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Long-term orthodontic tooth movement response to short-term force in the rat

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ABSTRACT

Both the amount of force applied and the duration of the application affect tooth movement. To study the effect of duration, adult male Sprague-Dawley rats were fitted with orthodontic appliances delivering a 40-gm initial mesial tipping force to the maxillary molars. The animals were divided into two longitudinal groups (I: 1 hour and II: 24 hours; N=15). Sham-treated control (III) and 14 day (IV) continuous cross-sectional force tooth movement data were also included for comparison (72 rats per group). Extraoral cephalometric radiographs were obtained at appliance placement and at 1, 3, 5, 7, 10, &14 days. Tooth movement was determined with respect to palatal implants. ANOVA indicated significant differences existed over time in each group (p=0.0001). Continuous force applied for 14 days generated a classic three-part tooth movement curve. Short-term forces were characterized by initial mesial movement, a distal relapse period (d3–d5), and a late mesial movement period (d7–d14). The results suggest short-term forces of 1 and 24 hours initiate remodeling events, which result in tooth movement 7 to 14 days later and that the minimum effective duration of a 40-gm activation is less than 1 hour in this animal model.

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