

Analysis of the Application Value of MRI and CT Diagnosis of Lumbar Disc Herniation

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Abstract: Objective: To analyze the application value of MRI and CT diagnosis for those with lumbar disc herniation. **Methods:** The data of 62 patients with LDH treated in our hospital from January 2019 to December 2019 were analyzed retrospectively. All patients were diagnosed as LDH after operation, and 62 patients were treated with MRI and CT. The accuracy of CT and MRI in the diagnosis was analyzed according to the gold standard of operation results. **Results:** 62 patients were diagnosed as LDH after operation, including 25 cases with intervertebral disc herniation, 12 cases with intervertebral disc prolapse, 8 cases with intervertebral disc nodule, 7 cases with intervertebral disc dissociation as well as 10 cases with intervertebral disc bulge. The accuracy of MRI diagnosis (95.16%) was higher than that of CT (75.81%), and the difference was statistically significant ($P < 0.05$). **Conclusion:** For the diagnosis of LDH, MRI is more accurate, but CT is faster and cheaper. Both of them have their own advantages and can be chosen clinically according to the actual situation of patients on the basis of ensuring the diagnostic accuracy.

Keywords: Lumbar disc herniation (LDH); MRI; Spiral CT; Diagnosis

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As a spinal disease caused by excessive intervertebral force and repeated waist injuries, the intervertebral disc herniation has a high clinical incidence rate.

After lumbar disc fiber is damaged, the protruding nucleus pulposus will compress the spinal nerve and cauda equina nerve. The main clinical manifestations include lumbar pain, sciatic nerve pain or radiation pain of one side of the lower limbs, which will seriously affect the health and life of patients if the effective measures are not taken in time for intervention^[1]. For young adults with a high activity intensity, there is a high incidence of disc herniation. For the location of the disease, there is a high incidence in the left intervertebral disc for its long-term receipt of pressure while the right one with a stronger side waist muscle strength is habitually used by most people. Clinical diagnosis made as early as possible can provide a basis for treatment and facilitate the development of the treatment plan. MRI and CT are common methods for clinical diagnosis of LDH. However, there are still disputes in the selection and application of them for various factors^[2]. In this study, the diagnosis and application value of MRI and CT in LDH can be analyzed as follows.

1 Data and methods

1.1 General data

The data of 62 patients with LDH treated in our hospital from January 2019 to December 2019 were analysed retrospectively. All patients were diagnosed as LDH after operation with waist and sciatic pains of different degrees, radiative pain of the lower limb of a side and obviously limited activity, which can be alleviated after a rest. 62 patients were diagnosed with MRI and CT. There were 34 males and 28 females aged 34 to 82 years old, averagely 55.65

± 5.28 years old; The course of disease lasted for 4-3.5 years, averagely 1.47 ± 0.62 years. There were 17 cases with lumbar lateral bending, 15 cases with positive symptoms in the lumbar nerve compression test and 30 cases with positive symptoms in the straight leg elevation test.

1.2 Methods

1.2.1 Spiral CT

The Revolution CT system of GE company of the United States was used to locate the positioning film and set the parameters, including the layer spacing of 1mm, the layer thickness of 3mm, the matrix of 256 × 512, and the current of 250mA. With the scanning reference line of the centerline of intervertebral space of the patient in the supine position, the intervertebral space between L3/4-15/S1 of the lumbar spine was scanned routinely for 4 times. Then, the patient's bone window and soft tissue window were observed, including changes of the position and shape of the intervertebral disc, and bone density of the vertebral body as well as the vertebral arch, etc., to make sure the pathological condition of the lumbar intervertebral disc.

1.2.2 MRI

The 1.5T HDX MRI system of GE company of the United State was used to check the conventional sagittal T1WI imaging and cross-sectional T2WI imaging with parameter settings: T1WI, tr500ms, te15ms; T2WI, tr5100ms, te90ms. The patient in the supine position was scanned from head to foot in turn. During the whole scanning process, the vertebral body shape, sagittal disc signal, disc herniation, compression of spinal cord and dural sac, and the

width of spinal canal diameter line shall be closely observed to determine the pathological changes of the lumbar disc.

1.3 Evaluation Indicator

To analyze the accuracy of CT and MRI examination in diagnosis with the golden standard of the operation results.

1.4 Statistical Method

The spss23.0 statistical software was used, the counting data was expressed by percentage, and χ^2 test was used. The difference was statistically significant ($P < 0.05$).

2 Results

2.1 Pathological Findings

62 patients were diagnosed as LDH after operation, including 25 cases with intervertebral disc herniation, 12 cases with intervertebral disc prolapse, 8 cases with intervertebral disc nodule, 7 cases with intervertebral disc dissociation as well as 10 cases with intervertebral disc bulge.

2.2 Comparison of the CT diagnosis and MRI diagnosis results

The diagnostic rate of intervertebral disc herniation with the MRI was higher than that with the CT. The difference was statistically significant ($P < 0.05$); While the diagnostic rate of intervertebral disc herniation, prolapse, nodule and dissociation with the MRI were slightly higher than that with the CT. The difference was not statistically significant ($P > 0.05$). The diagnosis results can be seen in Table 1.

