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Some Features of Injuries of the Thoraco-Lumbar Spine

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ABSTRACT

The number of injuries to the thoracic and lumbar spine remains at a consistently high level with a tendency to stable growth. The growth of such damage is primarily associated with the high urbanization of the population, an increase in road traffic accidents, the construction of high-rise buildings, and the use of high-tech household appliances. Modern views on diagnostic issues and tactical approaches to treatment require clarification. Therefore, work to improve the surgical treatment of the thoracic and lumbar spine is still relevant.

Introduction

Despite the successes of modern medicine in the field of neurosurgery, the problems of diagnosis and treatment of injuries of the thoracic and lumbar spine. Over the past decades, due to intensive urbanization, the development of communication, high-speed means of transportation, the pace and rhythm of life, year after year, there has been a continuous increase in the number and frequency of spinal injuries [1,2]. According to some authors, the number of injuries to the spine, spinal cord and roots of the ponytail in peacetime ranges from 0.7% to 4% of all injuries, and 6.3% of injuries to the bones of the skeleton [8,9,10], of which 40-45% are damaged thoracic and 45-52% lumbar. Th12 (15-17%) and L1 (25-28%) are more often damaged [1]. 30-70% of patients with injuries of the thoracolumbar spine have neurological disorders, which indicates damage to the spinal cord and roots. At the same time, mortality due to spinal cord injury (PSMT), depending on the severity and localization, ranges from 18% to 99% [9,10]. 30-70% of patients with injuries of the thoracolumbar spine have neurological disorders, which indicates damage to the spinal cord and roots. In the last decade, the overall mortality rate for compression of the spinal cord, as a result of improved diagnosis and treatment, has decreased to 10.5% [3,4,5], with injury to the thoracic spine has become 18-20%, and at the lumbar level below 10% [6,7,9].

Analysis of the data reflecting the dynamics of treatment outcomes shows their significant

differences, which is explained by the different contingent of patients considered by the authors. Considering all of the above, it should be recognized that, in general, the global growth of neurotraumatism reflects the dynamics of spinal cord injuries, which have increased significantly over the past decades [8,3,10].

Material and methods. The work is based on the analysis of 60 observations of patients with acute injuries of the thoracolumbar spine who were treated at the RNCNH in the period from 2008 to 2015. The age of the patients ranged from 14 to 65 years; of them, there were 42 men and 18 women (Table 1). All those admitted to the clinic underwent a full examination, including: general somatic and clinical neurological examination, Spondylography, CT, MRI and laboratory methods of examination.

Table 1Distribution of patients by gender and age (according to WHO classification)

Age in years	Sex				Total	
	male		female			
	Abs.	%	Abs.	%	Abs.	%
Up to 20 years old	5	8,4%	2	3,3%	7	11,7%
21-44 years old	23	38,3%	12	20%	35	58,3%
45-59 years old	11	18,3%	3	5%	14	23,3%
60 years and older	3	5%	1	1,7%	4	6,7%
Total	42	70%	18	30%	60	100%

As can be seen from Table 1, there were 70% of men and 30% of women among the examined patients. The largest age group consisted of patients aged 21-59 years (81.6%), that is, the most able-bodied age.

The examination of patients was carried out to assess the severity of the general condition of the patient, the condition of internal organs, the level and nature of damage to the spine, spinal cord and its roots, to determine the supportability of the vertebrae.

Table 2 Distribution of patients by injury level and by gender

Level	men	women	Total	%
VTh10-VTh12	27	14	41	68,33%
VL1-VL2	15	4	19	31,67%
Total	42	18	60	100%

Table 2 shows that the vertebrae are most often damaged at the level of VTh10-VTh12 – 68.33% of cases, that is, in the area of the thoracolumbar junction, which is called the "critical point" (Shultes, 1907).

Household injuries were noted in 36 cases (60%), industrial – 3 cases (5%), motor transport – 5 (8.3%), street – 16 (26.7%) observations.

