Cast Haas-type RME appliance: A case report

Mauro Cozzani, DMD, MScD¹
Mattia Fontana, DMD¹
Paolo Cozzani, DMD¹
Andrea Bertelli²

Rapid maxillary expansion (RME) in the initial stages of occlusal development has become a routine procedure in orthodontic practice. The increase of the transverse dimensions of the maxilla in the mixed dentition can be carried out by a rapid palatal expander that exploits primary teeth as anchorage to minimize any negative effects on permanent teeth. This case report demonstrates the use of a modified Haas-type RME appliance in a Caucasian girl 7 years 6 months of age with a maxillary transverse deficiency, unilateral crossbite, dental midline deviation, and maxillary anterior dental crowding. The patient was treated with a modified Haas-type RME appliance composed of a six-band metal-cast structure with a partial occlusal covering that was bonded to the primary teeth using glass-ionomer cement. Clinicians see advantages in terms of speed of application and patient compliance by taking a single impression. Stability and retention of the appliance improve thanks to custom-made metal casting and the risks of decementation minimize via the use of glass-ionomer cement. Moreover, the fabrication in inert titanium, hypoallergenic resin, and laser soldering means patients with allergies can use it. The results demonstrate that the expansion carried out on primary teeth is followed by permanent molars and remains stable. ORTHODONTICS (CHIC) 2011;12:252–259.

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However, the deleterious effects of stress on the cranial base tend to intensify with increasing age due to the diminishing elasticity of the bone. It is postulated that strain can arise upon flexion of the pterygoid processes in adulthood during rapid palatal expansion, especially in the sphenoid bone, with the risk of involvement of anatomical zones critical for the passage of nervous and vascular structures. In addition, the skeletal changes induced by RME also seem prone to partial relapse in the long term, in particular if RME is employed after the pubertal growth peak. Nevertheless, recent studies have demonstrated how expansion will remain more stable if it is performed before eruption of the permanent maxillary lateral incisors. Permanent first molars and first premolars are often exploited for anchorage, but this unfortunately leads to buccal inclination (which tends to partially relapse after the retention phase) and buccal tipping of the crowns of these teeth.

In addition, forces exerted during expansion frequently lead to root resorption and bone dehiscence on the buccal side, especially in patients with scarce alveolar bone thickness. Previous studies have demonstrated how gingival recession in teeth used for anchorage occurs three times as frequently with respect to the other teeth.

To avoid these undesired effects on permanent teeth, palatal expansion can be carried out in mixed dentition: The primary teeth may be exploited via bands cemented onto the primary second molars and lingual wires bonded onto the primary canines. However, the necessity of adapting appliances for permanent teeth for use with their primary counterparts is not a simple procedure, particularly due to the poor retention of the coronal anatomy of the primary molars. Furthermore, bonding of the anterior lingual wires of the palatal expander can require grooves to be made on the primary canines using a turbine-driven bur, a process that requires a certain degree of collaboration, which is not always possible with young children.

The aim of the present report was to present an Haas-type RME appliance on primary teeth, requiring new construction procedures to resolve transverse discrepancies in the first stages of mixed dentition and minimizing chair time and compliance from young patients.

**APPLIANCE CONSTRUCTION**

A single alginate-impression has to be taken and sent to the lab. Two acrylic clear resin covers (one for each side) (Pattern Resin LS, GC) are built on the primary teeth, from the second molar to the canine (Fig 1). Acrylic resin covers...
are then metal cast. After verifying the adaptation on master cast, the metal casting covers are finished and polished (Fig 2).

An expansion screw (Titan-hyrax screw, Dentaurum) is selected and connected to the metal casting coverages by titanium connectors with laser weldings and then covered by two resin pads (Orthocryl, Dentaurum).

Hooks and 1.2-mm-diameter vestibular tubes are laser welded and then rounded off and polished (Fig 3).

The construction with biocompatible materials (inert biomedical titanium, hypoallergenic resin, and laser welding) permits the use of this appliance in patients with allergies. In particular, pure type I titanium bars (0.8 to 1.2 mm diameter) and pure type IV titanium wire are used.

The strong appliance retention is guaranteed by the individual metal castings and the final inner titanium bioxide shot-blasting (Fig 4). The inner part can be filled with a small quantity of glass-ionomer cement (Fuji Ortho, American Orthodontics) and bonded to the primary teeth.
CASE REPORT

The treatment of a girl, aged 7 years 6 months, in the intertransitional phase of mixed dentition is shown. She presented with a skeletal Class I, normodivergent growth pattern, maxillary transverse deficiency, and mandibular deviation. She had a Class I dental relationship, with a left lateral crossbite involving the permanent first molar and the primary first and second molars and a crossbite of the permanent maxillary lateral incisor on the opposite side. The midlines appeared to not be coinciding for a lateral functional mandibular shift caused by dental interferences; overjet and overbite were found to be within the normal limits, and a slight degree of crowding was noted in the maxillary and mandibular anterior sections. The patient presented an asymmetrically constricted narrow palate (Fig 5). Functional analysis revealed no signs or symptoms of dysfunction, and the patient was a partial mouth breather.

