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Moments and forces delivered by transpalatal arches for symmetrical first molar rotation

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ABSTRACT

The moments and forces delivered by round transpalatal arches of steel and of beta-titanium (TMA) for symmetrical derotation of molars were studied in laboratory experiments. Three sizes of arches were tested in two series. In the first series, the degree of activation was checked for symmetry in a computer-based strain-gauge measuring system. In the second series, the activation was carried out in a way simulating clinical use. The mesio-distal and transverse forces and the derotating moments at full activation and during derotation in steps of 5 degrees were measured. At full activation, the steel arches delivered relatively large moments which, however, decreased rapidly during deactivation. The TMA arches had a larger working range. It was not possible to achieve full symmetry of the moments at the two ends of the arch. The difference of the two moments resulted in forces acting on the two anchorage teeth in a mesio-distal direction. The derotation resulted in a contractive force of up to 2.7 N which has to be compensated for by expansion. The mode of activation simulating clinical use resulted in reasonably constant forces and moments. The use of a vice to hold the arch during activation was found to be of great help and is recommended in the clinical setting. Because of the larger working range, TMA arches are recommended if substantial derotation is needed.

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