Document details

International Journal of Recent Technology and Engineering Open Access
Volume 8, Issue 4, November 2019, Pages 4544-4547

Fabrication of low-cost hip implant using direct metal laser sintering technique (Article) (Open Access)

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Abstract

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Total hip replacement (THR) is the most popular surgery been performed in orthopedic surgery due to the inclination of musculoskeletal disorder and the aging population worldwide. However, the implant's cost-burdened the patient, especially in the ASEAN region. The main objective of this study was to fabricate the low-cost hip implant using direct laser metal sintering (DMLS). The framework starts with the three dimensional of hip anthropometric datasets from computed tomography scanner, followed with the design of hip implant, computational analysis using finite element, and finally fabrication using DMLS technique. The morphological results demonstrated the value of neck-shaft angle was 130.46°, and the femoral head offset of 30.35 mm. The finite element analysis showed strain distribution was 65 MPa for the implant in metaphyseal region and 110 MPa for intact femur under staircase physiological loading which indicated inhibition of stress shielding at medical calcar region, and micromotion was 4.8 μm which prevent the formation of fibrous tissue and promoting osseointegration between implant-bone interfaces. This study proposed the fabrication using the DMLS technique, which produced accurate implant with low-cost, which suits the ASEAN hip morphology that prolongs implant lifetime. © BEIESP.

SciVal Topic Prominence

Topic: Hip | Arthroplasty | Developmental dysplasia

Prominence percentile: 90.139

Author keywords

Direct metal laser sintering | Finite element analysis | Hip implant | Morphology

Funding details

Funding sponsor	Funding number	Acronym
Universiti Pendidikan Sultan Idris	2017-0119-105-01	

Funding text

This study funded by the Research Management Innovation Center, Universiti Pendidikan Sultan Idris, with research grants numbered 2017-0119-105-01.

ISSN: 22773878
DOI: 10.35940/ijrte.D8472.118419
Source Type: Journal
Document Type: Article
Original language: English
Publisher: Blue Eyes Intelligence Engineering and Sciences Publication

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