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POSSIBILITIES OF THE COMPUTED TOMOGRAPHY METHOD IN THE DIAGNOSIS OF CENTRAL LUMBAR SPINAL CANAL STENOSIS

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Abstract

To date, a large number of fundamental works have accumulated, the analysis of which shows that lumbar vertebral central stenosis is a fairly common disease among the general pathology of the spine. Central stenosis is a consequence of various pathogenetic processes of the bone and soft tissue components of the lumbar spinal canal, and is mainly diagnosed by radiation methods. One of which is the CT method, discovered in 1972. The creation of spiral (CT) and multispiral (MSCT) computed tomographs has made the CT method extremely reliable and universal for early diagnosis and screening of central spinal canal stenosis. CT with CT and MSCT using three-dimensional reconstruction, having a high scanning speed, the ability to cover a significant length of the spine, visualizes the initial changes in the intervertebral disc, differentiates the structures of the spinal canal, the magnitude of the prolapse of the disc into the canal, the magnitude and migration of sequesters, their “age", i.e. It gives a more complete picture of degenerative-dystrophic diseases of the lumbar spine, including central spinal canal stenosis as a result of lesions of the bone and soft tissue structures of the spine. The possibility of visualization of spinal pathology allows us to consider CT as the main and most accessible diagnostic method for vertebral and discogenic lesions, with which it is possible to identify with high accuracy the pathological changes that cause central stenosis of the lumbar spinal canal. CT with CT and MSCT has been perceived by many scientists as the biggest step forward in radiation diagnostics since the discovery of X-rays. The purpose of the study: To study the possibilities of computed tomography in establishing the diagnosis of lumbar vertebral stenosis.

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Introduction

Materials and methods

To establish the possibility of a computed tomographic method in the diagnosis of lumbar vertebral stenosis, the structure of the lumbar spinal canal was examined in 35 patients without pathology of the lumbar spine segment. The patients of the control group and patients were examined in the department of radiation diagnostics of the multidisciplinary clinic of the Andijan State Medical Institute, the Republican Scientific Center for Emergency Medical Care and the medical center "Star Med Center" in Tashkent. We measured the following parameters of the lumbar vertebral canal in the control group and CT patients: the midagittal and frontal dimensions of the bony border of the spinal canal, the vertical size of the intervertebral disc in direct and lateral projections. CT scan with CT and MSCT of the lumbar spine allows you to get a clear idea of the size and configuration of the spinal canal, to identify central and lateral stenoses. In CT, only thin sections of tissue are exposed by X-rays. CT has a high contrast resolution, which makes it possible to differentiate tissues with a density difference of 0.5% (radiography with a density difference of 15-20%). The CT tube emits a thin, collimated, fan-shaped beam of X-rays perpendicular to the long axis of the body. By adjusting the collimation, the thickness of the slice was changed, for example from 1 to 10 mm. The beam of X-rays passed through the patient is fixed not by a film, but by a system of special detectors. CT detectors are about 100 times more sensitive than X-ray films when detecting differences in attenuation of the primary beam. A numerical value is usually assigned to the attenuation of the primary beam and is called the Hounsfield unit (HV). CT is calibrated in such a way that the attenuation value of water is equal to 0, air is equal to 1000. For bone structures, the attenuation value ranges from +800 and above. The density value for parenchymal tissues is 60-100 HV. CT with CT and MSCT allows you to simultaneously make from 4 to 256 computer slices and, with the spiral movement of the X-ray tube, obtain an image of the entire body in a few seconds. The obtained results were processed statistically by Student-Fisher using criteria for the reliability of differences in the compared indicators.

Results and discussion

As it was written above, CT with CT and MSCT examined the lumbar spinal canal in 35 patients without pathology of the lumbar spine, in whom the normal average and frontal dimensions of the bony border of the lumbar spinal canal, the vertical size of the intervertebral disc in direct and lateral projections were measured. The dimensions of the listed parameters are indicated in Table 1 (numerator). The midagittal and frontal dimensions of the spinal canal expand in the cranio-caudal direction: they were at the level of L1=18,000,84mm and 24,700.96mm, at the level of L5 =21,3186mm and 30,600.82mm, respectively. At the same time, the frontal size of each lumbar spinal canal (from L1 to L5) turned out to be significantly wider (P0.05) than the 1st average size. The vertical size of the intervertebral disc in direct and lateral projections. Cranio-caudal direction also significantly expanded (P 0.001): the intervertebral disc was at the level of L1 - L2 = 6,43L5 - S1 = 9.94 0.56mm and 11.14.67mm, respectively.

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Table 1 **Normal (numerator) and affected (denominator) CT values of the parameters of the lumbar segment (Mm, in mm).**

№	Parameters	The level of the vertebra				
		L1	L2	L3	L4	L5
1	The average sagittal size of the bony border of the spinal canal	18,00±0,8418, 15±0.58	18,69±0.8118, 25±0,65	19,80±0.8716, 60±0,45	20,29±0.8615, 43±0,43	21,31±0.8614, 55±0,37
2	Frontal size of the bony border of the spinal canal	24,70±0.96 24,60±0,67	26,00±0.96 24,90±0,56	27,49±0.91 25,55±0,50	29,00±0.86 26,15±0,46	30,60±0.8227, 20±0,48
3	The vertical size of the intervertebral disc in a direct projection	6,43±0.38 6,05±0,31	8,57±0.42 7,48±0,28	9,00±0.49 7,13±0,30	9,89±0.52 6,03±0,29	9,94±0.56 5,63±0,26
4	The vertical size of the intervertebral disc in the lateral projection	6,63±0.41 6,18±0,24	7,71±0.45 6,80±0,27	8,94±0.56 7,05±0,22	10,09±0.60 6,38±0,24	11,14±0.67 6,70±0,27

