Osteoprotegerin and zoledronate bone effects during orthodontic tooth movement

Fernández-González F.J.
López-Caballo J.L.
Cañigral A.
Menéndez-Díaz I.
Brizuela A.
de Cos F.J.
Cobo T.
Vega J.A.

Objectives: To assess the effects of local delivery of recombinant fusion protein osteoprotegerin (OPG-Fc) and bisphosphonate zoledronate on bone and periodontal ligament in a rat tooth movement model. Materials and methods: Maxillary first molars of 36 male Sprague-Dawley rats were displaced mesially using a calibrated spring connected to an anterior mini-screw. Two different drugs were used: a single dose of Zoledronate (16 ?g) and a twice-weekly dose of OPG-Fc (5.0 mg/kg) were injected. Tooth movement was measured on scanned plaster casts. Structural and immunohistochemical analysis of the orthodontic-induced changes in bone included receptor activator of nuclear factor K (RANK), Runx, type 1 collagen, matrix metalloproteinases (MMPs) 2 and 9, tissue inhibitors of metalloproteinases (TIMPs) 1 and 2, and vimentin. Results: Both groups showed a reduction in mesial molar displacement. Animals receiving OPG-Fc demonstrated only 52%, 31%, and 21% of the total mesial molar displacement compared to control rats at 7, 14, and 21 days, respectively (*p < 0.001). For rats receiving zoledronate tooth displacement decreased significantly with 52%, 46% and 30%, respectively (*p < 0.001). At 14 and 21 days, OPG-Fc group showed significantly less molar displacement than the zoledronate group (*p < 0.001). RANK, Runx, vimentin, MMP-9 and tissues-inhibitor metalloproteinase 1 immunoreactivity were reduced in zoledronate treated animals and even more in OPG treated animals. Conclusion: Local delivery of
OPG-Fc or zoledronate inhibits bone resorption and therefore tooth movement. OPG-Fc was more effective than zoledronate in blocking the action of osteoclasts. © 2016 John Wiley & Sons A/S.