Clinical Application Value of MRI in the Diagnosis of External Injury of the Spine

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Abstract: To explore the MRI findings of spinal injury and its clinical significance, this article retrospectively analyzed 82 cases of complete spinal injury, summarized the characteristics of MRI, and compared with X-ray and CT. The results show that MRI can comprehensively reflect the degree and pathological changes of spinal cord and spinal cord injury, and evaluate the damage of spinal cord, intervertebral disc, ligament and other soft tissues. It is the best examination method for clinical diagnosis, treatment evaluation and prognosis. In particular, bone contusion that cannot be found by X-ray and CT has important diagnostic significance; however, there are still some limitations on accessory fractures.

1. Introduction

Spinal injury is one of the common clinical traumas. Domestic MRI examination has many studies on spinal cord, intervertebral disc, ligament and soft tissue injury [1-3]. The report on vertebral body injury is small, and the fracture of the vertebral body has clear fracture line and displacement. For X-ray and CT, the examination can be diagnosed, but there is no clear fracture line for vertebral body flattening. X-ray, CT examination and old fracture are difficult to identify. X-ray and CT examination of vertebral contusion cannot be found [4]. Therefore, accurate diagnosis of spinal vertebral injury can be obtained, the clinical correct treatment and prognosis significance is extremely important. The author retrospectively analyzed the MRI findings of 82 patients with spinal injury in our hospital to improve the understanding of the diagnosis of spinal injury and provide the basis for accurate treatment [5].

2. Comparison of DR, CT and MRI

2.1 Definition

DR (Digital Radiography) is a digital filming machine. DR is most commonly used for human chest and bone photography, as well as other parts such as the abdomen, teeth, and head [6].

CT (Computed Tomography), that is, electronic computer tomography. CT scans a certain thickness of a certain part of the human body with an X-ray beam. The detector receives X-rays transmitted through the layer and converts into visible light, which is converted into an electrical signal by photoelectric conversion, and then passed through an analog/digital converter. Analog/digital converter is converted to digital and input to computer processing [7].

MRI (Magnetic Resonance Imaging) is also a new type of high-tech imaging examination method in recent years. It has non-ionizing radiation "radiation" damage; no bone artifacts. It can be multi-directional transverse, coronal, sagittal section, etc. And it can be multi-parameter imaging; high soft tissue splitting ability. Unique advantages such as vascular structure can be displayed without the use of a contrast machine [8].

2.2 Accuracy comparison

In this paper, the clinical manifestations of DR, CT and MRI in spinal diagnosis are studied. The

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accuracy of MRI is better than CT, and the accuracy of CT is better than DR, as shown in Table 1 and Figure 1 [9]. Therefore, MRI has an irreplaceable advantage in clinical diagnosis. The accuracy of the test and the accuracy of the three tests are not replaced by other methods, as shown in Table 2 and Figure 2. The experimental data were analyzed by SPSS 17.0 software, and *t* test and χ^2 test were used respectively. P<0.05 indicated that the difference was statistically significant.

Table 1 Comparison of the accuracy of X-ray, CT and MRI in the diagnosis of external injury of the spine

Test items	Total number of cases	Number of cases detected	The detection rate	Correct number of cases	Correct rate
DR	82	49	59.76%	32	65.31%
CT	82	58	70.73%	51	87.93%
MRI	82	64	78.05%	63	98.44%
The value of P	——	<0.05	<0.05	<0.05	<0.05

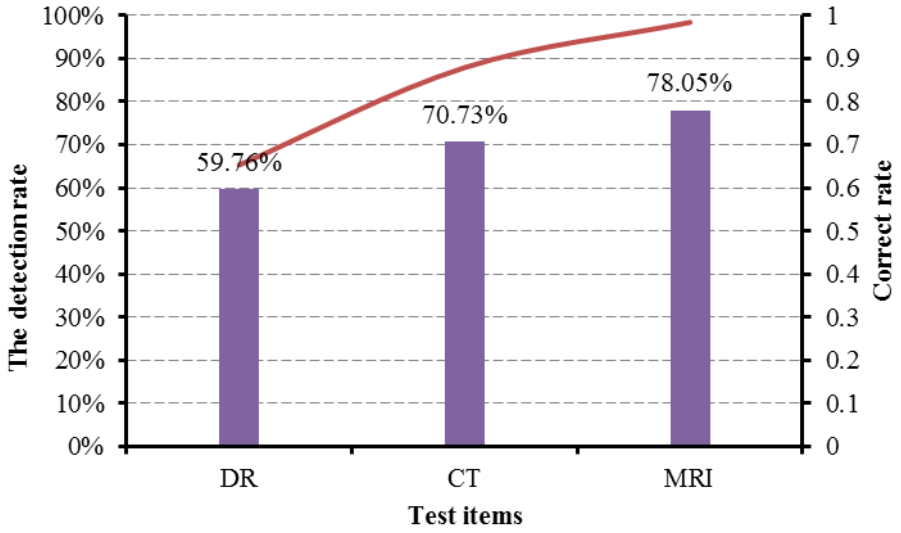


Figure 1 Detection rate and accuracy of X-ray, CT and MRI in the diagnosis of external injury of the spine

