



**МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ**  
**ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ**  
**УНІВЕРСИТЕТ РАДІОЕЛЕКТРОНІКИ**



**МАТЕРІАЛИ ТЕМАТИЧНОЇ КОНФЕРЕНЦІЇ**  
**"АКТУАЛЬНІ ПИТАННЯ БІОМЕДИЧНОЇ ІНЖЕНЕРІЇ"**

**В РАМКАХ 26-ГО МІЖНАРОДНОГО**  
**МОЛОДІЖНОГО ФОРУМУ**

**"РАДІОЕЛЕКТРОНІКА І МОЛОДЬ В ХХІ СТОЛІТТІ"**



**Харків 2022**

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ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ  
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## **FEATURES OF VISUALIZATION OF THE LUMBAR SPINE IN PATHOLOGIES**

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The lumbar spine, due to its axial location in the human skeleton and the predominance of spongy bone tissue in the structure of vertebral bodies (66%) with a constant and diverse functional load, is an important diagnostic object. The lumbar spine experiences two multidirectional effects: static - resistance to load and transmission of power impulses, and dynamic - motor function. In other words, the lumbar spine is an element of transmission and adaptation. The dynamic function involves intervertebral discs, muscles and articular surfaces of the vertebrae, and the presence of physiological curvature of the lumbar spine - lumbar lordosis-also plays a significant role. Thus, the spine is the main supporting structure of the human body.

Due to the anatomically intensive structure, the lumbar spine is the most loaded. It is affected by the weight of the entire trunk, which leads to the appearance of many pathological conditions. It is in this department that primary lesions in multiple myeloma (MM) begin. Also in this department there are manifestations of other common bone tissue pathologies, such as osteoporosis, hemangioma and metastatic lesion [1-4]. And since treatment and development prospects differ for each case, the exact definition of the type of pathology is not burdensome for treatment tactics and possible surgical planning [5, 6].

For the lumbar region, namely for the L1-L5 vertebrae, a number of parameters were calculated to analyze each of them. In total, 15 morphological features were calculated, among which 4 were identified as the most significant for the characteristics of the type of lesion and subsequent prediction [7-8]. These signs are: the width of the cortical layer, the average height and width of the vertebral column, the brightness coefficient, the area of the vertebra in the sagittal section, the index of the degree of compression. These signs were calculated for the following cases: norm, osteoporosis, hemangioma, multiple myeloma and metastatic lesion caused by breast cancer (because the highest percentage of the probability of bone metastases occurs with breast cancer (about 60%) [9].

Selected cases are justified by the following: osteoporosis is one of the most common diseases in people over 50, which is characterized by a decrease in bone density and mass and, as a consequence, a violation of the structure of bone tissue. Spinal hemangioma is a benign vascular tumor inside the spine. It is

a fairly common benign neoplasm. Hemangiomas occupy 2-3% of all spinal tumors and the first place among bone tumors. Multiple myeloma is a type of bone marrow cancer. Breast cancer is considered as an example of metastatic bone damage. All these cases are compared with the indicators of the studied parameters in a normal healthy person.

A decrease in the biomechanical properties of vertebrae is a consequence of a violation of their morphological and functional integrity, which in turn causes deterioration, and in some cases leads to a critical state of the musculoskeletal system. In this paper, a set of experimental data was calculated for four cases: norm, osteoporosis, hemangioma, and multiple myeloma. This data allows you to classify the primary image according to the selected characteristics.

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