Titania Nanotubes for Orchestrating Osteogenesis at the Bone–Implant Interface

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Abstract:

Titanium implants can fail due to inappropriate biomechanics at the bone–implant interface that leads to suboptimal osseointegration. Titania nanotubes (TNTs) fabricated on Ti implants by the electrochemical process have emerged as a promising modification strategy to facilitate osseointegration. TNTs enable augmentation of bone cell functions at the bone–implant interface and can be tailored to incorporate multiple functionalities including the loading of active biomolecules into the nanotubes to target anabolic processes in bone conditions such as osteoporotic fractures. Advanced functions can be introduced, including biopolymers, nanoparticles and electrical stimulation to release growth factors in a desired manner. This review describes the application of TNTs for enhancing osteogenesis at the bone–implant interface, as an alternative approach to systemic delivery of therapeutic agents.

Keywords:

Bone implants, bone therapy, local drug delivery, osseointegration, titania nanotubes, titanium

Published In:

Nanomedicine, Vol. 11, No. 14, pp. 1847-1864