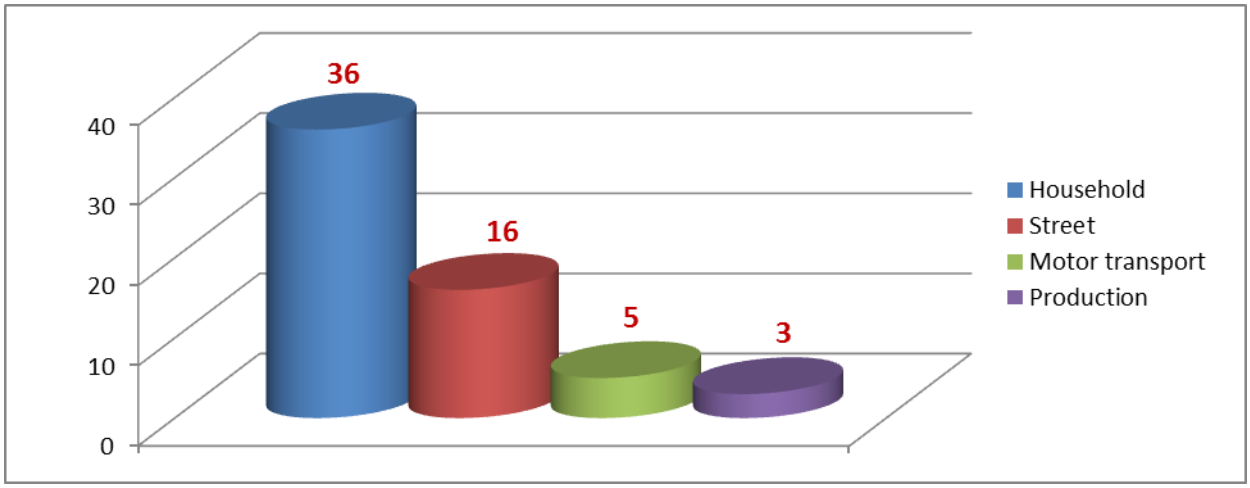

Fig. 1 Causes of injuries.

From this diagram it can be seen that among the types of injury, domestic and street injuries prevailed, of which: as a result of falling from a height – 67.6% of cases. Among the mechanism of indirect injury – in 88.5%. In the thoracic region, VTh10-12 – 24 (63.2%) and in the lumbar region VL1-2 – 14 (36.8%), vertebrae were most often damaged. There were 51 (85%) patients with compression fractures of the bodies of one vertebra, 8 (13.3%) patients with compression fractures of the bodies of two vertebrae, 1 (1.7%) victims with fractures of three vertebrae. According to the terms from the moment of injury in the acute period (during the first three days) – 60 (100%) patients of them: in the first 6 hours – 31 (51.7%) patients, on the first day – 17 (28.3%) victims, up to three days – 12 (20%).

To assess the degree of neurological disorders, the ASIA/ IMSOP classification was used, according to which patients were divided into 5 groups:

A – complete damage: absence of motor and sensory function below the level of damage, including in the anogenital area;

C – incomplete: motor functions are absent below the level of damage, but the elements of sensitivity are preserved;

C – incomplete; motor functions are preserved below the level of damage, but in most control groups muscle strength is less than 3 points;

D – incomplete; motor functions are preserved below the level of damage and in most control groups muscle strength is greater than or equal to 3 points;

E – motor and sensory functions are not impaired.

According to this classification, the victims were distributed as follows: patients of groups A – 9, groups B- 10, groups C- 15, groups D- 26.

Methods. Clinical neurological and radiological diagnostic methods (Spondylography, CT, MRI) were used to solve the tasks. Clinical and neurological research methods were carried out according to generally accepted methods of examination of patients with spinal injuries. The nature of injuries to the thoracolumbar spine and the severity of neurological deficits were assessed according to the ASIA/IMSOP classification (1998). Standard criteria for determining the magnitude of traumatic deformity and the dynamics of neurological disorders were used to objectively assess the severity of injuries and the results of surgical treatment.

Table 3 Paraclinical research methods

Research methods	Number of patients
Spondylography	60 (100%)
Computed tomography	29 (48,3%)
Magnetic resonance imaging	16 (26,7%)

Spondylography. In our studies, survey X-rays were taken in 60 patients. Spondylograms were made in 2 projections – straight and lateral, and if necessary, sighting shots were taken. The use of these projections allows you to get a complete picture of the state of the vertebral bodies, arches, joints, intervertebral spaces, the degree of displacement of the vertebrae relative to each other, the shape and size of the spinal canal. Intraoperative X-ray control of the reclination process and the spatial orientation of the structural elements was carried out using an electron-optical converter (EOP) from Brivo.

Compression injuries of the spine occurred most often in our observations. They occur with the flexion mechanism of injury, with sudden forced flexion of the trunk. On radiographs, the compressed vertebra has a wedge-shaped shape, the tip is directed anteriorly. The amount of compression of the vertebral body as a percentage was calculated by the Hvisyuk method – up to 15% - 1 degree; from 15 to 35% - 2 degree; more than 35% - 3 degree.

