SARME - Hyrax expander treatment of severe transverse and sagittal maxillary deficiency: A case report

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Abstract

Aim: Evaluate and compare different surgical and orthodontic procedures used to correct transverse deficiency problems in adult patients.

Materials and methods: A case of an adult patient (25 years old) with a severe maxilla contraction is brought as an example of SARME (Surgical Assisted Rapid Maxillary Expansion) procedure combined to Hyrax expander device is presented. Pro and cons of alternative orthodontic Tooth-borne versus bone borne devices are hence discussed based on several Pubmed articles concerning the subject.

Results: SARME combined to Hyrax expander device enables us to gain 3.6mm of upper first premolars width distance (almost 27% of previous transverse distance measurement). The device was gradually activated after surgery. Correction of transverse contraction and dental canine angle I class was achieved in 2 months time. Molar class couldn’t be evaluated since several teeth were missing. Breathing function was improved with immediate benefits for the patient.

Conclusions: SARME-Hyrax therapeutic treatment option has proved to be a valid and effective procedure in the solution of transverse maxilla contraction in adult patients.

Introduction

SARME (Surgical Assisted Rapid Maxillary Expansion) - with or without pterygomaxillary osteotomies, is a combination of orthodontics and surgical procedures that provides dental arch space for the alignment of teeth. Ideal candidates are adult patients with transverse maxillary hypoplasia since conventional rapid maxillary expansion can be applied only in younger patients provided he facial suture lines become significantly more interdigitated and partially or totally fused as individuals age increase. There is still discussion over the age progress of palatal sutural closure, generally it was estimated that maxillary sutures close around 14 to 15 years of age in females and 15 to 16 years of age in males. Thereafter the orthopedic transverse maxillary expansion through RME has lower success rate and the expansion is primarily composed of alveolar or dental tipping with little or no basal skeletal movement. Bishara stated that the optimal age for expansion is before 13 to 15 years. Although it may be possible to accomplish expansion in non-growing patients, the results are neither as predictable nor as stable. Profit and McNamara supported this opinion by suggesting that the feasibility of palatal expansion in the late teens and early twenties is questionable. Surgically assisted RME combined with fixed orthodontic treatment has been suggested to overcome this problem.

Materials and methods

Here it is presented a case report of a 25 years old male patient affected by bilateral cleft lip and palate that has undergone to a surgical excision of the premaxilla. The case was classified as a mild canine third class on the right side, and first class on the left side. The patient shows a unilateral crossbite on the right side due to a severe maxillary hypoplasia and contraction as clinically seen (illustration 1-2-3-4) and radiographically displayed on the postero-anterior lateral cephalometric x-rays (illustration 5-6).

The case was banded on second molars with occlusal composit increases on dental surface of upper premolars in order to delete possible interferences while expanding the maxilla. A Hyrax expander device was constructed based on model casts, applied and activated during SARME procedure, no surgical overcorrection was performed even though some authors recommend over expanding 0.5 to 2 mm on either side. The amount of distraction at the canine level was of 3.3mm and 3.6mm in first premolar region.

A complessive 3 months period of retention was required as generally accepted (ranging from 2-12 months). The surgical operation consisted in gingival fornix incision from 1.6 to 2.6 dental elements followed by periostal dissection similar to Le fort I.
osteotomy, and paramedian maxillary osteotomy was performed combined with pterygomaxillary separation. The endoscopic surgical excision of nasal turbinates was realized since the patient had a deviation of the nasal septum with consequent breathing problems. Indeed, thus has improved breathing function and even snoring was referred to be reduced by the patient. Orthodontic treatment was completed with segmental alignment of each half arch distalizing and uprighting 1.3 and 2.4. Orthodontic multibrackets appliance will ensure the maintenance of space and dental spatial relationships before the final last therapeutic phase will be completed through prosthodontic restoration on implants provided a GBR vertical bone augmentation on the upper anterior and lower lateral sectors, thus also improving the general aesthetic facial soft tissues and buccal corridors proportion.

