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PERSPECTIVES FOR DUAL-ENERGY COMPUTER TOMOGRAPHY IN THE DIAGNOSIS OF LOW-ENERGY SPINAL FRACTURES

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Abstract: Osteoporosis is a metabolic bone disease characterized by disturbed microarchitecture and reduced bone mass. The basic diagnostic test of osteoporosis is densitometry, which determines the bone mineral density. Densitometric examination is based on the statistical result in relation to bone density of young people (T-score) or people of the same age (Z-score). It has been arbitrarily assumed that a T-score equal to or greater than –2.5 SD means osteoporosis. However, Clinical practice shows that patients with a relatively normal densitometry score may be affected by low-energy fractures. The two-energy computer tomograph (DECT) method gives an insight into the chemical composition of bones, depending on the software used, one can determine the X-ray absorption coefficient for the given elements: calcium, chlorine, phosphorus.

The DECT method seems to be a great diagnostic tool for assessing the microarchitecture of bone tissue with reduced bone mass.

Goal: The aim of the work is an objective assessment of the DECT value in the diagnosis of osteoporosis, and the determination of the method value for the probability of occurrence of low-energy fracture in patients with osteoporosis.

Materials and methods: The study consisted of 20 patients: 10 women and 10 men who had decreased bone mass in the densitometry test. These patients underwent DECT examination. The scope of testing both methods are lumbar vertebrae from L2 to L4.

Results: The study showed a significant advantage of DECT over the standard densitometry test. In the diagnosis of osteoporosis, the determination of the X-ray absorption coefficient is much more accurate in the DECT study than in classical densitometry. It is possible to determine exactly which core of the vertebrae is affected by a significant loss of the hydroxyapatite structure, moreover, the study allows to determine the concentration of hydroxyapatite at a particular location of the stem.

Conclusion:

1. The DECT study has a much greater value in the diagnosis of osteoporosis from classical densitometry.

2. The DECT study allows to consider the loss of bone structure in each vertebra individually as opposed to the densitometric examination.

3. The DECT study shows the absolute values of the X-ray absorption coefficient of hydroxyapatite in contrast to the statistical method used in densitometry.

4. The DECT study shows that osteoporosis is not linear and generalized in all skeletal structures in the same way. Our study shows that a larger loss of bone mass and a larger disruption of the vertebral body architecture occurs in the stems of the higher lumbosacral segment, i.e. L2–L3 relative to the L4 and lower stems.