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Possibilities of CT in the diagnosis of lumbar spinal stenosis

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Abstract: Ccomputed tomography (CT) is widely used in the diagnosis of degenerative pathology of the lumbar spine, but the relationship between clinical manifestations of lumbar stenosis and its anatomical prerequisites has not been sufficiently studied to date. The objective: to determine the significance of the morphometric parameters of lumbar stenosis according to CT scans and to establish their relationship with the prevailing symptoms of the disease. Material and methods. Seventy-five consecutive patients with clinically significant lumbar stenosis who underwent CT scan before surgery were enrolled in this study. The average values of thirteen different morphometric parameters were calculated at LIII–SI levels of the intervertebral discs and of the pedicels in the axial and sagittal views. The possibility of classification of clinical observations and the correlation of morphometric parameters with the clinical forms of lumbar stenosis were investigated using discriminant and logistic regression analysis. Results CT scan with high probability allocates patients with predominant symptoms of neurogenic claudication or bilateral radiculopathy. The most significant morphometric predictors of this clinical group are the depth of the lateral recesses and the cross-sectional area of the spinal canal. Conclusion CT scan significantly expands the informative value of magnetic resonance imaging and can be used in planning the decompressive stage of the surgery intervention in patients with lumbar spinal canal stenosis.

Keywords: Degenerative Process, Computed Tomography, Lumbar Spinal Stenosis, Neurogenic Claudication, Cross-Sectional Area

Introduction

Osteochondrosis and other degenerative lesions of the lumbar spine are among the most common chronic diseases: 15-35% among the adult population. The main pathomorphological substrate of osteochondrosis is damage to the intervertebral disc (IVD), especially in young patients. In patients over 50 years of age, along with IVD lesions, there is a tendency to develop multifactorial spinal canal stenosis (SPS) caused by hypertrophy of the elements of the articular-ligamentous apparatus of the spine — degenerative STS. Pathological narrowing of the spinal canal (SPCS) at the lumbar level is also called lumbar stenosis. If such compression is accompanied by progressive damage to the spinal cord and/or its roots, surgical decompression is required. The frequency of occurrence of SPKP, not associated with disc herniation, among patients with osteochondrosis is 2-9%. In addition to osteochondrosis, congenital anomalies in the development of the spine, traumatic injuries of the vertebrae, neoplasms, hematomas, abscesses of the spinal canal, periarticular cysts, lesions of the vertebral joints in rheumatoid arthritis, etc. can be causes of SPKD.
Computed tomography is one of the most popular types of study of bone and cartilage anatomical formations. Scanning is carried out using x-rays. Solid tissues of the body actively absorb ionizing fluxes, providing the possibility of detailed visualization of the structure of internal structures. CT scan of the spine is performed to determine the condition of bone and cartilage elements, surrounding tissues, and blood vessels.

As a result of computed tomography, a series of layered images of the area under consideration is obtained. Monochrome photographs are high resolution. Unlike radiography, the images do not show defects and shadows from nearby structures. Changing the plane during image reconstruction allows you to carefully study the anatomical formations. The advantage of CT is the ability to create a 3D model of the spine.
Contrasting is used to enhance the information content of scanning. As a “coloring” substance, a solution of iodine is used, which has a high absorbing capacity for X-rays.
Computed tomography visualizes changes in the structure of the anatomical formation. The spine performs supporting, shock-absorbing, motor and protective functions. A complex joint is formed by 33-34 bone elements connected by a ligamentous apparatus. Inside the spinal column is a canal containing cerebrospinal fluid and cerebral substance. Paired nerve roots depart from the spinal cord. Depreciation is carried out by cartilaginous layers (disks).

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With the development of the pathological process, structural disturbances, anomalies in the shape and size of morphological elements occur.
CT scan of the spine shows:
• density, uniformity, height of cartilaginous disks;
• size, shape, location of the vertebrae;
• patency of the spinal canal;
• condition of the main blood vessels (scanning of the cervical region);
• features of the structure of the ligamentous apparatus, back muscles.

Material & Methods

55 consecutive patients with clinically significant lumbar stenosis who underwent CT scan before surgery were enrolled in this study. The average values of thirteen different morphometric parameters were calculated at LIII–SI levels of the interverte-bral discs and of the pedicels in the axial and sagittal views. The possibility of classification of clinical observations and the correlation of morphometric parameters with the clinical forms of lumbar stenosis were investigated using discriminant and logistic regression analysis.

Results

CT scan with high probability allocates patients with predominant symptoms of neurogenic claudication or bilateral radiculopathy. The most significant morphometric predictors of this clinical group are the depth of the lateral recesses and the cross-sectional area of the spinal canal.

Conclusion

CT scan significantly expands the informative value of magnetic resonance imaging and can be used in planning the decompressive stage of the surgery intervention in patients with lumbar spinal canal stenosis.

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