

# MAXILLARY TRANSVERSE DEFICIENCY CORRECTION THROUGH SURGICALLY ASSISTED RAPID EXPANSION

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## Abstract

**Fundamentação:** The correction of maxillary transverse deficiencies involves orthodontic and surgical procedures that can be performed before or after skeletal maturity. The surgically assisted rapid maxillary expansion (SAR ME) is performed by osteotomies through the lateral walls of the maxilla, zygomatic and canines buttresses, palatal and pterygomaxillary sutures, causing the maxillary disjunction. Followed by activation of the expander to the desired over-expansion in order to correct intercuspal later. **Objective:** The purpose of this study was to discuss the issues involved in the diagnosis of maxillary atresia, SAR ME indications, as well as surgical technique, through a case study. **Methods:** The male patient, 19 years old, had severe transverse maxillary deficiency with facial pattern III , Class III , with great lip incompetence. The patient underwent general anesthesia in a hospital environment, the osteotomies was done according to the technique described by Epker and Wolford (1980). Postoperatively, the patient underwent activations daily for 15 days and after 6 months, the orthodontist installed fixed orthodontic appliance to prepare the patient to orthognathic surgery later. **Conclusion:** The diagnosis by clinical evaluation and models study is essential for the indication of SAR ME and this procedure provides good predictability in the correction of transverse deficiency, with minimal morbidity.

**Key-words:** maxillary; maxillary expansion; atresia.

## Resumo

**Fundamentação:** A correção das deficiências transversais da maxila envolve procedimentos ortodônticos e cirúrgicos, que podem ser realizados antes ou após a maturidade esquelética. A expansão rápida da maxila cirurgicamente assistida (ER MCA) é realizada por meio de osteotomias nas paredes laterais da maxila, pilares zigomáticos e caninos, sutura palatina mediana e sutura pterigomaxilar, ocasionando a disjunção maxilar. Seguido da ativação do aparelho expansor até a sobre-expansão desejada visando a correta intercuspidação posteriormente. **Objetivo:** O propósito deste trabalho foi discutir a respeito do diagnóstico da atresia maxilar, bem como as indicações e a técnica cirúrgica da ER MCA, por meio de caso clínico. **Métodos:** Paciente do sexo masculino, 19 anos de idade, apresentava severa deficiência transversal da maxila, com padrão facial III , Classe III , com grande incompetência labial. O mesmo se submeteu a ER MCA sob anestesia geral, em ambiente hospitalar, pela técnica descrita por Epker e Wolford (1980). No pós-operatório, o paciente realizou as ativações diárias por 15 dias e após 6 meses, o ortodontista instalou aparelho fixo e prosseguiu com a mecânica ortodôntica para posterior Cirurgia Ortognática. **Conclusão:** O diagnóstico por meio da avaliação clínica e dos modelos de estudo é essencial para a indicação da ER MCA e este procedimento proporciona boa previsibilidade na correção da deficiência transversal, com mínima morbidade.

**Palavras-Chaves:** maxila; expansão maxilar; atresia.

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## INTRODUCTION

Dental occlusion is considered normal when the upper and lower teeth are aligned in their bony bases in the center of the alveolar ridge and in relative class I<sup>1</sup>. Thus, the upper dental arch needs to be proportionately greater than the lower arch, making the palatal cusps of the premolars and molars fit properly to occlusal pits of the premolars and mandibular first molar<sup>1</sup>. When there is any deviation from a morphological characteristics of normal occlusion and manifestation in the senses of space, including the transverse dimension, it is called malocclusion. The result of atresia of the upper dental arch in front of the inferior arch of normal dimensions is the posterior crossbite<sup>2</sup>.

The diagnosis of posterior cross bite is very easy, since the normal reference morphology is near, at the lower arch. Thus, we can define the posterior crossbite as the upper arch atresia without compensation of the lower arch. However, the posterior crossbite is not the only indicator of maxillary atresia. The maxillary atresia may be present in the case of simultaneous atresia of the lower dental arch. This implies the absence of posterior cross bite. Thus, the cross-sectional diagnosis should be based on inter- and intra-arch relationship<sup>2,3</sup>.

For the treatment of maxillary atresia, Rapid Maxillary Expansion (RME) was described and originally performed by Angell (1860)<sup>4</sup> and later by Hass (1961)<sup>5</sup> in the United States, and it was advocated that the ideal age range for the RME through orthodontic- orthopedic apparatus corresponds to the young patients, with maximum age ranging from 14 years for women and 16 for men, in which the median palatine sutures have not completed the ossifying process<sup>6</sup>.

