Local application of zoledronate for maximum anchorage during space closure

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Abstract

Introduction
Orthodontists have used various compliance-dependent physical means such as headgears and intraoral appliances to prevent anchorage loss. The aim of this study was to determine whether a local application of the bisphosphonate zoledronate could be used to prevent anchorage loss during extraction space closure in rats.

Methods
Thirty rats had their maxillary left first molars extracted and their maxillary left second molars protracted into the extraction space with a 10-g nickel-titanium closing coil for 21 days. Fifteen control rats received a local injection of phosphate-buffered saline solution, and 15 experimental rats received 16 µg of the bisphosphonate zoledronate. Bisphosphonate was also delivered directly into the extraction site and left undisturbed for 5 minutes. Cephalograms and incremental thickness gauges were used to measure tooth movements. Tissues were analyzed by microcomputed tomography and histology.

Results
The central group demonstrated significant (P<0.05) tooth movements throughout the 21-day period. They showed significantly greater tooth movements than the experimental group beginning in the second week. The experimental group showed no significant tooth movement after the first week. The microcomputed tomography and histologic observations showed significant bone loss in the extraction sites and around the second molars of the controls. In contrast, the experimental group had bone preservation and bone fill. There was no evidence of bisphosphonate-associated osteonecrosis in any sample.

Conclusions
A single small, locally applied dose of zoledronate provided maximum anchorage and prevented significant bone loss.