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Lorenzo Grassi, Hanna Isaksson

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Lorenzo Grassi [1], and Hanna Isaksson [1]

1. Department of Biomedical Engineering, and Department of Orthopedics, Lund University, Lund, Sweden

EXTRACTING ACCURATE STRAIN MEASUREMENTS IN BONE MECHANICS: A CRITICAL REVIEW OF CURRENT METHODS.

CORRESPONDING AUTHOR:
Lorenzo Grassi, M.Sc.
Department of Biomedical Engineering, Lund University, P.O. Box 118, SE-221 00, Lund, Sweden
lorenzo.grassi@bme.lth.se
+46 (0) 46 222 0655

Abstract

Osteoporosis related fractures are a social burden that advocates for more accurate fracture prediction methods. Mechanistic methods, e.g. finite element models, have been proposed as a tool to better predict bone mechanical behaviour and strength. However, there is little consensus about the optimal constitutive law to describe bone as a material. Extracting reliable and relevant strain data from experimental tests is of fundamental importance to better understand bone mechanical properties, and to validate numerical models.

Several techniques have been used to measure strain in experimental mechanics, with substantial differences in terms of accuracy, precision, time- and length-scale. Each technique presents upsides and downsides that must be carefully evaluated when designing the experiment. Moreover, additional complexities are often encountered when applying such strain measurement techniques to bone, due to its complex composite structure.