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Simultaneous ortho-surgical expansion and protraction of the maxilla in patients with mature midpalatal suture: A technical note

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ABSTRACT

The authors aim to propose combination of Surgically Assisted Miniscrew-Assisted Rapid Palatal Expansion (SAMARPE) with orthopedic traction miniplates placement in cases where a sagittal deficiency coexists with the necessity of carrying out a surgical maxillary expansion. Unlike the conventional orthopedic traction technique, where the miniplates are placed bilaterally in the infrazygomatic crest of the maxillary buttress, in this scenario the upper miniplates should be placed below the LeFort I osteotomy, and therefore a little bit angulated.

1. Introduction

Transverse maxillary deficiency is a relatively common orthofacial problem that can be effectively treated with Rapid Palatal Expansion (RPE) in children and young adolescents (da Silva Filho et al., 1995). However, in late adolescence and adult life, the increased degree of interdigitation of the midpalatal and surrounding sutures jeopardizes the opening process. With the introduction of skeletal anchorage, and in order to avoid unwanted dentoalveolar side effects, Lee et al., in 2010 described a new bone-supported technique: Miniscrew-Assisted Rapid Palatal Expansion (MARPE). It must be highlighted that MARPE is either a tooth-bone-borne or a solely bone-borne RPE appliance. Although MARPE has increased the age at which the palate can be expanded without surgery, there is controversy as to the age at which this technique can be successfully performed without placing other craniofacial sutures at risk during the opening process (Kapetanović et al., 2021).

Thus, maxillary expansion in skeletally mature patients requires a surgical intervention where midpalatal suture and LeFort I osteotomies are carried out. Two types of appliances can be used for expansion after

the surgical process: bone-borne (Surgically Assisted Miniscrew-Assisted Rapid Palatal Expansion [SAMARPE]) (Mommaerts, 1999; Haas Junior et al., 2022) or tooth-borne (Surgically Assisted Rapid Palatal Expansion [SARPE]) (Hernández-Alfaro et al., 2023). However, maxillary Le Fort I segmentation may be required when maxillary discrepancies exist in all planes, though in the axial plane, when the correction is greater than 6 mm, SARPE or SAMARPE should be previously performed (Marchetti et al., 2009).

On the other hand, orthopedic traction of the maxilla using a pure bone-borne anchorage with miniplates has been described to successfully treat midface sagittal deficiency in growing patients, also avoiding any dentoalveolar compensations (De Clerck et al., 2009).

The authors thus propose the combination of both techniques in cases where a sagittal deficiency coexists with the need for surgical maxillary expansion. Unlike the conventional orthopedic traction technique, where the miniplates are placed in the infrazygomatic crests of the maxillary buttress, in this scenario the miniplates should be placed below the LeFort I osteotomy, and therefore a little bit angulated.

The described protocol has been illustrated with two cases treated at

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our Department during 2023 (Table 1).

2. Surgical technique

The expansion bone anchored device was placed by the orthodontist or was just the first surgical step after local anesthesia infiltration. The surgical procedure began with a bilateral transmucosal pterygomaxillary osteotomy using a piezoelectric device through a flapless approach at the level of the hamular notch, as described elsewhere (Hernández-Alfaro et al., 2023). Then, through a sublabial incision, subperiosteal elevation of the anterior aspect of the maxilla was carried out, as well as subperiosteal tunneling of the lateral walls of the maxilla to the pterygoid region featuring an approximately 45° inclination. The nasal spine was separated from the maxilla with the piezoelectric saw; the nasal mucosa was detached from the nasal floor with a periosteal elevator; and the nasal septum was luxated laterally to separate it from the nasal crest of the maxilla as per protocol. The standard Le Fort I osteotomies were performed using a reciprocating saw with a 4-cm blade. At this point, two additional short vertical incisions were made in the area between the first and second molar roots, followed by tunnel-shaped subperiosteal dissection of the angulated path for future placement of the miniplates below the horizontal Le Fort I osteotomies, fixed with three self-drilling monocortical screws, and always avoiding root damage (Fig. 1). Then, pterygomaxillary disjunction was completed through an anterior approach by driving a sharp, straight 2-cm osteotome from the nasal crest of the maxilla to the pterygomaxillary junction, known also as the “twist technique” (Hernández-Alfaro et al., 2023). The vertical midline osteotomy was carried out with the piezoelectric saw between the central incisors and completed with a thin osteotome. The bone-borne expansion device was activated to check symmetrical and complete expansion of both sides. One-millimeter (4 activations) expansion remained at the end of the surgery.

The mandibular miniplates were placed through a couple of vertical approaches between the lateral incisors and the canines, and fixed with two monocortical screws.

Cross-suturing of the perinasal muscles was performed with 4/0 Vicryl (Ethicon, Inc.), and the mucosa was closed with running 5/0 Monocryl suture (Ethicon, Inc.). Heavy (8 ounces) traction elastics were placed at the end of surgery (Fig. 2).

