

The Diagnostic Value of CT Scan and Magnetic Resonance Imaging Technology for Acute Pancreatitis

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Abstract

To compare the application value of CT scan and magnetic resonance imaging techniques in the diagnosis of acute pancreatitis. Method: 76 suspected patients with acute pancreatitis (January 2021 January 2024) were selected. CT scanning and magnetic resonance imaging techniques are used to examine patients. Based on comprehensive examination (gold standard), calculate and compare the conformity, sensitivity, and specificity of CT scan and magnetic resonance imaging techniques in the diagnosis of acute pancreatitis. Result: The use of magnetic resonance imaging technology for the diagnosis of acute pancreatitis showed higher accuracy and sensitivity than CT scanning ($P < 0.05$). There was no significant difference in specificity between the two groups ($P > 0.05$). Conclusion: The value of magnetic resonance imaging technology in the diagnosis of acute pancreatitis is higher than that of CT scan.

Keywords

Acute Pancreatitis; CT Scan; Magnetic Resonance Imaging Technology; Diagnostic Value.

1. Introduction

Acute pancreatitis can be caused by various reasons. During the onset of the disease, the patient's own pancreatic enzymes are abnormally activated to digest pancreatic tissue. Diseases usually occur suddenly after meals, and the symptoms are mainly upper abdominal pain that lasts for a long time. Some patients may experience nausea and vomiting simultaneously. Mild cases are easy to treat and have a good prognosis, while severe cases have certain treatment difficulties and poor prognosis. Due to the lack of specificity in the clinical symptoms of this disease, it is difficult to distinguish other types of acute abdomen, which can easily lead to missed diagnosis, misdiagnosis, and delay in disease treatment. It is very important to explore a feasible, easy to operate, and cost-effective diagnostic scheme in order to improve the diagnostic accuracy of acute pancreatitis. Imaging examination techniques are currently widely used for the diagnosis of acute pancreatitis, including ultrasound, CT, and magnetic resonance imaging. CT scan can clarify the diagnosis of acute pancreatitis and assess the severity of the condition. Enhanced CT scan can be used for the diagnosis of pancreatic necrosis. Magnetic resonance imaging technology has advantages in excluding biliary diseases in the diagnosis of acute pancreatitis. The study compared the application value of CT scanning and magnetic resonance imaging techniques in the diagnosis of acute pancreatitis, providing reference for the diagnosis of acute pancreatitis and hoping to improve diagnostic accuracy.

2. Data and Methods

2.1 General Information

Research subjects: 76 suspected patients with acute pancreatitis. Patient screening time range: January 2023 January 2024. Patient gender: 40 males and 36 females. Patient age: 45-70 (58.64 ± 5.45) years old. Body mass index: 19.4-24.3 (22.31 ± 1.02) kg/m^2 .

Inclusion criteria: (1) Patients experiencing persistent upper abdominal pain after meals; (2) Be informed about the research; (3) Good compliance and cooperation with inspections; (4) