

## Elemental Composition of the Bone Tissue of the Head and Neck of the Hip with Evascular Necrose Studied by X-ray Analysis with Ion Excitation

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Nowadays, nondestructive nuclear methods such as RBS and PIXE cover a broad range of applications in electronics, material science, medicine and biology.

In this study, the characteristic X-ray spectra of the bone tissue section, taken from patients during a surgery with hip arthroplasty, were measured. As study samples, the slices of degraded bone tissue of the upper pole of the femoral head and relatively healthy areas of lateral departments of the femoral neck were used. The results of elements analysis of degraded bone tissue of the femoral head in evascular necrose of the hip joint of the 3rd degree are presented and discussed.

A spectrometer of characteristic X-rays excited by ion bombardment was designed and created on the basis of ion electrostatic accelerator AN-2500. The energy resolution of spectrometer, which measured at 5.9 keV line of the <sup>55</sup>Fe spectrometric source, amounts to 151 eV

It was shown that the intensity of P and Ca spectral lines measured from the thick tissue is reduced by 20 and 30%, respectively. Meanwhile, the chlorine amount increases by more than two times. It is indicating the accumulation of salts in the sick tissue. A characteristic line of NaK $\alpha$  in the X-ray spectra at 1.03 keV is under the threshold level for the registration by a X-ray spectrometer. It is revealed, also an increase by 1.5 times of sulphur percentage due to increasing the magnesium sulphate amount. Analogous to this, an increase of potassium percentage is observed in the bone structure. It should be mentioned that the amount of iron and chromium in the sick and healthy bone tissue is kept constant. Therefore, a ratio between the yields of characteristic X-rays from different elements, containing in the bone tissue, serves as a marker of the bone degradation degree.

Elemental composition of the bone structures of the head and neck of the femur with dysplastic coxarthrosis studied by X-ray analysis with ion excitation

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It is show that the intensity of P and Ca spectral line in the sick tissue is reduced by 20% and 30%, respectively. Meanwhile, the amount of chlorine increases by almost five times. It is indicating on the accumulation of salts in the sick tissue and the impoverishment of the bony tissue with calcium and phosphorus.