Table 2 Comparison of MRI test diagnostic accuracy and accuracy of three tests

Test items	Total number of cases	Number of cases detected	The detection rate	Correct number of cases	Correct rate
MRI	82	54	65.85%	53	98.15%
Three items	82	56	68.29%	55	98.22%
The value of P	——	＞0.05	＞0.05	＞0.05	＞0.05

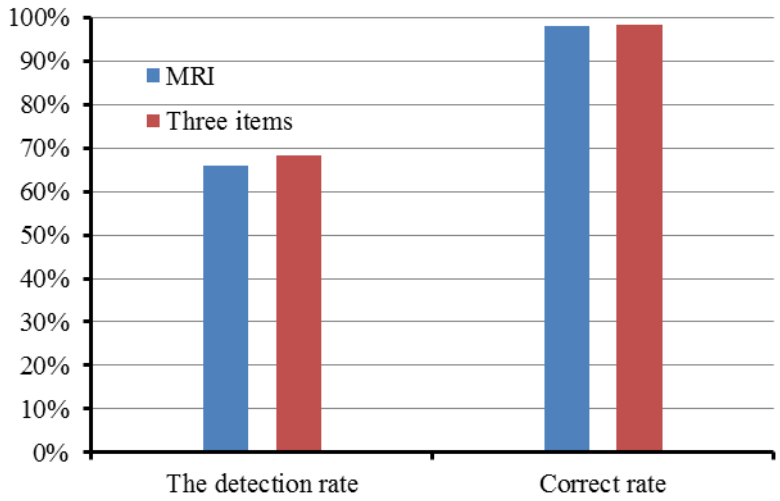
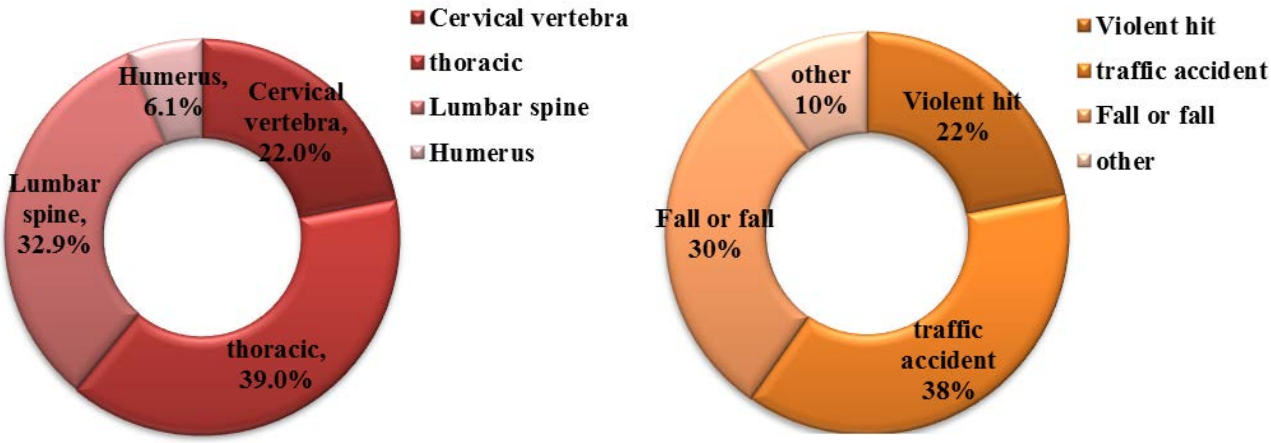


Figure 2 Detection rate and accuracy of three-term and MRI in the diagnosis of external injury of the spine

3. Research methods

3.1 Clinical data

82 cases of spinal trauma patients admitted to our hospital from January 2016 to December 2018 were selected as the study subjects [10]. There were 56 males and 26 females with an average age of (45.7±2.5) years. All patients had a clear history of trauma. See other history of spinal diseases or injuries, patients with post-traumatic pain and limited mobility, all patients without mental disorders and other serious diseases, can complete the CT and MRI examination. There were 18 cases of violent hits, 31 cases of traffic accidents, 25 cases of falls, 8 cases of other cases. There were 18 cases of cervical vertebrae in the injured area, 32 cases of thoracic vertebrae, 27 cases of lumbar vertebrae and 5 cases of tibia, as shown in Figure 3.



