

Comparison of two asymmetric headgear force systems: A finite element analysis

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Objective: The aim of this study was to evaluate the effect of displacement patterns of the molar teeth in response to different asymmetric headgear loading using 3D finite element method.

Methods: A series of twenty-five facebow with different left *vs.* right outer bow length and different expansion of left *vs.* right were designed. The non-favored side (right side) was shortened at intervals of 10 mm, and favored side (left side) was expanded 10 degree greater than right side and 5 degree expansion were successively added. At the first phase, each side received 200-g load, implying the neck strap to displace toward shorter arm. At the second phase, a total of 400-g load was applied to the ends of the outer bow. Because of the neck strap displacement, the shorter arm received greater load than the left side, the magnitude of the applied force to each side depended on difference of left *vs.* right outer bow length and expansion.

Results: All systems were effective in promoting asymmetric distal movement of the molars. However, the asymmetrical facebow with the 40 mm shortening and 25 degree expansion outer bow when unequal force applied could be used in asymmetric mechanics. Medial and occlusal displacing forces were observed in all systems.

Conclusions: Both equal and unequal force application is effective for molar distalization. Expansion of the outer bow in the affected side and shortening of the outer bow in the normal side were effective to produced differential distal molar movement.

Keywords: Asymmetric. Extraoral traction appliances. Finite element analysis.

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