PROTOTYPE DEVELOPMENT PROSTHESIS SURFACE CUSTOMIZED WITH MEDICAL IMAGING FOR HIP JOINTS

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The hip joint may undergo degenerative changes due to the natural aging of bone, tumors, trauma from accidents and genetic defects. In some of these cases depending on the magnitude of damage, the patient could not require the complete removal of the femoral head or part of the femoral bone in order to replace with a partial or total hip prosthesis. This research seeks to solve this problem by designing prosthesis customized for each patient. The main idea pretend to develop a manufacture method for a prosthesis which replaces specifically the bone affected area, and ensure adequate anatomical symbiosis implant-bone offering lower bone destruction, better performance and functionality. For this purpose, this developed methodology uses medical imaging by computed tomography as a initial pattern of a damaged bone. After the images are processed and 3D solid is obtained, next particular design of the prosthetic customized surface is parameterised and manufactured. During the process this design is optimized through simulations combining theories of bone remodeling with finite element method analysis. In addition in this work is proposed the method of manufacturing and inspection quality, integrating rapid prototyping techniques (ABS), casting precision using techniques biocompatible alloy CoCr ASTM F75, and finally finishing processes and metallurgical characterization. To validate this technique implant performance tests were carried out in vitro conditions.

Keywords: Prosthetic surfaces custom, finite element method analysis, rapid prototyping techniques

References:


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