

Title

Impact of bone-implant gap size on the interfacial osseointegration: an in vivo study

Objective

To evaluate the impact of bone-implant gap size on the interfacial osseointegration of cervical disc arthroplasty (CDA) in a rabbit animal model.

Methods

A cylindrical (8 mm in diameter with different depth) calvarial bone-implant gap model was established to assess the impact of bone-implant gap size on interfacial osseointegration. A series of round-plate implants with different teeth depth (0.5 mm, 1.0 mm, 1.5 mm and 2.0 mm) was specifically designed. A total of 48 New Zealand white rabbits were randomly categorized into four groups by the implants they received (0.5 mm: group A, 1.0 mm: group B, 1.5 mm: group C, 2.0 mm: group D). At 4th and 12th week after surgery, animals were sacrificed. Micro-CT, acid fuchsin and methylene blue staining and hematoxylin and eosin (HE) staining were conducted.

Results

At 4th week and 12th week after surgery, both micro-CT and HE staining showed more new bone formation and larger bone coverage in group A and group B than that in group C and group D. At 12th week, the bone biometric parameters were significantly superior in group C when compared with group D ($p<0.05$). At 12th week, hard tissue slicing demonstrated larger portion of direct contact of new bone to the HA coating in group A and group B.

Conclusions

Bone-implant gap size larger than 1.0 mm negatively affected bone-implant osseointegration between compact bone and HA coated implant surface.