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The Role of Computed Tomography in the Diagnosis of Spinal Injuries

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Abstract: In this article we discuss about the role of computed tomography in the diagnosis of spinal injuries, its damages and impact.

Keywords: Traumatic spinal injury, Magnetic resonance, X-ray, myeloradicular, topogram.

INTRODUCTION

Traumatic spinal injury and its consequences are extremely damaging not only socially, but also for the patient's own body. [1,2]. Early diagnosis of spinal injuries and timely choice of treatment tactics, being an integral part of the daily work of radiologists, traumatologists, and neurosurgeons, can reduce the suffering of such patients. Conventional radiography of the spine, for all its importance and necessity, in many cases is not able to answer all the questions that arise from traumatologists and neurosurgeons. It often does not reveal the existing fracture of the vertebra or its arch and, as a rule, does not give a complete picture of the extent of damage and the nature of the fracture, and does not allow choosing the optimal treatment strategy (including surgical). Spondylography does not always detect compression of the spinal cord by bone fragments of vertebral bodies or arches, or by random foreign bodies embedded in the spinal canal. This leads to errors in determining the indications for the operation, its scope, and timing of its implementation. Therefore, in all cases of spinal injury, even in the absence of signs of vertebral damagec, CT or MRI studies are indicated on spondylograms [3,4,5,6]. Many authors describe compaction of the structure of the damaged vertebra as one of the symptoms of a compression fracture. [7]. Thus, for an uncomplicated fracture, only the radiological sign of deformity of the body of the damaged vertebra remained reliable. The X-ray CT method has opened a fundamentally new stage in the development of modern imaging diagnostic systems. It has a high contrast resolution, which makes it possible to differentiate tissues with a density difference of 0.5-2% (with conventional radiography, this indicator is 10-20%) [6]. CT is a highly informative diagnostic method and makes it possible to judge the localization, nature of the fracture, spinal cord injury, and in combination with data from clinical and other instrumental diagnostic methods (radiography, myelography), it allows you to determine the nature of the fracture, dependence on the mechanism of injury, mineral density, geometric parameters and architectonics of bone tissue of vertebral bodies [4,5,6,7,8]. On the other hand, this method is by no means a substitute for standard radiography [1,3,5,7,9,10]. All these studies do not exclude each other, but complement each other. As a rule, this sequence of actions allows you to establish the correct diagnosis in 90-95% of cases and avoid diagnostic errors and inaccuracies. In cases where there are doubts about the interpretation of the conducted studies, when the clinical picture does not correspond to the existing X-ray and CT picture, it is advisable to conduct an MRI study if necessary to visualize the spinal cord [1,3,7,10]. MRI allows you to see soft-tissue structures of the spine, see ischemia, extra-and intradural hemorrhages, as well as changes in the vertebral bodies. If the patient has compression radicular or myeloradicular symptoms, if there is no bone pathology on X-rays on MRtomograms a herniated disc may occur. Accurate diagnosis of the level and nature of damage allows for minimally invasive surgical intervention [1,7,9,10]. The combined use of these methods would make it possible to determine the nature of the fracture, its dependence on the injury mechanism, mineral density, geometric parameters, and microarchitectonics of vertebral body bone tissue.

Objective: to evaluate the role of computed tomography in the diagnosis of spinal fractures on the basis of the Scientific Research Institute of Traumatology and Orthopedics in Astana.

Materials and methods:

Computer tomography was performed in 48 patients who sought medical help as a result of spinal injury. Computer tomographic study was conducted on the computer tomograph "Tomoskan V/SR 5000" company "PHIIPS" (Germany), the matrix with the scans, 512 × 512, with cross sections 320x320, the following physico–technical conditions: scanning for removing topogram 3C, the voltage generated radiation 120sq, current 220m. 170, the width of the layer of 3.0 mm, and 3.0 mm of the table, the index is 3.0, mas 300. The CT scan began with the patient's position on his back, with his hands behind his head. A special roller is placed under the knee joints to straighten the lumbar lordosis.

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When entering data into the tomograph computer database, the standard protocol of CT examination of the spine was used.

Research results

In all cases of spinal injury (with available clinical evidence of damage to the spinal cord or its roots, with severe pain syndrome), even in the absence of signs of vertebral damage, CT scans were shown on spondylograms. According to the results of standard radiography and computed tomography, injuries to the thoracolumbar spine predominate among spinal fractures. In the group with vertebral fractures, 57 (61.9%) cases revealed a fracture of 1 vertebra, 28 (30.4%) – 2 vertebrae, a combination of damage in 1 and Th12 vertebrae – in 28 (30.4%), a combination of damage to 1 and 2 vertebrae – in 30 (32.6%) cases. CT signs of compression fracture on axial sections were: fracture lines, displacement of fragments, bone compression; increased density during densitometry in the area of bone compression during densitometry. One of the manifestations of spinal injury was cartilaginous nodes of the vertebral bodies (Schmorlhernias), most often observed in the lower thoracic and upper lumbar regions. CT signs of Schmorl hernias in the examined patients were the presence of deformities of the end plate of a rounded or oval shape, with a sclerotic shaft around, which are well visualized on axial sections during CT. During densitometry, the density in the nodule corresponded to the consistency of the intervertebral disc. CT clearly revealed damage to the posterior column-the arches and processes of the vertebrae, displacement of bone fragments into the lumen of the spinal canal, and the degree of damage to the spinal cord and its roots

– KT complicated fractures of the spine In cases when there is doubt about the interpretation of the research, when the clinical picture does not match the existing x-ray and CT picture, if you need to visualize the spinal cord appropriate MRI MRI scan allows you to see magadane structure of the spine ligaments, intervertebral discs, covers the spinal cord and the spinal cord itself with its changes (ischemia - edema, hemorrhage, cyst), extra - and intradural hemorrhage, as well as changes in the vertebral bodies. If the patient has compression radicular or myeloradicular symptoms, or if there is no bone pathology on X-rays, MRscans may reveal a herniated disc. An accurate diagnosis of the level and nature of damage allows for minimally invasive surgical intervention [1,7,9,10]. (Fig. 1)

MRI of the lumbosacral spine. On the T2-VI in the sagittal plane, a compression fracture of the L1 vertebra is determined against the background of osteoporosis.

Conclusion

Magnetic resonance imaging allows you to see soft-tissue structures of the spine: ligaments, intervertebral discs, spinal cord membranes and the spinal cord itself with its changes, as well as changes in the vertebral bodies. Thus, taking into account the disadvantages and advantages of various diagnostic methods for spinal injury, it should be noted that the integrated use of these methods allows us to determine the nature of the fracture, the dependence on the mechanism of injury, mineral density, geometric parameters and microarchitectonics of the vertebral body bone tissue.

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