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Bone response to immediate loading through titanium impalants with different surface roughness in rats

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Abstrak

Because of its high predictability of success, implant therapy is a reliable treatment for replacement of missing teeth. The concept of immediate implant loading has been widely accepted in terms of early esthetic and functional recovery. However, there is little biological evidence to support this concept. The objective of this study was to examine the interactive effects of mechanical loading and surface roughness of immediately loaded titanium implants on bone formation in rats. Screw-shaped anodized titanium implants were either untreated (smooth) or acid-etched. Two implants were inserted parallel to each other in the tibiae of rats, and a closed coil spring (2.0 N) was immediately applied. Trabecular and cortical bone around both implants was analyzed using microtomographic images, and a removal torque test was performed at weeks 1, 2, and 4. Immediate loading of acid-etched implants resulted in significant decreases in bone mineral density, contact surface area, and cortical bone thickness. These effects were not observed after immediate loading of smooth implants. Conversely, loading did not influence acid-etched implant fixation; however, smooth implant fixation at week 1 was significantly reduced. These results imply that surface roughness regulates bone response to mechanical stress and that immediate loading might not inhibit osseointegration for smooth and rough implants in the late healing stages.