With a strong impact, a complete compression fracture occurs: the vertebrae are squeezed from top to bottom and wedged into each other, the vertebra appears flatter on the X-ray, its shadow is reinforced, the bone structure is disturbed, an interruption of the contour is observed on the anterior wall. Radiological signs of a compression fracture can also serve as thickening of the bone beams of the vertebral bodies along the compression line, fracture and indentation of the closure plate into the vertebral body "penetrating fracture", narrowing of the intervertebral space in the projection of adjacent discs, an increase in the interosseous space and axial deformation of the spine.

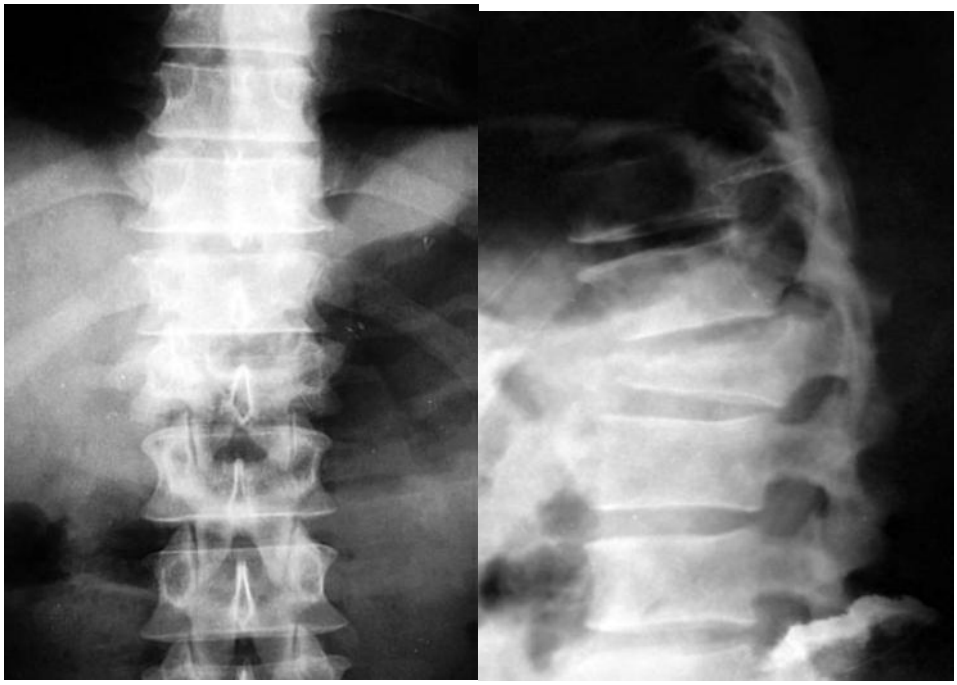

Fig.2. Spondylograms in direct and lateral projection. Compression fracture of the vertebral body at the L1 level.

Often there were comminuted fractures in 9 cases and vertebral fractures in 16 cases. In our material, compression flexion fractures of the vertebral body with damage to one closure plate - 51.82%; compression-flexion fractures with separation of the middle-upper edge of the vertebral body-21.78%; multi-splintered penetrating fractures of the vertebral body-18.81%; vertical fractures of the vertebral bodies-3.63%, fracture-dislocations-3.96% of injuries.

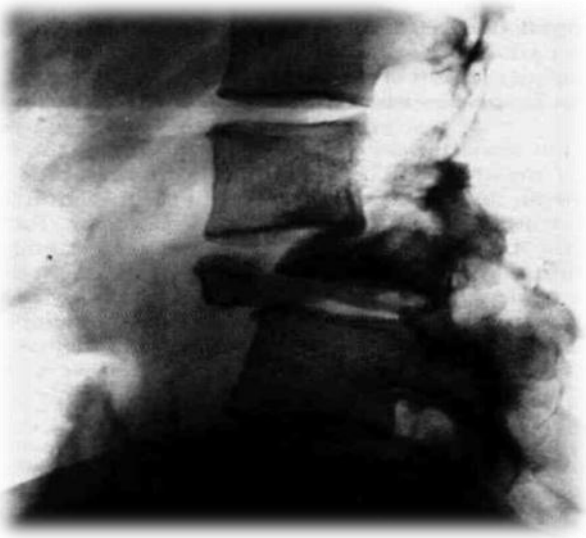

Fig.3. On lateral spondylograms, signs of damage are fan-shaped divergence of adjacent spinous processes, at the VL2 level.

