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Stimulation of bone formation in the expanding midpalatal suture by transforming growth factor-[beta]1 in the rat

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ABSTRACT

The most intense endogenous transforming growth factor (TGF)-[beta] 1 expression was detected on osteoblasts and fibroblasts in the mid-palatal suture 24 hours after the start of palatal expansion with an immunohistochemical technique. Based on these data, local effects of transforming growth factor-[beta] 1 (TGF-[beta] 1) in the expanding mid-palatal suture of the rat were examined. Single doses of human recombinant (rhu) TGF-[beta] 1 (40 and 200 ng, and 1 [mu]g) were injected into the expanding mid-palatal suture 24 hours after expansion started. Calcein was also injected immediately, and 6 and 12 days after expansion. The width of each calcein label was measured to evaluate bone formation along the suture with bone histomorphometry. In the experimental groups, bone formation during the 12-day expansion period was stimulated significantly ($P < 0.05$), in a dose-dependent manner, compared with that in the control group. Furthermore, bone formation during the later stage (6-12 days) of the 12-day expansion period, was still significantly higher than that in the control group. In addition, the amount of bone formation in response to a course of 3 injections of 200 ng TGF [beta]1 on days 3, 6, and 9 was almost equal to that induced by a single injection of 200 ng rhu TGF-[beta] 1 on day 1. These results suggest that TGF-[beta] 1 may play an important role in bone formation at the active site of the suture in response to rapid palatal expansion and application of TGF-[beta] 1 during the early stages may induce rapid bone formation.

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