

Original Article

Finite element analysis of the transpalatal arch force systems activated in the Burstone geometries with different materials

Abstract:

AIM OF THE STUDY: This research paper was intended to quantify the stresses and the displacement distribution pattern released by Omega-loop transpalatal arch (TPA) activated in the Burstone geometries (II, III, and V) within two different materials.

MATERIALS AND METHODS: Three-dimensional solid models of the maxilla and maxillary teeth were created using CBCT data for a 20-year-old man. A molar band and Omega-loop TPA were constructed. Force application was pretended virtually to geometry II, III, and V within stainless-steel and Armco β -titanium (TMA) (titanium–molybdenum–aluminum) material.

RESULTS: The schemes for stresses and the displacements were alike for both stainless-steel and TMA alloy Omega-loop TPAs. The stresses and displacements for the stainless-steel Omega-loop TPAs were higher than those for the TMA. Mesial tipping was seen in the unit with a large moment, distally in the opposite side. The highest displacement values were seen around the x-axis, which represent the tipping molar movement.

CONCLUSIONS: This study results have shown that Omega-loop TPA can effectively derotate upper first molars. Anchorage reinforcement for the opposite molar should be kept in the orthodontist mind to avoid the unwanted movement as a result of the reactive forces for the active unit, especially when it is decided to use a high force to correct unilateral molar rotation.