Surgically assisted rapid palatal expansion (SARPE) prior to combined Le Fort I and sagittal osteotomies: A case report

A severe Class III malocclusion with maxillary transverse and anteroposterior deficiency, mandibular prognathism, and excessive lower facial height is presented. The malocclusion was treated with a combination of orthodontics and a 2-stage surgical treatment: a surgically assisted rapid palatal expansion prior to a sagittal mandibular and chin reduction and Le Fort I osteotomies. The patient exhibited excellent stability 6 years after treatment. The controversy regarding one surgery or a 2-stage surgical approach is discussed briefly. (Int J Adult Orthod Orthognath Surg 2001;16:200–206)

A 23-year-old white man presented for treatment with no history of trauma or serious illness. He reported that his maxillary canines had erupted in a very high position and had been extracted. His major complaints included a large mandible, an unsatisfactory smile, and the inability to incise food (Figs 1a to 1c). The first consultation revealed psychosocial trauma regarding his facial appearance. The cause of this malocclusion was presumed to be hereditary, although no familial history was reported.

Diagnosis

Dental

The patient had a Class III malocclusion with a very narrow maxilla and a negative overjet of 7 mm. The mandibular incisors were in a retroclined position, causing 5 mm of crowding. Bilateral posterior and anterior crossbites were exhibited. The absence of the maxillary canines led to acceptable alignment of the maxillary teeth. The lower dental midline was 2 mm to the right in relation to the facial midline. The patient presented good periodontal health, with no recession or gingival bleeding. Enamel hypoplasia was present in the mandibular incisors (Figs 2a to 2e).

Skeletal

Facial analysis revealed a very hypoplastic maxilla with anteroposterior and transverse deficiency. The patient exhibited some inferior sclera show, the bizygomatic width was decreased, and concave paranasal areas and a narrow alar base width were present. In the profile analysis, the patient presented with decreased infraorbital rim projection and cheek configuration. Lower facial height was excessive, especially from stomion to soft tissue menton. Chin projection and the chin-neck angle were increased and the chin-neck length was decreased (Figs 1a to 1c).
Figs 1a to 1c  Facial appearance before treatment. The hypoplastic mid-third of the face, increased lower facial height, and mandibular protrusion are notable.

Figs 2a to 2e  Intraoral aspects before treatment. The Class III malocclusion was made worse by the missing maxillary canines.
**Diagnostic summary**
- 7 mm negative overjet
- Class III malocclusion
- Total crossbite
- 5 mm of mandibular crowding
- Retroinclination of mandibular incisors
- Missing maxillary canines
- Concave profile
- Protrusive chin and mandible
- Anteroposterior and transverse maxillary deficiency
- Lack of good function; inability to incise food
- Poor self-esteem

**Treatment objectives**
- Eliminate crossbites
- Establish a Class I relationship between maxillary first premolars and mandibular canines
- Decompensate mandibular incisors
- Improve profile
- Expand and advance the maxilla 7 mm
- Set back the mandible 5 mm
- Reposition the chin at menton superiorly and posteriorly
- Establish good occlusal function

**Treatment**

**Surgically assisted rapid palatal expansion**

A Hyrax palatal expander was cemented with bands on the maxillary first molars and first premolars, and a surgically assisted rapid palatal expansion (SARPE) was performed under local anesthesia via bilateral zygomatic buttress and midpalatal osteotomies. The zygomatic buttress osteotomies were extended forward to the piriiform apertures but not to the pterygomaxillary fissures. The screw was activated 5 turns until a midline diastema appeared. Two days after the operation, the expansion was continued on a 1-activation-twice-daily basis (morning and evening). The patient was examined weekly until the desired amount of expansion was achieved (Figs 3a to 3d). The screw was then tied with a ligature wire for stability and retention. The palatal expander was left in place 6 months for complete healing.

**Appliances**

After the cessation of the expansion, a full fixed edgewise 0.022-inch appliance was placed in the mandible. Bands were placed on the molars and brackets on the other teeth. The first wire used was a 0.012-inch nickel-titanium (NiTi); this was followed by a 0.014-inch NiTi wire. Both were left in place for 60 days each to project the incisors. After that, a sequence of stainless steel archwires was used: 0.016-inch, 0.018-inch, 0.020-inch, and 0.019-×0.025-inch and 0.215-×0.0275-inch with soldered spurs. The main objective in the mandible was alignment, leveling, decompensation of the incisors, and elimination of crowding.