In individuals who have reached skeletal maturity, the surgical separation is indicated in order to provide separation of the median palatine suture with consequent maxillary expansion and the decrease in ortodontic gradient effects<sup>7</sup>. This is known as Surgically Assisted Rapid Maxillary Expansion (SARME) in which the use of a conventional expander is indispensable, and it may be tooth-supported or tooth-mucous-supported with the activator screw should be appropriate to the amount of expansion required. It can be performed under general anesthesia or local anesthesia, and this procedure is aimed at separating the sutures to prevent palate disjunction, through the techniques proposed by Epker and Wolford (1980)<sup>8</sup> in which an osteotomy of Le Fort I type is performed associated with a osteotomy with chisel and hammer of pterigomaxilares sutures (not performed in cases under local anesthesia) and median palatine sutures (Figure 1). Postoperatively, the patient promotes the daily activation of

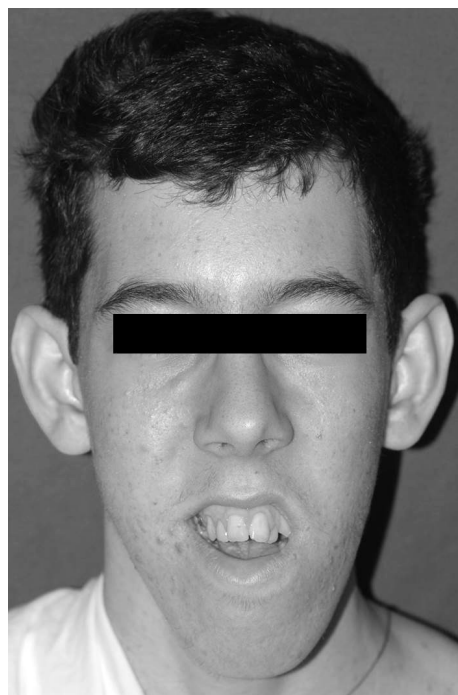
the expansion device, up to the over-expansion controlled by the orthodontist, so that after completion of the process of bone repair (6 months), the professional proceeds with necessary orthodontic mechanics<sup>2,6,10,11</sup>.

## OBJECTIVE

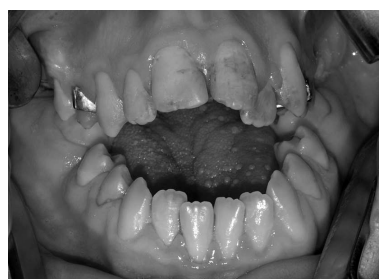
Given the dento-skeletal changes that maxillary atresia causes to patients, as well as the lack of technique and its indications, such issues justifies this study, by discussing them through a clinical case treated by Surgically Assisted Rapid Maxillary Expansion (SARME).

## METHODS AND RESULTS

Male patient, leucoderma, 19 years old, sought outpatient accompanied by his father, with referred by an orthodontist for evaluation of severe malocclusion. The patient had a medical history of arthrogryposis, a disorder characterized by multiple congenital rigid deformities of joints, which limits the locomotor development.



**Figure 1 -** Diagram showing the osteotomies performed during SARME.



**Figure 2 –** Facial aspect in which the patient had lip incompetence, III facial pattern with horizontal maxillary deficiency, combined with horizontal mandibular excess.



**Figure 3** - In the intraoral examination, anterior and posterior cross bite , Class III and anterior open bite.



**Figure 4** – Jaw access, followed by incision and mucoperiosteal detachment in the region of the upper gengivolabial groove.



**Figure 5** – Osteotomy using reciprocating saw (Striker®) from the nasal aperture to the jaw posterior wall bilaterally.



**Figure 6** - Osteotomy of the nasal septum using chisel with guide and hammer.



**Figure 7** - Pterygomaxillary disjunction bilaterally with curved chisel and hammer.



**Figure 8** - Osteotomy of the median palatine sutures. The maxillary expansion with inter-incisor diastema is noted.

On extraoral examination, the patient had lip incompetence, facial pattern III, transverse deficiency and vertical maxillary excess, combined with horizontal mandibular excess (**Figure 2**).

In the intraoral examination, it was noted posterior and anterior crossbite, Class III and anterior open bite (**Figure 3**). In the analysis of models of inter-arch study, leading them from the occlusion clinically observed for Class I occlusion, we confirmed the absolute cross bite, with a severe maxillary atresia.

We proposed SARME under general anesthesia in a hospital for correction of maxillary atresia. First, the orthodontist installed the tooth-supported device (Hyrax) with screw of 13 mm long.

The surgery began with incision and mucoperiosteal detachment in the region of the upper gengivolabial groove (distal 16-26) (**Figure 4**). Then the bilateral osteotomy from the nasal aperture to maxilla wall was performed using reciprocating saw (Striker®) 5 mm above the apex of the teeth (**Figure 5**). Then, separation of the nasal septum (cartilage and vomer bone) using chisel with guide and hammer (**Figure 6**) was performed. At this time, using his index finger, the surgeon should palpate the boundary between the hard palate and soft palate, so that during the separation of the septum up to the posterior limit it can be noticed by the surgeon.

