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Effect of nicotine on mandibular distraction osteogenesis: a radiological and immunohistochemical study

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Background: Cigarette smoking is a social problem. It is a clinical challenge to treat heavy smokers receiving reconstructive surgery due to their compromised tissue healing ability. Nicotine has been implicated as the primary ingredient in cigarette smoke responsible for tobacco's physiologic effects. Although the influence of nicotine on bone is still controversial, our pilot study has demonstrated a dosage dependent response of nicotine on inhibiting bone healing on a rabbit model of mandibular distraction osteogenesis.
Objective: To evaluate the effect of nicotine on bone healing process, and on the expression pattern of bone growth factors during mandibular distraction osteogenesis.
Methods: Twenty New Zealand white rabbits were averagely assigned to the nicotine treatment group and control group. 1.5g 60-day time release nicotine pellets or placebos were embedded subcutaneously one week before osteotomy. After three days latency period, active distraction was performed at 0.9mm/day for eleven days. Five rabbits in each group were sacrificed after two and four weeks of consolidation respectively, the mandibular samples were subjected to plain x-ray, micro-CT, histological and immunohistochemical study.
Results: The bone healing process was significantly compromised in the nicotine treatment group. The presence of nicotine affected the growth factors expression associated with bone healing.
Conclusion: nicotine exposure had a significant impact on bone healing in a rabbit model of mandibular distraction osteogenesis.