In the maxilla, after removal of the palatal expansion device, the second molars were banded and the remaining teeth bonded. The first archwire was a 0.014-inch NiTi; stainless steel archwires were then applied in the following sequence: 0.016-inch, 0.018-inch, 0.020-inch, and 0.019-×0.025-inch and 0.0215-×0.0275-inch with spurs. The medial diastema left by the SARPE was closed with elastic chains. The main objective of this phase in the maxilla was alignment, leveling, and space closure. This full-slot archwire remained in place for 6 weeks before surgery (Figs 4a and 4b).

**Combined surgery**

A sagittal osteotomy was performed with 5 mm of mandibular setback. In addition, a genioplasty with 5 mm superior and posterior repositioning at menton was performed. In the maxilla, a high Le Fort I osteotomy was performed, advancing the maxilla by 7 mm. The bone slice from the chin was used as an autogenous bone graft in the maxillary osteotomy. Rigid fixation was used in the maxilla, and wire fixation was used in the mandible. The patient remained in rigid maxillomandibular fixation for 5 weeks and in elastic fixation for 6 additional weeks.

**Postsurgical treatment**

Eleven weeks after surgery, a pair of 0.019-×0.025-inch stainless steel archwires were placed for finishing and detailing.
Maxillomandibular elastics were used to finalize the occlusion. After removal of appliances, a wraparound maxillary retainer and a mandibular lingual 3-3 bonded bar were placed. The patient was instructed to wear the maxillary retainer full time for a year and at night thereafter.

**Results**

The occlusion was finished with a Class II molar relationship due to the absence of the maxillary canines. The maxillary first premolars replaced the missing canines in the esthetic and functional aspects; to achieve good function, the lingual tips were worn down. The overbite and overjet relationships were ideal. Maxillary and mandibular dental midlines were coincident with the facial midline (Figs 5a to 5e). Facial appearance improved dramatically, especially as a result of the great transverse and anterior improvement in the middle third and the reduction in the lower third of the facial height (Figs 6a to 6c). Cephalometric changes included an increase of the ANB angle from –12 degrees to –1 degree. The mandibular incisor to mandibular plane angle increased from 67 degrees to 78 degrees. The maxillary incisors were uprighted after the rapid maxillary expansion, during space closure, and were advanced within the whole maxilla.
The cephalometric superimposition showed a 13-mm sagittal change. The mandible was moved posteriorly 5 mm, and the maxilla was advanced 8 mm. About 2 mm of maxillary impaction occurred, and the chin was moved superiorly 6 mm. The nose tip elevated and went forward but there is probably a certain cartilage growth included in that change. The patient gained weight after surgery, which also produced changes in his soft tissue profile (Figs 6a to 6c).

Six years after treatment the patient’s skeletal and dental structures were completely stable and showed no evidence of relapse (Figs 7a to 7e).
Discussion

The technique of the SARPE is well described in the literature.\(^1\)\(^-\)\(^4\) But the performance of SARPE prior to a Le Fort I osteotomy has been the subject of controversy. Lanigan et al,\(^5\) in a survey of vascular complications of orthognathic surgery, concluded that the maxilla should be divided into as few segments as possible and that it is safer to widen the maxilla prior to Le Fort I osteotomy than it is to perform a segmental Le Fort I. Silverstein and Quinn\(^6\) affirmed that the 2 procedures (SARPE and 1-piece Le Fort I) are easier to perform than a segmental Le Fort osteotomy, and the chance of segment malposition and vascular compromise is lessened. In addition, correction of the transverse deficiency first makes the second procedure easier, faster, and more stable. The risks of periodontal defects, relapse, and compromised blood supply are also reduced in comparison with segmentalized Le Fort procedures. Orthodontic alignment is also faster and easier because it is achieved earlier, and the need for individual segment alignment and tipping of roots is eliminated. On the other hand, Bailey et al\(^7\) concluded that the most important consideration is that if the patient will require additional maxillary surgery after transverse expansion has been achieved, there is little reason to perform surgery twice.

In this specific patient, some advantages and disadvantages of doing the SARPE prior to a Le Fort I osteotomy could be summarized as follows.

Figs 7a to 7e  Facial and intraoral aspects 6 years after treatment show great stability.
Advantages:

• Facilitated placement of brackets
• An almost unlimited amount of expansion
• Simplified orthodontic preparation
• Simpler Le Fort I osteotomy
• Minimal chance of segment malposition
• Completely stable transverse expansion

Disadvantages:

• Two surgical procedures
• Psychologic impact
• Possibly longer treatment time
• Increased costs

Conclusion

This case indicates that the performance of SARPE prior to a combined orthognathic surgery that involves Le Fort I osteotomy could be an excellent alternative treatment in selected cases. The most important advantages are the complete stability of the transverse gain and a much simpler Le Fort I procedure.

References