molar and canine relation on the right.

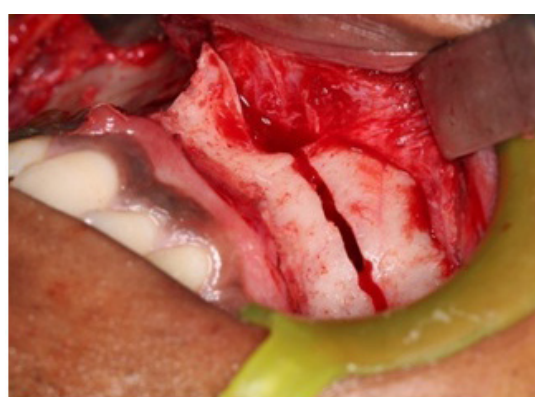
Treatment involved surgically assisted upper arch expansion, to relieve crossbites and increase arch length enabling alignment, followed by fixed orthodontic therapy. A Hyrax expander was cemented in the upper arch and was activated preoperatively by 0.5mm twice a day for a week to enable shelf separation [1].

A modified SARME technique with osteotomies extending only till the zygomatic buttresses with separation of the hemimaxillae was executed. This enabled expansion with reduced morbidity and faster healing. Hospital stay was not required since the procedure was carried out in the dental operator. Intravenous sedation (IV) was given followed by infiltration of local anaesthesia bilaterally in

the mucobuccal fold of the maxilla along with infraorbital nerve blocks, posterior superior alveolar nerve blocks, nasopalatine and greater palatine nerve blocks. Additional local anaesthetic was administered during the procedure as and when required when the patient complained of sensation.

Bilateral osteotomies were performed from the piriform rims till the zygomatic buttress [Table/Fig-3]. The cuts were not extended till the pterygomaxillary junctions. Hemi maxillae separation was achieved by driving an osteotome between the upper centrals, parallel to the palate for 1.5 cm [Table/Fig-4]. Midline sectioning progressed superiorly from alveolar crest to anterior nasal spine till the chisel was felt parallel to the palate. The expander was then activated by 6 quarter turns (0.25mm each) to ensure clean separation. The screw was then reversed and the surgical site was cleaned and sutured. No expansion was carried out for a week postoperatively to ensure comfort.

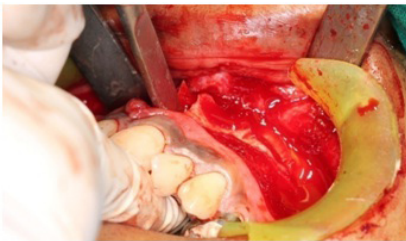
Postoperative instructions included taking a soft diet for 2 weeks following the procedure. Oral hygiene was to be maintained by using a soft brush and supplemented with chlorhexidine rinses after every meal. Oral antibiotics and analgesics were prescribed for a



[Table/Fig-1]: Constricted maxillary arch

[Table/Fig-2]: Pretreatment facial view

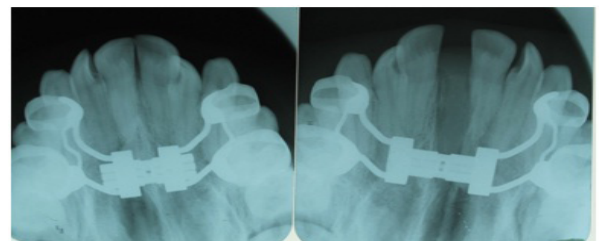
[Table/Fig-3]: Modified SARME



[Table/Fig-4]: Palatal shelf separation



[Table/Fig-5]: Arch expanded



[Table/Fig-6]: Pre and post- expansion occlusal radiograph



[Table/Fig-7]: Intra-oral frontal photograph after bonding of brackets

period of 5 days postoperatively. The sutures were left in place for 3 weeks and removed.

The expander was activated by a quarter turn twice daily a week after the surgical procedure till the crossbites bilaterally were fully corrected [Table/Fig-5]. The Hyrax screw was then sealed with cold cure acrylic and was left in place for 3 months to enable consolidation of the segments. No post expansion complications were reported [Table/Fig-6].

Fixed orthodontic therapy was initiated with 0.022 slot MBT appliance prescription. Sufficient arch length was obtained in the upper arch to permit alignment of teeth with complete crossbite correction [Table/Fig-7].

