Modified-casted Appliance for Surgically-assisted Rapid Palatal Expansion: A Clinical Report

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ABSTRACT

Transverse maxilla-mandibular discrepancies are a major component of several malocclusions. Surgically assisted rapid palatal expansion (SARPE) is a common treatment modality for older patients in the correction of a maxillary transverse deficiency. In such cases, retention of the appliance plays an important role and this becomes a problem in patients having enamel hypoplasia. Therefore, the design was modified of a tooth-borne rapid maxillary expansion appliance with provision for miniscrew skeletal anchorage in a Class II malocclusion case having anterior open bite with bilateral posterior crossbite and enamel hypoplasia.

Keywords: Surgically assisted rapid palatal expansion, Implant, Class II malocclusion, Transverse discrepancy.

CASE REPORT

A 19-year-old male patient presented with a Class II malocclusion and an anterior open bite with a bilateral posterior crossbite and amelogenesis imperfecta (Fig. 1). The treatment plan was combined surgical and nonextraction orthodontic therapy. The surgery was divided into three stages, that is, SARME; maxillary osteotomy with superior positioning by 4 mm, followed by bilateral split sagittal osteotomy of 8.5 mm for mandibular advancement and rotation of 4 mm, and advancement genioplasty of 4 mm. As the patient had amelogenesis imperfecta, a modified bonded split casted expansion appliance with bilateral buccal extension for implant placement was fabricated (Fig. 2). The rationale of the bonded appliance was to get more retention with miniscrew implants and to eliminate the undesirable dental effects of the splinted appliance.

Appliance Fabrication

Presurgically impressions were made and a master cast was poured in dental stone. Dental surveying was done on the master cast to mark the highest contour of convergence and placement of the prosthesis (Fig. 3). Block out was done to remove the undesired undercut. Complete metal crowns in nickel-chromium alloy were fabricated on the posterior teeth bilaterally with Hyrax palatal expander.
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(11 mm) was attached to the prosthesis. Prepared teeth were painted with a thin coating of separating medium (George Taub). The wax pattern was made in type II casting wax with buccal extension for the placement of 1.2 mm wide implants and expander attached to the pattern (Fig. 4). Two opposing sprues 2 mm thick were provided at the occlusal-axial junction of the pattern bilaterally. At the junction of these sprues, a reservoir was provided that was attached to the main sprue (Fig. 5). The pattern was invested in phosphate-bonded investment. The pattern was first coated with

Fig. 1A: Extraoral photographs

Fig. 1B: Intraoral photographs
comparatively thinner mix of investment material using a camel hair brush. A vacuum mixer (vac-u-vestor) was used for mixing the investment and the investing procedure was completed. The invested ring was placed in burn out furnace for 75 minutes at 800°C for thermal expansion to compensate for casting shrinkage. An induction casting machine was used. After retrieving the casting, it was cleaned by using sandblaster with 50 to 100 μg particle size abrasives. The casting was tried for fit on the densite stone dies and finally cemented on the posterior teeth.

The expansion appliance was cemented with glass ionomer cement to all the teeth with two implants [Titanium microimplant 1.2 mm wide and 6 mm long, with long head and hexagonal in shape Absoanchor®] placed on the buccal surface to provide more retention 2 weeks before the surgical expansion (Fig. 6). The occlusal surface of the appliance was made compatible for the free movement of mandibular cusp in all eccentric movements. During the expansion procedure, the appliance was expanded until the tissue between the central incisors blanched and then expanded the appliance 2 turns per day (0.5 mm) until the desired expansion was complete. The patient was seen by the orthodontist 3 weeks after the surgical procedure. The occlusal radiograph taken after SARPE (Fig. 7) showed a symmetric expansion at the midpalatal suture. The intercanine expansion was 11 mm with intermolar expansion was 8 and 17 mm of midline diastema was observed after the surgical procedure (Fig. 8). Twelve months after the surgical expansion the interproximal gingiva remains healthy but radiographically the bony fill appears immature and disorganized.

**DISCUSSION**

RME promotes an increase in transverse dimensions and in the perimeter of the upper dental arch with a real gain of bone at the level of midpalatal suture. In the present case, intercanine expansion of 11 mm with intermolar expansion...
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Fig. 4: Wax pattern made in type II casting wax with buccal extension

Fig. 5: Two opposing sprues 2 mm thick placed at the occlusal-axial junction of the pattern bilaterally

Fig. 6: Appliance placed intraorally

Fig. 7: Occlusal radiograph after surgically assisted rapid palatal expansion

of 8 mm was observed after the surgically assisted rapid palatal expansion.

Complications that are related to the expansion appliance include its impingement on palatal soft tissue, loosening (more common with bone-borne distractors), and breakage and stripping or locking of the appliance screw.

Bonded acrylic RME appliance was recommended in cases of constricted maxilla where inferior and anterior movements of maxilla were restricted. Bonded RME appliances are designed to cover the posterior occlusal buccal segments so that the appliance not only serves as an expansion device but also intrudes on the freeway space through its vertical thickness. It acts as a functional appliance with small range of action. Theoretically, by infringing on the
freeway space with the displacement of the mandible (2-3 mm) below the intercuspal position. A constant passive force is exerted on the maxilla and the mandible.  

Enamel hypoplasia or amelogenesis imperfecta can be considered an exclusive ectodermal disturbance which can cause white flecks, narrow horizontal bands, lines of pits, grooves, and discoloration of teeth varying from yellow to dark brown. In the present case report enamel hypoplasia was present; therefore, a modified-bonded split-casted expansion appliance with bilateral buccal extension was cemented with glass ionomer cement to all the teeth and two miniscrew implants were placed to augment retention.

The major advantage of using miniscrews in this case is that the forces are acting directly to the bone at the mechanically desired level, which prevents dental tipping and keeps segmental tipping to a minimum in addition to reinforcement of retention.

CONCLUSION

Appliance design is very critical for the success of this procedure. Casted appliance was supplemented with bone-borne anchorage using miniscrew implants.

REFERENCES


Fig. 8: Occlusal view after surgically assisted rapid palatal expansion