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USE OF COMPUTER TOMOGRAPHY IMAGING TO OBSERVE INCREASED DISTAL-END CORTICAL BONE AROUND A PERCUTANEOUS OSSEOINTEGRATED IMPLANT

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ABSTRACT ONLY:

Osseointegration (OI) is being used for the direct skeletal attachment of prosthetic limbs using an intramedullary stem that extends percutaneously from the subject's residual limb. For this technology to be successful, bone ingrowth and remodeling around the implant must occur. Physicians need an effective way to assess bone remodeling to make informed treatment and rehabilitation decisions. Previous studies utilizing two-dimensional imaging x-ray as a tool to monitor bone-remodeling around OI devices have limitations. This work describes methodology that was developed utilizing computed tomography (CT) imaging as a tool for analyzing bone remodeling around a percutaneous OI implant. Six transfemoral amputees implanted with a Percutaneous Osseointegrated Prosthesis (POP) had CT scans taken of their residual femur at 6 and 52-weeks post-operatively. Three-dimensional femoral models were processed using custom MATLAB script to collect cortical and medullary morphology measurements. Morphology data from 6 and 52-week scans were compared to quantify bone remodeling around the POP implant. 52-weeks after implantation of the POP device, increases in cortical bone area and thickness were observed around the porous coated stem. Minimal changes were observed in the medullary canal parameters within the periprosthetic regions. This study successfully utilized CT imaging and 3D modeling techniques to analyze longitudinal data of bone remodeling around a transfemoral percutaneous implant. These methods have the potential to be used as a clinical tool for evaluating orthopedic implants *in vivo*. Data collected suggests that the POP device achieved the desired bone remodeling around the porous coated region of the implanted stem.