

Osteoprotegerin and zoledronate bone effects during orthodontic tooth movement

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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 µg) 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 tissue-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.

Bisphosphonate

Orthodontic anchorage

Osteoclasts

Osteoprotegerin

Periodontal ligament

Tooth movement

osteoprotegerin

animal

drug therapy

male

orthodontic tooth movement

osteoclast

osteolysis

rat

Sprague Dawley rat

Animals

Bone Resorption

Male

Osteoclasts

Osteoprotegerin

Rats

Rats, Sprague-Dawley

Tooth Movement Techniques