ABSTRACT

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Title: BeST-Graft viewer, A NEW SYSTEM TO IMPROVE THE BONE ALLOGRAFT–RECIPIENT MATCHING PROCESS

Introduction

One of the major clinical applications of bone allografts is the substitution of big bone areas in tumoral and prosthetic replacement surgeries. In these situations, a matching process is required to determine the allograft that best fits the recipient bone in the patient. Currently, in our tissue establishment, this correlation is accomplished by “manually” comparing the measurements of the graft to those of patient. However, detailed allograft morphology is a key consideration for the matching process and manual procedures applied to obtain these parameters make the process error-prone.

Purpose

Developing a procedure to efficiently digitalize musculoskeletal allografts and a system for the analysis of bone morphology to improve the donor-recipient matching process.

Methods

Bone allografts from the musculoskeletal bank were used to design a digitalization procedure which optimizes the use of clinical computer tomography equipment.

The Starviewer software (1), currently used in image diagnosis in Catalonia was used as a starting point to design a software for allograft-patient matching.

Results

The digitalization procedure was optimized and a new system to manage bone allograft–recipient matching for tissue establishments is proposed: BeST graft viewer (2). The system requires bone allografts to be digitalized and the resulting images to be stored in a DICOM file. The system provides functionalities to: (i) manage DICOM files from both allografts and recipients; (ii) reconstruct 3D models from DICOM images; (iii) explore 3D models using 2D, 3D, and multiplanar reconstructions; (iv) take allograft and recipient measurements; and (v) visualize and interact with recipient and allograft data simultaneously

A use case with a femur is presented to test all the viewer functionalities.

Conclusions

The bone allograft–recipient matching procedure can be optimized using software tools with functionalities to visualize, interact, and take measurements.

Literature

(1) Ruiz M, Julià A, Boada I. Starviewer and its comparison with other open-source DICOM viewers using a novel hierarchical evaluation framework. Int J Med Inform. 2020 May;137:104098.

(2) Vila M, Xiberta P, Ruiz M, Bermudo R, Leivas D, Fariñas O, Vilarrodona A, Boada I. BeST-Graft viewer, a new system to improve the bone allograft-recipient matching process. Comput Biol Med. 2024 Jun;176:108553.

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