DISCUSSION

Rapid Maxillary Expansion is a well established clinical procedure used to correct transverse maxillary deficiency and increase arch length in adolescents. This procedure was first introduced as early as 1860 by Angell and has been the treatment of choice in transverse discrepancy situations where growth is remaining [2]. Brown probably first described a technique of SARME with midpalatal splitting in his textbook [3]. Heiss carried out midline splitting in the anterior maxilla for expansion of the compressed maxillary arch for orthodontic reasons [3]. In 1961, Haas described the downward and forward movement of the maxilla that occurs during RME because of the location of the Cranio Maxillofacial sutures [3].

In adult patients presenting after cessation of growth and complete ossification of the mid palatal suture, conventional RME has limited effects [4]. The reduction in bone elasticity, decrease in the number of fibroblasts and collagen fiber bundles and increasing resistance to expansion due to inter-digitation of mid palatal and lateral maxillary sutures, necessitate the need for surgically assisted rapid maxillary expansion (SARME).

SARME in conjunction with orthodontics was introduced in 1938 and continues to be used till date in management of transverse problems [3]. Bell and Starnbach [4] report that activation of an appliance against mature sutures can lead to the sensation of pain and necrosis of oral mucosa under the appliance. It could also result in periodontal defects as the teeth are pushed through the buccal cortical plate, which may lead to bony defects and gingival recession. All these potential complications can be avoided by surgically

releasing the osseous structures that resist the expansive force being applied. Some of the advantages of SARME are improvement of periodontal health; improved nasal air flow; elimination of the negative space, which results in less visible tooth and gingival structures upon smiling [4]. However, there is no consensus on a specific surgical technique to be followed as different osteotomy techniques have been described in literature.

The Bays modified SARME technique was introduced in 1992 which permitted mid palatal split without the need for conventional LeFort I osteotomies [5]. This procedure could be performed in an outpatient setting with minimum morbidity and faster healing. We have used a modification of this procedure wherein the osteotomy cuts from the piriform rims were extended only till the zygomatic buttresses and not till the pterygomaxillary junction which allowed mid palatal splitting like in the former. This, in our opinion, was simpler and could be indicated in cases needing expansion predominantly in the canine and premolar regions [6].

The modification in the technique advocated by Bays permits treatment with even more reduced morbidity and similar amounts of expansion. Intraoperative and postoperative bleeding tendency in this procedure is also minimal since disjunction of the pterygoid plates increases the duration of the surgical procedure and requires administration of general anaesthesia. Risk of trauma to the palatine artery or the cranial nerve is known complications [7-9]. The results achieved without pterygomaxillary disjunction are comparable to multiple piece maxillary osteotomies. In a study by Sygorous [10], the quantum of anterior, inters-premolar and inter-molar expansion was similar in groups treated with and without Pterygomaxillary Disjunction (PMD). In all areas of medicine and dentistry, the trend of minimally invasive procedures is evident. Efforts are being made to reduce the extent or the number of surgical procedures for a specific patient [11-13].

There is sufficient evidence to conclude that transverse stability is significantly better in this technique than with techniques involving multiple osteotomies [14]. The recovery period is also short and costs can be kept low. These are important reasons in considering this approach, especially in the Indian scenario, where the vast majority of patients come from low socioeconomic backgrounds with little or no health insurance. In the majority, orthodontic camouflage of the discrepancy is also not a viable option.

Clinically, there is no difference in patient response between the RME and SARME groups. The only difference between the groups is their indication, which is based on the age and skeletal maturation of the patient. Cephalometrically, the most important difference could be summarized as the rotational behaviour of the maxilla between groups [15]. A study by Bays concludes that no significant differences were noticed between conventional and modified SARME [5].

Although SARME without pterygoid plate separation helps in correction of transverse discrepancies, it places additional strain on the periodontal apparatus especially in the premolar areas. There is reduction in buccal alveolar width and height of the alveolar crest. Periodontal screening for all patients is recommended to reduce periodontal complications post surgery [16].

A Meta analysis of long term dental and skeletal changes after SARME in a study by Vilani et al., showed long term increase in

alveolar, intercanine and intermolar widths [17]. Relapse in intercanine width in the long term is to be expected. A systematic review and Meta analysis of outcomes of SARME with and without PMD as described in a study by Hamed-Sangsari et al., was inconclusive as to the necessity of PMD and whether PMD has a different effect in the posterior and anterior regions [18].

