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# Technological improvement in the assessment of bone quality and osteoporosis: a new method of evaluation in ancient and modern skeletal remains using Quantitative Ultrasonometry

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## Résumé

Osteoporosis is a complex and heterogeneous disorder with a multi-factor aetiology. It is currently one of the major diseases in contemporary Western society, especially affecting people over 50 years old. Clinically, osteoporosis is defined as an abnormal bone loss and its most severe form is accompanied by the presence of fragility fractures occurring with the minimal trauma. A diagnosis of osteoporosis is given through the assessment of bone mineral density (BMD) which can be determined, above all the possible methodologies, by dual-energy X-ray absorptiometry (DEXA) or Quantitative Ultrasonometry (QUS). The latter is commonly used by physicians for the diagnosis of bone mineral density and bone quality, since it is relatively simple, cheap and easy to use.

In the last years paleopathologists have focused their attention on the study of osteoporosis and bone mineral density in ancient skeletons, in relation to sex, age and cultural background. The study of bone quality in past populations is particularly important because it can provide a relevant insight into the diachronic evolution of a seemingly modern pathology. However, a number of challenges remains in determine the bone loss in ancient remains, these mainly due to the methodological approaches used in the anthropological analysis. This underline the need of a new methodology and new standards specifically created and adapted for human skeletal remains.

The current study aims to develop a new methodology in order to assess bone quality in modern and ancient human skeletal remains using Quantitative Ultrasonometry, applied for the first time to skeletal samples (Frassetto collection, University of Bologna). The use of Quantitative Ultrasonometry (QUS) allowed us to evaluate bone tissue quality, analysing not only the characteristics related to bone mass and density, but also bone structure and to its elastic component.

**Mots-Clés:** Bone mineral density, Bone quality, Quantitative Ultrasonometry, Paleopathology

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