(a) Causes and proportion of sample injuries (b) Sample injury site and proportion

Figure 3 Causes of injury, location of injury and proportional characteristics of the sample

3.2 Methods

CT and MRI were performed in 82 patients with spinal trauma. The CT scanner is a GE16 row scanner in the United States. The scanning voltage and current are controlled at 120kV and 200mA respectively. The injured part is scanned horizontally before the scan of the spine. The scan layer thickness and layer thickness are 0.5mm and 1.0mm respectively. For the center, the spiral scan is performed before and after, and after scanning, the data is input to the workstation for analysis. The

MRI inspection uses the US GE1.5T scanner, the scan layer distance and layer thickness are respectively 4.0mm, the spin echo sequence TE is 10~20ms, the TR is 450ms, the optional echo sequence TE is 100~120ms, and the TR is 2330ms. The sagittal, transverse and coronal planes were selected for the scanning site, and the images were scanned and analyzed by the workstation. After the workstation analysis data is completed, the two experienced doctors of the hospital will read the film, and the difference in the reading results may be read by the third doctor.

3.3 Observation indicators

Comparing the two types of examination for spinal fracture, broken bone fragments, spinal canal volume change, nerve root injury, spinal cord injury, ligament injury, soft tissue injury and vertebral arch injury detection rate, by comparing the detection rate of different injury types, we study the evaluation for application value of different examination methods in the diagnosis of spinal trauma.

3.4 Statistical Analysis

The experimental data were analyzed by SPSS 17.0 software, and *t* test and χ^2 test were used respectively. P<0.05 indicated that the difference was statistically significant.

4. Spinal injury CT, MRI performance and comparison

In this group of 40 patients, there were 51 fracture vertebral bodies, 206 vertebral body fragments, 50 vertebral bodies and 38 compression bone fragments, and 28 compressional nerve fragments. CT, MRI showed no difference in the detection rate of fracture vertebral body, vertebral compression of spinal bone fragments, attachment compression of spinal bone fragments, compression nerve root fragments (P>0.05. CT detected vertebral body fragmentation. The number of bone fragments was higher than that of MRI, but the detection rate of spinal cord injury, anterior and posterior ligament injury and posterior ligament complex injury was higher than that of CT (P<0.05). See Table 3 for details.

Table 3 Comparison of the detection rates of two types of spinal trauma based on CT and MRI techniques (N=82, n/%)

Check out content (Unit)	CT	MRI	χ^2	P
Fracture vertebral body	41	38	0. 51	>0. 05
Vertebral bone fragments	110	46	42.26	<0. 05
Vertebral body compression spinal bone fragments	25	18	2.0	>0. 05
Attachment compression spinal bone fragments	8	4	1.6	>0. 05
Compression of nerve root broken bone pieces	9	7	0.35	>0. 05
Spinal cord injury	9	22	8.8	<0. 05
Nerve root injury	9	11	0.27	>0. 05
Anterior longitudinal ligament injury	2	10	6.3	<0. 05
Posterior longitudinal ligament injury	7	19	8.21	<0. 05
Posterior ligament complex injury	3	14	9.04	<0. 05

5. Conclusion

With the update of MRI equipment, especially the continuous development of high-field machines, the scanning time has been greatly shortened, which provides a convenient condition for early diagnosis and diagnosis of critically ill patients in emergency department. The shortest

examination time in this group was 1 hour after the injury, indicating that the magnetic resonance emergency examination has received more and more attention. In patients with trauma, X-ray and CT examinations are normal. If there is significant local pain and limited mobility in the clinic, MRI should be performed to exclude vertebral bone contusion. For patients with spinal injuries and neurological symptoms, MRI is necessary to detect spinal cord injury and its extent. In patients with traumatic paraplegia, the doctor is mostly concerned about the permanent injury of the spinal cord, which determines the effect of surgical decompression in the emergency department. MRI can determine the segment and extent of the injury, which is conducive to the development of a strict surgical plan for the patient. Patients who have undergone surgery can be reviewed for MRI to observe the reduction of vertebral dislocation, the presence or absence of spinal stenosis, and the presence or absence of compression and degeneration of the spinal cord. Because MRI can accurately, effectively and non-invasively diagnose ligament tear, traumatic disc herniation, spinal cord compression, spinal cord injury. It provides favorable information for early treatment, and its clinical application value is extremely high. With the development of MRI scanners, the impact of time, space and condition is getting smaller and smaller, which will surely rescue more trauma patients.

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