

In Vitro Comparison of Bioresorbable and Titanium Anterior Cervical Plates in the Immediate Postoperative Condition

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Abstract

Bioresorbable plates have recently been used with anterior cervical discectomy and fusion (ACDF). Compared with metallic plates, bioresorbable plates provide segmental stabilization with minimal imaging artifact, eventual resorption, and increased load sharing. The objectives of the present study were to determine whether a bioresorbable plate can withstand simulated physiologic static and cyclic loading, to compare the reduction in flexibility provided by bioresorbable and titanium plates, and to quantify load sharing between the plate and spine with graft. Sixteen human cervical motion segments were tested to +/-2.5 Nm in flexion-extension, lateral bending, and axial rotation. Range of motion (ROM) was measured (1) in the intact state, (2) with ACDF without plating, (3) after addition of either a bioresorbable or titanium plate, and (4) after 500 cycles of combined flexion-extension and axial torsion. Load sharing was evaluated by applying the same fixed rotation both without and with the plate, and was calculated as the moment resisted by the uninstrumented ACDF expressed as a percentage of the plated ACDF state. No plate failures or graft migration occurred during testing. Compared with the uninstrumented ACDF, bioresorbable plates reduced mean ROM by 49% in flexion-extension and 25% in lateral bending, with very little change in torsion. Titanium plates reduced uninstrumented ACDF ROM by 69% in flexion-extension, 45% in lateral bending, and 27% in torsion. Differences between bioresorbable and titanium plates were significant in flexion-extension and lateral bending. Cyclic loading did not significantly change ROM for either plate. More moment was shared in lateral bending by the spine/graft with bioresorbable plates (78%) compared with titanium plating (63%). Bioresorbable plates contained an intervertebral graft, provided some stabilization, remained intact throughout the simulated immediate postoperative loading, and shared more load with the graft and osteoligamentous spine than titanium plates.