

## HYRAX versus HAAS EXPANSION APPLIANCES

**Garib, Daniela.** “Periodontal effects of rapid maxillary expansion with tooth-tissue-borne and tooth-borne expanders: a computed tomography evaluation.” In press, AJO-DO

### Abstract

The present study evaluated rapid maxillary expansion (RME) periodontal effects by means of computed tomography (CT), comparing the tooth-tissue-borne and the tooth-borne expanders. The sample comprised 8 girls aged between 11 to 14 years, presenting with Class I or II malocclusions with unilateral or bilateral posterior crossbite. The sample was randomly divided into two treatment groups (Haas-type and Hyrax expanders) paired according to the buccal bone plate thickness of the maxillary posterior teeth. All appliances were activated up to the full 7-mm capacity of the expansion screw. The patients were submitted to spiral CT scan before expansion and after the three-month retention period when the expander was removed. One-millimeter thick axial sections were performed parallel to the palatal plane, comprising the dentoalveolar area and the base of the maxilla up to the inferior third of the nasal cavity. Multiplanar reconstruction was used to measure buccal and lingual bone plate thickness and buccal alveolar bone crest level by means of the computerized method. Results showed that RME orthodontic effect reduced the buccal bone plate thickness of supporting teeth in 0.6 to 0.9mm, and increased the lingual bone plate thickness in 0.8 to 1.3mm. The tooth-tissue-borne expander caused less increase of lingual bone plate thickness of maxillary posterior teeth than the tooth-borne expander. RME induced bone dehiscences on the anchorage teeth buccal aspect (7.1+4.6mm at first premolars and 3.8+4.4mm at mesiobuccal area of first molars), especially in subjects with a thinner buccal bone plates. [The tooth-borne expander produced more reduction of first premolar buccal alveolar bone crest level than the tooth-tissue-borne expander.](#)

[Garib DG, Henriques JF, Janson G, Freitas MR, Coelho RA.](#)

**Rapid maxillary expansion--tooth tissue-borne versus tooth-borne expanders: a computed tomography evaluation of dentoskeletal effects.**

[Angle Orthod.](#) 2005 Jul;75(4):548-57.

This study evaluated rapid maxillary expansion (RME) dentoskeletal effects by means of computed tomography (CT), comparing tooth tissue-borne and tooth-borne expanders. The sample comprised eight girls aged 11 to 14 years presenting Class I or II malocclusions with posterior unilateral or bilateral crossbite that were randomly divided into two treatment groups, palatal acrylic (Haas-type) and hygienic (Hyrax) expanders. All appliances were activated up to the full seven mm capacity of the expansion screw. The patients were subjected to a spiral CT scan before expansion and after a three-month retention period when the expander was removed. One-millimeter-thick axial sections were scanned parallel to the palatal plane, comprising the dentoalveolar area and the base of the maxilla up to the inferior third of the nasal cavity. Multiplanar reconstruction was used to measure maxillary transverse dimensions and posterior teeth inclination by means of a computerized method. The results showed that RME produced a significant increase

in all measured transverse linear dimensions, decreasing in magnitude from dental arch to basal bone. The transverse increase at the level of the nasal floor corresponded to one-third of the amount of screw activation. Tooth-borne (Hyrax) and tooth tissue-borne (Haas-type) expanders tended to produce similar orthopedic effects. In both methods, RME led to buccal movement of the maxillary posterior teeth, by tipping and bodily translation. The second premolars displayed more buccal tipping than the appliance-supporting teeth. The tooth tissue-borne expander produced a greater change in the axial inclination of appliance-supporting teeth, especially first premolars, compared with the tooth-borne expander.

**Oliveira NL, Da Silveira AC, Kusnoto B, Viana G. Three-dimensional assessment of morphologic changes of the maxilla: a comparison of 2 kinds of palatal expanders. [Am J Orthod Dentofacial Orthop.](#) 2004 Sep;126(3):354-62.**

