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The hyaline zone and associated root surface changes in experimental orthodontics in rats: a light and scanning electron microscope study

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ABSTRACT

Light and scanning electron microscopic (SEM) examinations were used to study the hyaline zone and associated root resorption after orthodontic treatment of the upper first molars of rats. The orthodontic treatment consisted of a fixed buccal expansion appliance with an initial force of 250 mN. The animals were divided into nine experimental groups with orthodontic treatment and one control group without orthodontic treatment. Three groups were sacrificed immediately after 1, 3, and 7 days of treatment, and six groups after 7 days of treatment followed by 1, 2, 3, 4, 5, and 6 weeks without treatment. A hyaline zone on the pressure side of the mesial root was identified at the light microscopic level of examination as well as the SEM examination as early as 1 day after the initiation of treatment. In the SEM it was found that on the roots of teeth studied in the first few days after initiation of treatment the hyaline tissue was so firmly attached to the root that it remained in place during the extraction and preparation procedures. After longer treatment periods these hyaline zones were lost at extraction or during the preparation for the SEM examination. The cementum surface under the hyaline zone had a smooth appearance suggesting that the surface had been modified by substances released from the hyaline zone. After 1 week of treatment, resorption in the cementum could be noticed. The resorption extended to the dentine as uncovered dentinal tubuli were found. Formation of reparative cementum started two weeks after treatment. Changes in the cementum surface as well as root resorption cavities could be seen for as long as 6 weeks after the cessation of orthodontic treatment.

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