CONCLUSION

The modified SARME technique described here is easy to perform and has reduced post operative complications. Complete downfracture of the maxilla as in a conventional LeFort I osteotomy is avoided. Most importantly, the procedure can be carried out in a clinical setting under local anaesthesia. The results from this procedure are stable. Patients with transverse maxillary deficiencies can thus be treated predictably with reduced morbidity. It is understood that long term conclusions about the efficacy of the present surgical technique can be accurately determined after treating a larger number of patients.

REFERENCES

- [1] Goddard R, Witherow H. Surgically assisted rapid palatal expansion (SARPE). *Br J Oral Maxillofac Surg.* 2011;49(1):65-66.
- [2] Angell EH. Treatment of irregularity of the permanent or adult teeth. *Dental Cosmos.* 1860;1:540-4,599-600.
- [3] Koudstaal MJ, Poort LJ, van der Wal KG, Wolvius EB, Prah- Andersen B, Schulten AJ. Surgically assisted rapid maxillary expansion (SARME): A review of the literature. *Int J Oral Maxillofac Surg.* 2005;34(7):709-14.
- [4] Bell RA. A review of maxillary expansion in relation to rate of expansion and patients age. *Am J Orthod.* 1982;81:32-37.
- [5] Bays RA, Greco JM. Surgically assisted rapid palatal expansion: an outpatient technique with long term stability. *J Oral Maxillofac Surg.* 1992;50:110-13.
- [6] Kilic E, Kilic B, Kurt G, Sakin C, Alkan A. Effects of surgically assisted rapid palatal expansion with and without pterygomaxillary disjunction on dental and skeletal structures: a retrospective review. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2013;115(2):167-74.
- [7] Lanigan DT, Mintz SM. Complications of surgically assisted rapid palatal expansion: review of literature and report of a case. *J Oral Maxillofac Surg.* 2002;60:104-10.
- [8] Reiner S, Willoughy JH. Transient abducens nerve palsy following a Le Fort I maxillary osteotomy: report of a case. *J Oral Maxillofac Surg.* 1988;46:699-701.
- [9] Williams BJ, Currimbhoy S, Silva A, O'Ryan FS. Complications following surgically assisted rapid palatal expansion: a retrospective cohort study. *J Oral Maxillofac Surg.* 2012;70:2394-402.
- [10] Sygouros A, Motro M, Ugurlu F, Acar A. Surgically assisted rapid maxillary expansion: Cone- beam computed tomography evaluation of different surgical techniques and their effects on the maxillary dentoskeletal complex. *Am J Orthod Dentofacial Orthop.* 2014;146(6):748-57.
- [11] Herford AS, Akin L, Cicciu M. Maxillary vestibular incision for surgically assisted rapid palatal expansion: evidence for a conservative approach. *Orthodontics (Chic).* 2012;13(1):168-75.
- [12] Hernandez – Alfaro F, Mareque Bueno J, Diaz A, Pages CM. Minimally invasive surgically assisted rapid palatal expansion with limited approach under sedation: a report of 283 consecutive cases. *J Oral Maxillofac Surg.* 2010;68:2154 -58.
- [13] Marchetti C, Pironi M, Bianchi A, Musci A. Surgically assisted rapid palatal expansion vs. segmental Le Fort I osteotomy: transverse stability over a 2 – year period. *J Cranio maxillofac Surg.* 2009;37:74-78.
- [14] Proffit WR. Long term stability in surgical orthodontic treatment. AAOMS AAO ACLPA Clinical Congress, Washington DC, February 1991.
- [15] Ayse T. AltugAtac Surgically Assisted Rapid Maxillary Expansion Compared with Orthopedic Rapid Maxillary Expansion *Angle Orthod.* 2006;76:353–59.
- [16] Gauthier C, Voyer R, Paquette M, Rompre P, Papadakis A. Periodontal effects of surgically assisted rapid palatal expansion evaluated clinically and with cone – beam computerized tomography: 6 month preliminary results. *Am J Orthod Dentofacial Orthop.* 2011;139(4 Suppl):S117-28.
- [17] Vilani GN, Mattos CT, de Oliveira Ruelias AC, Maia LC. Long-term dental and skeletal changes in patients submitted to surgically assisted rapid maxillary expansion: A meta-analysis. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2012;114(6):689-97.
- [18] Hamed Sangsari A, Sadr Eshkevari P, Al Dam A, Friedrich RE, Freymiller E, Rashad A. Surgically assisted rapid palato-maxillary expansion with/without Pterygomaxillary Disjunction: A Systematic review and Meta – Analysis. *J Oral Maxillofac Surg.* 2015;6:161.

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