Previous studies of the morphologic changes of the maxilla after palatal expansion have used 2-dimensional methodologies. In the present study, we used a 3-dimensional surface laser scanning technique and computerized cast analysis, in addition to analysis of anteroposterior cephalograms, to assess the morphologic changes of the palate by 2 kinds of expanders: tissue borne (Haas; n = 9) and tooth borne (Hyrax; n = 10). Cast analysis demonstrated that, although all patients started treatment with similar malocclusion, treatment outcomes were different depending on the appliance used. Both appliances generated maxillary expansion (ie, improved mean surface area, mean intermolar linear distance, and mean perimeter) ( $P < .05$ ). However, the appliances performed differently to achieve the final expansion. Haas appliances demonstrated a greater orthopedic movement (ie, improvement of the mean interpalatal distance) ( $P < .05$ ), and Hyrax appliances demonstrated dentoalveolar expansion by increasing the mean palatal angulation of the alveolus ( $P < .05$ ). Anteroposterior cephalometric analysis showed that both appliances increased mean maxillary width and mean intermolar distance significantly ( $P < .05$ ). On the other hand, differences in nasal cavity width and upper incisal apex distance were not statistically significant ( $P > .05$ ). This new 3-dimensional methodology proved useful for comparing treatment outcomes by evaluating the morphologic changes induced by palatal expansion and generated a better visualization of these outcomes.

**Master's Thesis, U. Mich, 1998 Ralph, S.W., "A comparison of two rapid maxillary expansion appliances using three-dimensional finite element analysis,"**

- 1) The average tipping effect was 2.5-3 times greater with Hyrax than with Haas
- 2) The Haas displaces teeth 26% more than the Hyrax in the transverse dimension
- 3) Larger sutural displacement occurred with the Haas appliance.

- 4) The Hyrax deformed more than the Haas, resulting in less energy affecting the sutures.

**Halazonetis DJ, Katsavrias E, Spyropoulos MN. Changes in cheek pressure following rapid maxillary expansion. Eur J Orthod. 1994 Aug;16(4):295-300.**

The purpose of the present investigation was to study the effects of rapid maxillary expansion on the pressures exerted by the cheeks on the maxillary arch. The sample consisted of 15 patients (five males, ten females) who received either a Hyrax or Haas type expansion appliance for treatment of a bilateral maxillary constriction of more than 5 mm. The median age of the sample was 12 years. Buccal pressures were measured at the upper first molar on the left and right side, before and after active expansion, and also after an average of 3-4 months of retention with the appliance in place. Buccal pressures on the maxillary first molar averaged approximately 3 g/cm<sup>2</sup> before expansion and increased significantly to a value of approximately 9 g/cm<sup>2</sup> after expansion. Pressure change was approximately 0.6 g/cm<sup>2</sup> for each millimetre of expansion. During the 3-4-month period of stabilization of the appliance, the pressures remained at the post-expansion levels and no adaptation of the soft tissues was observed. These results lead to the conclusion that cheek pressures on the maxillary arch may be implicated in the relapse occurring after rapid expansion, even after the usual 3-month period of stabilization.

**Erverdi N, Sabri A, Kucukkeles N. Cephalometric evaluation of Haas and Hyrax rapid maxillary appliances in the treatment of the skeletal maxillary transverse deficiency. J Marmara Univ Dent Fac. 1993 Sep;1(4):361-6**

Two different rapid palatal expansion appliances were compared, using lateral cephalograms, antero-posterior cephalograms and diagnostic models. The Haas appliance was used on ten patients and the Hyrax appliance on another ten. **A difference in the effect of the two appliances was found only for the increase in intermolar distance.** This difference could be the result of the different appliance design.

**Chaconas SJ, Caputo AA. Observation of orthopedic force distribution produced by maxillary orthodontic appliances. Am J Orthod. 1982 Dec;82(6):492-501.**

A three-dimensional anatomic model was duplicated from a human skull, using different birefringent materials to simulate the various craniofacial structures. Individual bones of the midface were fabricated separately and then articulated in their correct sutural relation. One removable and four fixed maxillary appliances were used. The fixed appliances included the Haas, Minne-expander, Hyrax, and quad helix devices. The

removable appliance incorporated an expansion screw in a full acrylic palate with appropriate retentive clasps. After the insertion of each appliance, intraoral forces were produced by incremental activation. The model was examined and photographed in the field of a transmission polariscope. Each appliance used produced a different range of load-activation characteristics. This was reflected by the differences in the stresses transmitted through the bones of the craniofacial complex and the effect on the various sutures. Stresses produced by the fixed appliances were concentrated in the anterior region of the palate, progressing posteriorly toward the palatine bone. The Haas, Minne-expander, and Hyrax appliances produced stresses that radiated superiorly along the perpendicular plates of the palatine bone to deeper anatomic structures, such as the lacrimal, nasal, and malar bones, as well as the pterygoid plates of the sphenoid. Similar stress characteristics were seen with the removable appliance. However, increased activation decreased retention of the appliance, thereby lessening the stress. The quad helix appliance proved to be the least effective orthopedic device. Although the effects of palate separation were seen with increased activation, this appliance primarily affected the posterior teeth.