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LETTER TO THE EDITOR

THE 'STANDARDIZED FEMUR PROGRAM' PROPOSAL FOR A REFERENCE GEOMETRY TO BE USED FOR THE CREATION OF FINITE ELEMENT MODELS OF THE FEMUR

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INTRODUCTION

In an earlier issue of *Journal of Biomechanics* have been presented the results of an extensive validation study on a commercially available femoral bone analogue [Cristofolini *et al.*, 1996]. This bone analogue, hereinafter referred as 'composite femur', is made of glass fibre reinforced epoxy and of polyurethane foam. Differently from many similar products for surgical simulation, this analogue was designed to mimic as closely as possible the mechanical behavior of a human femoral bone. The advantages of using a standardized artificial analogue for in vitro studies are obvious; in fact an increasing number of experimental work are using the composite femur in place of cadaver bones [Harman *et al.*, 1994; McKellop *et al.*, 1991; Otani *et al.*, 1993].

At the Laboratory for Biomaterials Technology we develop three dimensional finite element (FE) models of the proximal femur to investigate various aspects of total hip replacement [McNamara *et al.*, 1995]. The geometrical reference for these models was the composite femur. Thus, *in vitro* strain gauge testing of the composite model was used to validate the finite element models. This process is somehow cumulative; all the experimental data obtained with the composite femur, in different studies and with different purposes could be used to calibrate or validate FE models as far as the same reference geometry is used. This approach was found extremely useful in our laboratory and we believe it would be even more effective on a multi-laboratory scale.

A 'STANDARDIZED FEMUR'

We propose to use the three dimensional geometry of the composite femur as a standardized reference for FE models of the human femur. This would allow every researcher to use all the published experimental measurements made on the composite femur as calibration data. Furthermore, a common reference geometry would allow the inter-laboratories replication of numerical studies, making evidences from numerical studies more 'believable'.

We do not endorse in any way the company which produce the composite femur; unfortunately in our knowledge it is the only available on the market [Inquiry on BIOMCH-L, 15/5/1995].

To further support this proposal, we have made available at no cost through Internet the solid model of the composite femur we are using in our studies, converted in formats which should be readable by most commercial CAD/CAE programs. Although already useful the available models could be improved; if our initiative will be approved by the community, more and better models will be made available.

HOW TO GET THE 'STANDARDIZED FEMUR'

The files can be downloaded using a WWW browser like Mosaic or Netscape and pointing at the following URL:

http://www.cineca.it/prometeo/stand_fem.htm/

This site makes available a lot of information on the composite femur (literature, material properties, etc.) and a downloadble Transfer Agreement Form. Once the filled form will be received by regular mail, a username/password will be sent back through e-mail, which will allow the unlimited download of the Standardized Femur geometric model data files. Files download will be possible only after September 15th, 1995.

We look forward to improving this service with the help of volunteers and with the feedbacks from the scientific community.

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