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## Research paper

# Bioactive glass microspheres as osteopromotive inlays in macrot textured surfaces of Ti and CoCr alloy bone implants: Trapezoidal surface grooves without inlay most efficient in resisting torsional forces

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## ABSTRACT

We have tested the efficacy of porous bioactive glass (BG) inlays in enhancement of implant osseointegration. A total of 24 sheep underwent bilateral surgical implantation of three parallel implants on the anteromedial cortical surface of each tibia. The disc-shaped implants made of Ti6Al4V or cobalt chromium (CoCr) alloys had two parallel surface grooves (trapezoidal space with bottom widening) filled with sintered 100% bioactive glass microspheres or a selected mixture of bioactive and biocompatible glass microspheres. The surface of uncoated control implants was smooth, grit-blasted or had unfilled grooves. A subgroup of control smooth CoCr implants was coated with two or three BG layers. Implant incorporation with bone was evaluated using torque testing to failure, scanning electron microscopy and morphometry at 12 and 25 weeks. A total of 144 *in vivo* implants and 16 *ex vivo* cemented control implants were analyzed. Control Ti6Al4V implants with unfilled trapezoidal grooves showed highest torsional failure loads with excellent ingrowth of new bone and remodeling of ingrown bone into lamellar bone. Implants with BG inlays and microroughened control Ti6Al4V implants showed significantly lower torsional failure loads than control Ti6Al4V implants with unfilled grooves. In conclusion, BG inlays failed to enhance biological implant fixation. Macrot textured surface was more effective than grit-blasting in promotion of mechanical incorporation.

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