Seven days after surgery, the patients were instructed to activate the expander. The distraction rate ranged between 0.5 and 1 mm per day. Distraction as well as protraction were continued until the desired correction was achieved. No overcorrection was applied. The contention period with the expander in place lasted 16 weeks, and in the case of the miniplates until stable occlusion was obtained.

3. Discussion

This technical note illustrates the possibility of concomitantly performing two surgical procedures that usually are carried out separately, as their combination is indicated in specific cases where the patient, apart from requiring surgical maxillary expansion, also needs a certain degree of protraction. The presented cases started from a very different initial situation: while one patient was in late adolescence with maxillary hypoplasia and an important aesthetic complaint due to relative prognathism (who probably will require orthognathic surgery at the end of growth of the maxilla-mandibular complex) (Fig. 3), the other patient

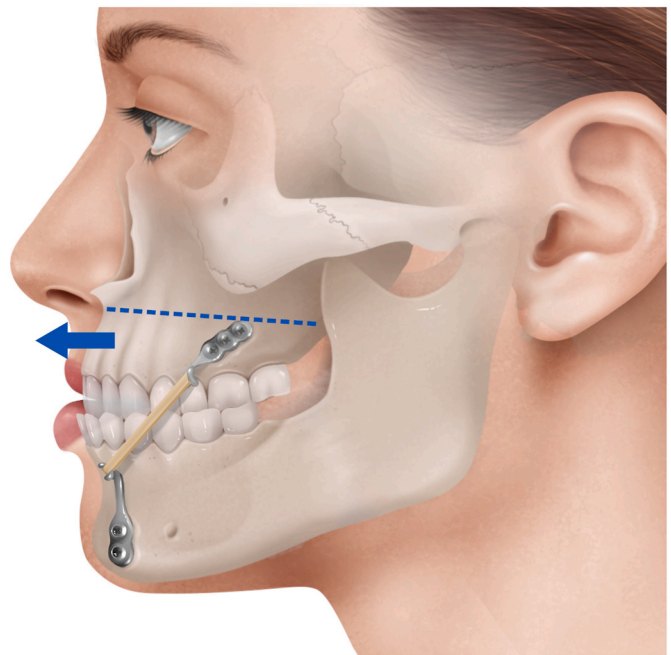


Fig. 1. Angulated miniplate placement below the Le Fort I osteotomy line.



Fig. 2. Intraoperative view after SAMARPE through a minimally invasive approach and traction miniplates with elastics.

was 53 years old and aimed to solve the underlying malocclusion (Fig. 4). Thus, the procedure can be applied in different scenarios, although indications for a sole maxillary advancement and expansion are scarce. To the author's knowledge, this is the first paper concomitantly using both techniques, since only facemask or bone anchorage protraction has been combined with RPE in children (Al-Mozany et al., 2017) or SARPE in adults (Benhia et al., 2019).

Table 1

Demographic and anatomic data of the preoperative situation of each patient.

PATIENT	SEX	AGE years old	Main complaint	Dental Class	Transverse maxillary gain ^a	Sagittal maxillary gain
1	F	15	Aesthetics	III	6.78	6.91
2	F	53	Functional: occlusion	III	8.09	5.8

*F = female.

^a Maxillary alveolar bone width.



Fig. 3. Initial occlusion and occlusion after expander removal in patient 1.



Fig. 4. Initial occlusion, occlusion after expander removal, and final occlusion in patient 2.

The combined SAMARPE-protraction miniplates technique could be used with all sorts of expansion devices: tooth-borne, bone-borne or hybrid, although the bone supported device obtains a more parallel

expansion. Whatever the type of device used, it is always advisable to use a minimally invasive technique to reduce patient morbidity (Wiltfang and Kessler, 2002; Hernandez-Alfaro et al., 2010; Haas Junior et al., 2022).

Regarding the surgical technique, the authors would like to highlight a couple of relevant points: a) the nasal septum is disinserted in order to avoid its undesired deviation after expansion (Seidita et al., 2022); and b) pterygomaxillary disjunction after transmucosal pterygomaxillary osteotomy is carried out to obtain parallel expansion, instead of a pyramidal aperture in the axial plane, as well as to allow proper protrusion. Contrarily, in cases where there is only an anterior lack of maxillary width (without posterior crossbite), the pterygomaxillary disjunction could be avoided (Hernández-Alfaro and Guijarro-Martínez, 2013).

Finally, there are no added complications related to the combination of both techniques, provided care is taken not to damage the roots of the molars. But it should be emphasized the importance of patient compliance in achieving successful results.

4. Conclusions

In cases where there is a mature midpalatal suture with a transverse maxillary discrepancy of over 6 mm in addition to maxillary sagittal deficiency not requiring mandibular surgery, both SAMARPE and the orthopedic traction miniplate procedure could be performed concomitantly, with some technical modification of the latter.

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