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Review article

Patient-specific bone modeling and analysis: the role of integration and automation in clinical adoption

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ABSTRACT

Patient-specific analysis of bones is considered an important tool for diagnosis and treatment of skeletal diseases and for clinical research aimed at understanding the etiology of skeletal diseases and the effects of different types of treatment on their progress. In this article, we discuss how integration of several important components enables accurate and cost-effective patient-specific bone analysis, focusing primarily on patient-specific finite element (FE) modeling of bones. First, the different components are briefly reviewed. Then, two important aspects of patient-specific FE modeling, namely integration of modeling components and automation of modeling approaches, are discussed. We conclude with a section on validation of patient-specific modeling results, possible applications of patient-specific modeling procedures, current limitations of the modeling approaches, and possible areas for future research.

Keywords: Bone, subject-specific modeling, image processing, musculoskeletal modeling, finite element modeling, functional data.

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