A modified cast Haas-type RME anchored to the primary teeth (Fig 6a) was employed to restore the correct transverse dimension of the maxilla and provide space for the maxillary permanent lateral incisors.

Activation of the device was accomplished with a single turn of the screw every day, each equivalent to 0.20 mm. Resolution of the left unilateral crossbite as well as that at the permanent right lateral incisor, was achieved after 38 turns (Fig 6b). The device was then left passively in situ for about 10 months to allow reorganization and bone restructuring of the median palatine suture and alveolar processes.

Correct transverse relationships at the permanent molars were obtained via expansion forces exerted on the primary teeth: The permanent molars followed the expansion obtained on their primary counterparts and were thus guided into occlusion without any appliances directly applied to them.
Expansion of the primary teeth permitted resolution of posterior crossbite on permanent first molar and provided space for the permanent maxillary lateral incisors. The lateral functional mandibular shift was corrected and dental midlines were coincident; metal casting separated the occlusion, and no occlusal grinding was necessary. The stability of the occlusion was maintained in the permanent dentition (Fig 7). The maxillary left first premolar rotation did not allow a correct occlusion of that tooth.
DISCUSSION

Correction of transversal discrepancies in the early mixed dentition can be effectively performed by means of a rapid palatal expander anchored onto the primary teeth,\textsuperscript{23} and relapse can be minimized if expansion is carried out prior to eruption of the permanent maxillary lateral incisors.\textsuperscript{13}

A previously described Haas-type RME appliance for primary anchorage was composed of two bands cemented onto the primary second molars, two anterior lingual wires bonded to the primary canines, and an acrylic resin palatal pad with a central screw.\textsuperscript{23}

The modified Haas-type RME appliance is made up of custom-made metal castings (one for each side) that cover the primary first and second molars and primary canines\textsuperscript{24,25}; hooks at the primary canines for elastic traction (Class II and asymmetrical elastics, Delaire mask\textsuperscript{26}) and buccal tubes at the primary second molars (for extraoral traction) and Class III elastics are incorporated into the structure.

This type of appliance offers clinical advantages of ease and speed of manufacture and fitting. While the bands in the original device had to be adapted to the poorly retentive coronal anatomy of the primary second molars, the process can now be accelerated by close collaboration with the dental technician, to whom it is sufficient to send an alginate impression. When the device comes back from the lab, it will already be perfectly adapted to the patient’s primary teeth, and the turbine-driven bur will not be required to create grooves for housing the anterior wires on the canines. The clinician need only bond the appliance to the teeth with composite material or glass-ionomer cement. This step is very rapid and simple, minimizing chair time and the request for compliance from the young patient.

The rigid metal-cast structure involving six primary teeth and using glass-ionomer cement has the advantage of greater stability and retention than traditional appliances (anchored to only two primary molars that have a less convex coronal structure and to a lingual wire bonded to primary canines with a greater risk of decementation).

The appliance may be fabricated with biocompatible materials (inert biomedical titanium, hypoallergenic resin, and laser welding), which allows for its use in allergic patients.\textsuperscript{24,25}

Studies demonstrate that the orthopedic forces exerted during expansion may damage the teeth used for anchorage\textsuperscript{21–27}; however, when using our device, this potential damage is limited to the primary teeth that will soon be replaced.

Mandibular shift is a frequently occurring phenomenon in cases of unilateral crossbite\textsuperscript{2,3}; however, in this case, the partial occlusal coverage provided by the rigid metallic structure has the advantage of separating the occlusion and giving the muscles the opportunity to abandon the habitual shift and the mandible to come back to centric relation during treatment; if some interferences remained, it will be easier to identify and eliminate them by occlusal adjustment after treatment.

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CONCLUSION

The case presented shows that Haas-type RME appliances anchored to the primary teeth are an effective procedure to resolve posterior crossbite and maxillary transverse deficiency and to provide space for maxillary permanent lateral incisors in the mixed dentition. The modified cast-Haas type RME appliance offers numerous advantages in terms of speed of application and patient compliance because a single impression is required for construction. Metal casting adapts perfectly to the anatomy of primary teeth, and this, in addition to the use of glass-ionomer cement, considerably increases stability and retention of the appliance. Partial occlusal coverage separates the occlusion in the presence of functional mandibular shift, postponing any occlusal adjustment. Fabrication with inert biocompatible materials extends its use to allergic patients.

REFERENCES


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