Results and discussion

The use of RME in adult patients leads to several complication as reported in literature such as unpredictable relapse up to 33-50% of achieved result, excessive tipping of the anchor teeth; buccal root resorption of the anchor teeth, pain sensation and periodontal defects as gingival recession and bony defects since teeth are pushed though the buccal cortical plate. Once skeletal maturity has been reached, surgically assisted rapid maxillary expansion (SARME), in combination with a corticotomy, must be performed to release the areas of bony resistance, such as the midpalatal suture, the zygomatic buttresses, and the piriform aperture. This technique includes a buccal corticotomy and a median osteotomy.

Cases requiring more than 8 to 10mm of expansion, severe unilateral posterior crossbites without having the necessity of tooth extractions, and patients with significant gingival recession are likely candidates for SARME. SARME is a well tolerated since performed under local anesthesia, successful treatment modality for the adult patients requiring palatal expansion. In the present case also a pterygomaxillary separation was performed to loose the real areas - the zygomaticotemporal, zygomaticofrontal and zygomaticomaxillary sutures - of increased craniofacial skeletal resistance to expansion, obtaining an effective bone rather than dental expansion especially in severe posterior transverse deficiency cases. Thus avoiding postoperative relapse even though some overexpansion is suggested. Possible intraoperative complications is an increased bleeding when pterygoid plates are separated from the maxilla.

In addition, a distinct subjective improvement in nasal airway capacity associated with enlargement of the nasal valve towards normal values was seen after SARME combined to Hyrax device. Same improved was found in SARME combined to bone borne (distractors) devices such as Transpalatal Distractor (TPD), developed in 1999 that consists in a plate placed on the palate by screw fixation and the similar Rotterdam Palatal Distractor (RPD), without screw fixation engineered in 2004. These device were developed to avoid several disadvantages generally associated to Hyrax device that consists in dental version or extrusion, periodontal membrane compression and buccal root resorption, cortical fenestration, skeletal relapse, anchorage-tooth tipping. Bone-borne compared to dental-borne devices have the primary advantages of directing mechanical forces solely toward the bone where therapeutically requested and also increase periodontal stability and bone apposition in the osteotomy site. However, their components (plates and modules) can get loosen, dental roots can be also damaged during their placement and they require another operation under local anesthesia to be removed after a consolidation period. Still no significant difference on improving breathing function or on maintaining long term stability of the results were found. Comparative studies in adult patients on either which SARME surgical techniques or tooth-borne versus bone-borne distractor applied is the best, what is the percentage of relapse (even if lower than orthodontic RME procedures) and of advisable (if so) overcorrection, have failed to give absolute universal answers.

Conclusions

SARME has proved to be a very efficient and well established therapeutic procedure that is becoming widely used in adult patients correcting spatial deficiency and improving breathing and swallowing functions since it helps to increase the volume of nasal and oral cavity, thus preventing relapses and ensuring long term sagittal, vertical and transverse occlusal stability.

References


Illustrations

Illustration 1

Frontal clinical view outlines unilateral lateral posterior crossbite on the right side, canine first class on the left side and mild third class on the right side. Midline symmetry not traceable.

Illustration 2

Lateral clinical view showing mild third class on the right side, vertical dimensional collapse, lateral-posterior crossbite, dental crowding and rotation in the mandibular anterior area.
Illustration 3

Palatal vault evidence an important depth with an upper first premolars width measure distance reduced

![Illustration 3](image)

Illustration 4

Model cast of the patient shows sagittal, vertical and transverse occlusal relationship.

![Illustration 4](image)
Illustration 5

Lateral cephalometric x-ray show severe vertical and sagittal deficiency and the absence of premaxilla in a hyperdivergent subject.

Illustration 6

Postero-anterior cephalometric x-ray evidence nasal septum deviation, severe transverse maxillary contraction. Asimmetry could not be lined out since midline was not traceable.
Illustration 7

Hyrax expander device tried on before SARME procedure was performed.

Illustration 8

Hyrax expander device banded and activated - final results. Palatal vault depth is reduced and its width enlarged. No overcorrection were surgically performed. Composit occlusal increase on upper first premolars were made to avoid interferences.