The pterygomaxillary disjunction was performed bilaterally with curved chisel and hammer, blind, and the index finger of the opposite hand of the surgeon palpates pterygoid hamulus and maxillary tuberosity, in order to feel the separation of these structures when the disjunction of the pterygomaxillary suture occurs. During this osteotomy the chisel should remain at all times under the periosteum and be directed from lateral to medial and upper to bottom (**Figure 7**).

At this time, the expanding device is activated (8-fold), which corresponds to 2 mm of expansion, with the intent of maintaining a tension in the palate. Then, a straight chisel was placed on the median palatine suture between the maxillary central incisors, and application of blows with the hammer. Clinically, when it occurs the separation of the jaws, one inter-spacing diastema is noticed, which is enhanced by prior activation of the expanding device (**Figure 8**).

On the second day after surgery the patient was instructed on daily activations being 0.5 mm expansion per day until over-expansion is achieved. The screw was locked using acrylic resin for a period up to 6 months after installation of braces. Still, as treatment plan orthodontic mechanics for decompensation and alignment and leveling of the teeth will be performed, and later orthognathic surgery.

## DISCUSSION

One of the most important aspects in the maxillary atresia is the correct diagnosis. The maxillary expansion is shown in transverse maxillary deficiencies, either absolute or relative, regardless of the stage of development of occlusion, from the deciduous dentition, since in the presence of posterior crossbite. When there is no posterior crossbite, transverse mechanics may start from the mixed dentition. However, there is a limit to the predictability of the outcome in relation to orthopedic patient age. From the clinical point of view, it is clear that the procedure of orthopedic maxillary expansion is fairly predictable until late adolescence. Thereafter, it becomes unpredictable and unlikely with increasing age. Given this circumstance, there is the option of eliminating the structural strength of the maxilla through osteotomies through the side walls and above the jaws (which break the zygomatic and canines buttress), median palatine sutures and pterygomaxillary suture, favoring the maxillary dysfunction even after adolescence<sup>2, 5, 10</sup>.

Therefore, in addition to clinical evaluation, analysis of dental casts is paramount. This is because it is necessary to determine whether the problem is dental or skeletal, and whether transversal deficiency is absolute or relative. The absolute deficiency is characterized by unilateral or bilateral crossbite after evaluation of plaster models with respect to Class I, often perceived in the evaluation of patients with retrognathia. In transversal relative disability, when the study models are placed in Class I, posterior crossbite is not observed, commonly seen in the assessment of patients with dentofacial deformity with Class III malocclusion. In the first situation ortho-surgical intervention to correct these deformities is required, and in the second no surgical treatment for correction of maxillary transverse dimension is indicated<sup>1, 10, 13</sup>. In this report, the patient was 19 years old, and corroborated with intraoral clinical examination and of plaster models, then we found the absolute crossbite, a fact that fully justified the indication for SARME.

There is a great debate in the literature regarding the performance of this surgical procedure under general or local anesthesia with or without sedation. Glassman, Nahiogian, Medway (1984)<sup>14</sup> in order to perform this procedure on an outpatient basis, described SARME without osteotomy of the nasal septum and pterygomaxillary suture, in order to provide greater comfort and safety to patients because it is a less invasive technique. However, controversies have arisen to determine which one would be less invasive procedure to be performed without affecting the amount of expansion achieved and the stability of such expansion over time, especially in severe jaw atresia.

In this context, the authors of this study are consistent in indicating conservative approaches where possible, to avoid subjecting the patient to surgery under general anesthesia, which is more costly since the operation performed in a hospital environment presents additional costs of hospitalization of the patient and anesthetist's fees. However, we also agree that RESAM through the osteotomy of all skeletal reinforcement, ensures greater stability in the correction of transverse maxillary deficiency, and further expansion in the molar region. This time, based on this philosophy, we indicate to the patient of this study the surgery in a hospital environment. The genetic defect presented by the patient (arthrogryposis), not incapacitated him to undergo an operation of such magnitude, since it does not alter the systemic functions, but only the locomotor autonomy.

Regarding the surgical technique, the SARME is a procedure that requires from surgeon specific maxillofacial training, in view of the possible complications. The main complications are vascular lesions during disjunction of pterygomaxillary suture due to disruption of the pterygoid venous plexus or maxillary artery branches<sup>2, 9</sup>. As well as the incorrect positioning of the chisel during osteotomy of the median palatine sutures, in cases on which the roots of the central incisors are very close it can result in fracture between the tooth root and the alveolar bone wall of central incisor<sup>15, 16</sup>. In this case there was no complications, and it is mandatory for any procedure the improved knowledge of the surgical technique by surgeons.

Based on the literature and presentation of clinical-surgical report, we conclude that the surgical technique provided good predictability in the correction of transverse deficiency, with minimal morbidity, the diagnosis by clinical evaluation and study models is essential for the indication of SARME; performing this surgery under local or general anesthesia will depend on the degree of maxillary atresia, the SARME before Orthognathic Surgery will help orthodontic mechanics of decompensation, alignment and leveling of the teeth.

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