

## ABSTRACT OF DISSERTATION

Title	Low-intensity pulsed ultrasound enhances bone formation around miniscrew implants LIPUS はミニスクリューインプラント周囲の骨形成を促進する
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<p><b>ABSTRACT</b></p> <p>Miniscrew implants (MSIs) are currently used to provide absolute anchorage in orthodontics; however, their initial stability is an issue of concern. Low-intensity pulsed ultrasound (LIPUS) is a form of physical energy that can be delivered to living tissue as acoustic waves. Used extensively as a therapeutic, operative, and diagnostic tool in medicine, LIPUS does not have any known deleterious, carcinogenic, or thermal effects on living tissues. LIPUS is well accepted as a noninvasive and safe tool for the treatment of bone fractures. Therefore, LIPUS application may stimulate bone formation around MSIs and enhance their initial stability. In this study, we investigate the effect of LIPUS exposure on bone formation after implantation of titanium (Ti) and stainless steel (SS) MSIs. MSIs made of Ti-6Al-4V and 316L SS were placed on rat tibiae and treated with LIPUS. The bone morphology around MSIs was evaluated by scanning electron microscopy and three-dimensional micro-computed tomography. MC3T3-E1 cells cultured on Ti and SS discs were treated with LIPUS, and the temporary expression of alkaline phosphatase (ALP) was examined. Bone-implant contact increased gradually from day 3 to day 14 after MSI insertion. LIPUS application increased the cortical bone density, cortical bone thickness, and cortical bone rate after implantation of Ti and SS MSIs (<math>P &lt; 0.05</math>). LIPUS exposure induced ALP upregulation in MC3T3-E1 cells at day 3 (<math>P &lt; 0.05</math>). These results indicate that LIPUS enhanced bone formation around Ti and SS MSIs, enhancing the initial stability of MSIs.</p>	