Table 1. Comparison of the CT and MRI diagnosis results *n* (%)

Inspection Method	Intervertebral disc herniation (25)	Intervertebral disc prolapse (12)	Intervertebral disc nodules (8)	Intervertebral disc (7)	Intervertebral disc bulge(10)
CT Diagnosis	22(88.00)	9(75.00)	6(75.00)	5(71.43)	5(50.00)
MRI Diagnosis	25(100.00)	11(91.67)	8(100.00)	7(100.00)	8(80.00)
χ^2	1.148	1.200	2.286	2.333	1.978
<i>P</i>	0.234	0.273	0.131	0.127	0.016

2.3 Comparison of the CT diagnosis and MRI diagnosis accuracy rate

The diagnosis accuracy rate of the MRI was higher

than that of the CT. The difference was statistically significant ($P < 0.05$). Shown in Table 2.

Table 2. Comparison of the CT and MRI diagnosis accuracy rate *n* (%)

Diagnosis methods	<i>n</i>	Pathological diagnosis	
		Conformed	Missed or misdiagnosed
CT Diagnosis	62	47(75.81)	15(24.19)
MRI Diagnosis	62	59(95.16)	3(4.84)
χ^2			9.359
<i>P</i>			0.002

3 Discussion

As the main cause of LDH, the damaged degeneration of the lumbar intervertebral disc would lead to the internal and external mechanical imbalance of the spine, and the nucleus pulposus of the intervertebral disc extended outward through the rupture gap, causing irritation and pressure on the lumbar spinal nerve roots as well as lumbar Leg pain^[3]. Due to the lumbar intervertebral disc is easily damaged and degenerated for the high labor intensity, young adults are also the group with a high incidence^[4]. The occurrence of lumbar disc herniation is mainly related to the size of the activity. According to statistics, most of the disc lesions are located on the left side, which is related to the fact that most people are forced on the right side and the right muscle is much stronger. Left intervertebral disc gradually protrudes outward after long-term compression^[5]. The main symptoms of LDH include radioactive pains in the waist and the lower limbs, which limit movement and will aggravate the symptoms and make walking difficult if patients exercise too long. Under the premise of fully learning the patient's disease, proper treatment plan after the accurate diagnosis is of great significance for the recovery of the patient^[6]. In clinical diagnosis of LDH, besides the examination of symptoms and signs as well as the inquiry of medical history, various imaging methods are needed to help confirm the diagnosis. At present, the commonly used imaging examination methods in clinic involve X-ray film, CTM, CT spinal iodine hydrography and MRI. The focus of this study is to observe and analyze the application value of the MRI and CT in the diagnosis of LDH.

According to the results of this study, the diagnostic coincidence rate of LDH with the MRI is higher than that with the CT, indicating that MRI has a higher accuracy in the diagnosis of LDH. As a common diagnostic method of imaging, CT has been widely used in the grassroots hospitals for its

fast scanning speed, wide range as well as low cost^[7]. With a unique advantage in the diagnosis of LDH, CT examination can visually check for the presence or absence of dural sac, whether it is associated with nerve tumours, nerve root compression and accompanying signs, and the size and position of intervertebral disc protrusions as well as a relatively high spatial resolution. After the CT examination, physicians can generally confirm the diagnosis according to the comprehensive analysis of the patient's clinical symptoms. However, there are also deficiencies, for instance, its accuracy for disc nodules and dissociation is relatively low and further examination is needed; In addition, as a radiological diagnosis, CT examination will cause invisible damages to patients. Therefore, the CT examination is used only when the diagnosis cannot be confirmed by other diagnostic methods. By comparing the accuracy of the MRI and CT in the diagnosis of LDH, Sun Yahui et al. found that MRI could clearly show the details of nerve root, nucleus pulposus, fiber fracture and dural sac and had a higher accuracy^[8]. As a common diagnostic method of imaging with no radioactivity and strong signal, MRI has a high accuracy and safety and can quickly obtain the T1WI and T2WI imaging through the SE sequence. In addition, with MRI, an all-round multi-sequence imaging can be obtained by scanning the coronary and fat suppression sequences to ensure the accuracy of diagnosis^[9]. However, the MRI diagnosis has a relatively long time and a high examination cost. Based on the above data and views, MRI has the advantages of high diagnostic accuracy, high soft tissue resolution, intuitive display of intervertebral discs dissociation, vacuum images and intraspinal canal structures, and relatively high safety without radiation throughout the process; The diagnostic advantages of CT lie in the fast scanning diagnosis, cheap and acceptable cost as well as direct display of the presence of neuroma and dural sac. In addition, it can distinguish the size and position of the intervertebral disc protrusion. These two examination methods have their own advantages and can be used

as complements in clinical selection. In clinical diagnosis, CT can be used for examination first, and a further diagnosis can be conducted if the result is different from the clinical diagnosis. Limited by time and the amount of samples, there are still deficiencies in the application value of CT and MRI, and a further improvement and in-depth research is needed in the further.

To sum up, MRI has a high accuracy in the diagnosis of LDH, but CT is faster and cheaper. These two diagnostic methods have their own advantages and can be selected according to specific situation clinically.

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