The average size of the bone border of the fifth L5 lumbar spinal canal in comparison with L1 and L2 expands with a high degree of difference (from P05 to P Otherwise, the average size of the spinal canal (L1 L2; L1 L3; L1 L4; L2 L3; L2 L4; L4 L5) is expanded with a low degree of difference (from P0.8 to P0.2). The frontal size of the bony border of the spinal canal is expanded with a high degree of difference (P05 in comparison with the previous spinal canals, except for adjacent vertebrae, which are expanded by an unreliable difference (from P8 to R. Using a computed tomographic method for the diagnosis of central stenosis of the lumbar spinal canal caused by degenerative-dystrophic diseases (protrusion and herniated disc) of the spine in 40 patients, as well as in healthy people, the following parameters were measured: the median and frontal dimensions of the lumbar-spinal canal, the vertical size of the intervertebral disc in direct and lateral projections (Table 1 denominator). Comparing the pathological values of the parameters of the lumbar spinal canal with the normal dimensions of these parameters, the following results were obtained (Table 2): the average and frontal dimensions of the spinal canal in the affected areas (L3, L4, L5) of the lumbar vertebral segment were significantly shortened (from P05 to P, while the average size of the spinal canal was shortened more than its frontal size. The vertical size of the intervertebral disc in direct and lateral projections in the affected areas (L3-L4; L4-L5; L5-S1) of the vertebral segment.

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Table 2 **The degrees of difference (P) between the normal (numerator) and pathological (denominator) CT values (in m) of the parameters of the lumbar spinal canal are presented**

№	The level of the vertebra	Parameters			
		The average size of the spinal canal	Frontal size of the spinal canal	The vertical size of the intervertebral disc in a direct projection	The vertical size of the intervertebral disc in the lateral projection
1.	L1	18,00±0,84 18,15±0.58 t=0,15 P>0,8	18,69±0.81 18,25±0,65	19,80±0.87 16,60±0,45	20,29±0.86 15,43±0,43
2.	L2	24,70±0.96 24,60±0,67	26,00±0.96 24,90±0,56	27,49±0.91 25,55±0,50	29,00±0.86 26,15±0,46
3.	L3	6,43±0.38 6,05±0,31	8,57±0.42 7,48±0,28	9,00±0.49 7,13±0,30	9,89±0.52 6,03±0,29
4.	L4	6,63±0.41 6,18±0,24	7,71±0.45 6,80±0,27	8,94±0.56 7,05±0,22	10,09±0.60 6,38±0,24
5.	L5	18,00±0,84 18,15±0.58	18,69±0.81 18,25±0,65	19,80±0.87 16,60±0,45	20,29±0.86 15,43±0,43

It is also reliable (from P01 to P are shortened. Their shortening relative to the normal size of the vertebral segment was as a percentage in the following values: L3-L4=-20.9% and -24.8%; L4-L5= -39.1% and -38.9%; L5-S1= -43.5% and -44.7%, respectively. To identify the severity of central spinal canal stenosis by CT, we focused on the detection of protrusions and herniated discs, their prevalence and location. Herniated discs are divided into local prolapse (up to 50% of the circumference of the spinal canal) and diffuse prolapse, when the disc bulge is uniform in more than 50% of the circumference of the spinal canal. CT analysis of the symptoms of degenerative lesion of the lumbar spine showed that disc herniation in 61.9% of patients was single and 38.1% of cases were multiple, and 12.5% of patients had disc herniation in three or more vertebral segments. According to the localization of the herniated disc, they were distributed as follows: diffuse prolapse of the herniated disc into the spinal canal was in 15.4% of patients, local prolapse in 84.6% of patients. Local disc herniations, in turn, were divided into unilateral in 85.8% of cases, and bilateral in 14.2% of cases. Unilateral disc herniations revealed a left-sided paramedial variant in 39.4% of patients, a right-sided paramedial variant in 24.5% of patients, a left-sided posterolateral variant in 13.9% of patients and a right-sided posterolateral variant in 8.0% of patients. The most part of the disc herniation occurred at the level of L4-L5 =44.8% and at the level of L5-S1=35.4%, in other parts of the lumbar spine, disc herniation ranged from 4 to 9 mm, and the size of the disc herniation increased in the cranio-caudal direction. Thus, the possibility of visualizing degenerative-dystrophic changes in the lumbar spine allows us to consider that CT is one of the main diagnostic methods for vertebrogenic and discogenic lesions, with the help of which it is possible to identify with high accuracy bone-cartilaginous and intracanal soft tissue pathological changes that cause central stenosis of the lumbar spinal canal. CT has an advantage over X-ray imaging in studying the features of the structure of the spinal canal, the position and prevalence of the disc that has fallen out, the causes of spinal cord compression, and the severity of degenerative processes in the intervertebral disc. However, the degree of visualization of computed tomography of intracanal soft tissue structures, including protrusions and herniated discs, causing lumbar vertebral central stenosis, is significantly inferior to the magnetic resonance imaging method of investigation.

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