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Research paper

The effect of different implant macrogeometries and surface treatment in early biomechanical fixation: An experimental study in dogs

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ABSTRACT

Implant surface characterization and biomechanical testing were made to evaluate the effect of different surface treatments along with different implant bulk configurations expressed as biomechanical fixation at early implantation times. Three implant surfaces, namely bioactive ceramic electrodeposition (ED), alumina-blasted/acid etched (AB/AE), and resorbable blasting media (RBM) were fabricated in three implant macrogeometries (cylindrical, small chamber, and large chamber). All combinations between surface and bulk configurations were placed in the radii of beagle dogs ($n = 18$), which were euthanized 14 and 40 days after surgery ($n = 9$ animals per time in vivo). The implants were subjected to torque to interface fracture. Effects of time, surface, and macrogeometry on torque to interface fracture were evaluated by a GLM at 95% level of significance. The results showed a significant increase in torque as time elapsed in vivo ($p < 0.001$), and that the ED surface presented significantly higher values compared to AB/AE and RBM ($p < 0.001$) at both times. The small chamber only presented a significantly higher biomechanical fixation compared to other geometries at 40 days in vivo ($p = 0.02$). Biomechanical fixation at 14 and 40 days was affected by implant surface treatment, whereas implant design only affected results at 40 days in vivo.

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