The condition of the supra- and interosseous ligaments was studied on lateral spondylograms. On lateral radiographs, fan-shaped divergence of adjacent spinous processes was considered signs of damage to these ligaments. According to our data, isolated ruptures of the posterior ligamentous apparatus were diagnosed in 2 patients.

According to the nature of the displacements, the patients were distributed as follows: anterior displacement 38 cases; posterior displacement 4 cases; lateral displacement 2 cases; combined dislocations 16 cases. These data interested us from the point of view of choosing an operational approach and determining the rational technique of stabilization and fixation of the damaged spine. In addition, all these injuries have their own specific clinical picture. But, considering that in case of spinal cord injuries, the clinic of the acute period is blocked by the symptoms of spinal shock, the diagnosis of confusions is mainly based on X-ray examination data.

To determine the optimal strategy and tactics of treatment of the victim, the correct idea of the nature of the damage to the body was carried out by MRI and CT studies.

Magnetic resonance imaging was performed at a magnetic field power of 1.5 tesla according to standard methods in T1 and T2 modes. It was produced in 16 cases. The task of MRI in the preoperative period included an additional assessment of the standing of the spinal canal and, above all, the detection of compression of the subarachnoid space and spinal cord. MRI allowed to obtain an image of the spinal cord along its entire length without subarachnoid administration of contrast agents. With absolute certainty, MPT allowed us to state the fact of compression of the spinal cord and the roots of the ponytail not only by bone structures, but also by areas of damaged discs, ligaments. The advantage of magnetic resonance imaging, compared with computed tomography, is that it allows you to obtain sagittal sections over a long distance, to take pictures in different sections without changing the position of the patient. The disadvantage is that the possibilities of MRI in the acute stage of injury are limited, due to the duration of the study.

Fig. 3 On MR tomograms, a compression-comminuted fracture of the body of the L2 vertebra, with the introduction of fragments into the spinal canal, with compression of the spinal cord.

Computed tomography was performed in 29 cases, in the acute period of injury, it allowed to study the anatomical and topographic features of the spatial location of the neurovascular formations of the vertebral and radicular canals. The obtained tomograms made it possible to assess the condition of the vertebral bodies, arcuate joints, to identify the nature of the fracture, to establish the degree of compression of the spinal cord, spinal nerves or spinal roots at this level, and also examined the condition of the dural sac and epidural space. CT allowed differentiating impression and comminuted fractures of the vertebral body, visualizing free bone fragments in the spinal canal (especially comminuted fractures of the craniodorsal angle of the vertebral body, which are screened by the legs of the arches on profile X-ray images). Great importance in the analysis of the obtained data was attached to the construction of secondary reconstructions in the sagittal, frontal planes, which gave an idea of the exact localization, extent of the pathological process and changes in adjacent structures.

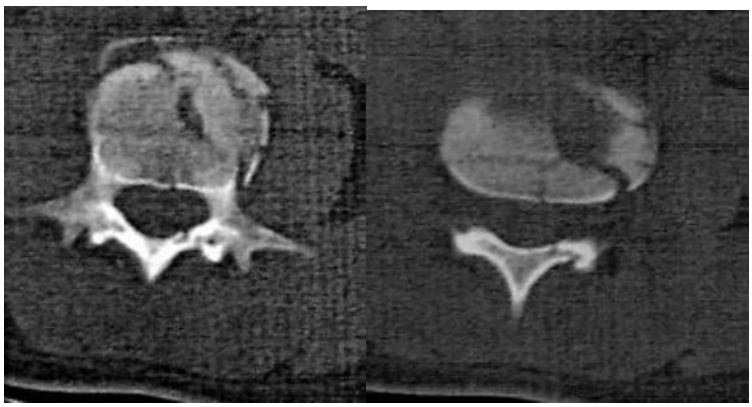

Fig.2.2.4 A multi-splintered fracture of the body of the L2 vertebra is visualized on the CT image.

Thus, in case of traumatic spinal injury, computed tomography is a highly informative method for studying the condition of the spinal canal, bone structures of the spine, intervertebral discs.

Conclusions.

1. The results of the study showed that the diagnosis of the level and nature of the lesion of the spine, spinal cord and its roots is possible only on the basis of a diagnostic complex, including a thorough neurological examination, X-ray examinations, as well as computer and magnetic resonance imaging data.
2. The most reliable diagnostic methods are spondylography, computed tomography and magnetic resonance imaging, which allow to determine the state of the bone structures of the spine, dural sac, spinal cord and roots of the ponytail.

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