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Structural and ultrastructural analyses of bone regeneration in rabbit cranial osteotomy: Piezosurgery versus traditional osteotomes.

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Abstract

Clinical advantages of piezosurgery have been already proved. However, few investigations have focused on the dynamics of bone healing. The aim of this study was to evaluate, in adult rabbits, bone regeneration after cranial linear osteotomies with two piezoelectrical devices (Piezosurgery[®] Medical - PM and Piezosurgery[®] Plus - PP), comparing them with conventional rotary osteotomes (RO). PP was characterized by an output power three times higher than PM. Fifteen days after surgery, histomorphometric analyses showed that the osteotomy gap produced with PM and PP was about half the size of that produced by RO, and in a more advanced stage of recovery. Values of regenerated bone area with respect to the total osteotomy area were about double in PM and PP samples compared with RO ones, while the number of TRAP-positive (tartrate-resistant acid phosphatase positive) osteoclasts per linear surface showed a significant increase, suggesting greater bone remodelling. Under scanning electron microscopy, regenerated bone displayed higher cell density and less mineralized matrix compared with pre-existent bone for all devices used. Nanoindentation tests showed no changes in elastic modulus. In conclusion, PM/PP osteotomies can be considered equivalent to each other, and result in more rapid healing compared with those using RO.

KEYWORDS: Bone regeneration; Cranial osteotomy; Elastic modulus; Nanoindentation; Piezosurgery

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