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P68 - Investigation of elemental distribution in human femoral head - studies of the Paget disease of bone

Friday, 11 July 2014 13:00 (1 hour)

Paget's disease of bone (PDB) is the second most common rheumatic disease and it is a condition of unknown etiology characterized by excessive and abnormal bone remodeling rate [1]. Trace elements are important indicators of bone pathology since they have an important role on bone metabolism and calcium homeostasis. Therefore, ion beam analysis techniques were applied to determine the concentration of the major and trace elements in order to find some characteristic abnormalities on pagetic bone. Bone samples removed after hip replacement in patients affected by the PDB were investigated by Particle Induced X-Ray Emission (PIXE) and Rutherford Backscattering Spectrometry (RBS). Micro X-Ray fluorescence Spectroscopy (MXFRS) was also applied to the bone analysis. For micro-PIXE and RBS analysis bone cross-sections were irradiated, under vacuum conditions, with a 2.0 MeV proton beam produced by the 2.5 MV Van de Graaff Accelerator of CTN/IST. An Oxford Microbeams-type nuclear microprobe was used (OM150 triplet system) [2], which allowed the proton beam to be focused on the sample with a spatial resolution of 3x4 μm2. The proton beam scanned a selected area of the sample in order to obtain elemental distribution maps for major elements. From these maps, line scans were defined in order to extract concentration profiles of these elements along the bone cross-sections and the concentrations of trace elements were also obtained. Both cortical and trabecular bone were analyzed. The MXRFS analysis was carried out using the Bruker's M4 Tornado spectrometer. The quantification was based on the fundamental parameters method using WinAxil code and the compare mode considering standard reference materials. Calibration against a series of standard samples has been carried out. Results were compared with concentrations referred in the literature for healthy bone of each type [3, 4, 5], and interpreted regarding the comparison and the functional role of elements in the bone metabolism.

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