Reviewer's report

Title: Design process of cementless femoral stem using a nonlinear three dimensional finite element analysis

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Reviewer: Daniel Espino

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OVERVIEW
Overall this is a useful study that extends the idea of subject specific modelling to nationality specific modelling. A finite element analysis study has been devised and used to aid the design process of a cementless femoral stem custom-designed for the Malay population. The need for the study is well presented, with evidence of poor results when using western-based designs. However, before recommending this paper for publication further clarification on the study aim, its conclusions and the modelling performed is necessary.

MAJOR COMPULSORY REVISIONS
1. Background
Reference is made to the fundamental principles of the finite element method, which is not necessary given its extensive use for implant design. However, reference to existing use of finite element analysis in implant design is currently limited.

2. Aims & Conclusions
Could the authors clarify whether the aim of this study was the design of a Malay-specific implant or to demonstrate the process of implant development? The key conclusion appears to vary between these two concepts in the abstract and main text.

3. Methods
a. In the Philosophy behind stem design section could the authors clarify the modifications made to the implant, how they were made and include which implant was used (i.e. manufacturer).

b. The authors state, in the Nonlinear 3D finite element analysis section, the optimal number of mesh elements and the importance of mesh convergence analysis. Were the results obtained mesh independent? What mesh sizes were assessed?

c. Could the authors clarify the non-linearity used in the model. Was equation 1 the only non-linear method used for the model? Was equation 1 used to assign properties to each whole-bone segment individually or to include micro-structural variations in E throughout the model? If it was the former, are any limitations expected from model predictions? If it was the latter, why is the femoral model
described as isotropic?

4. Discussion
How were model predictions validated for reliability?

MINOR ESSENTIAL REVISIONS
Should “femoral” read “femur” half-way through the first methods paragraph?

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interests