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Review

Whole bone mechanics and mechanical testing

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Abstract

The mechanical behaviour of material bone can be completely described by a group of material properties. The mechanical behaviour of the entire bone organ, however, is much more difficult to predict; it is the result both of the properties of the material of which it is made, and of the geometric spatial architecture in which this is arranged.

This review first describes material bone in terms of its complex, graded and hierarchical structure. Basic concepts used in the field of mechanics of materials are defined and explained and then used to describe the mechanical properties of whole bone. Some clinical implications of these properties are provided. Commonly used mechanical testing methods for the study of the mechanical behaviour of whole bone are reviewed and the technical difficulties associated with them are discussed.

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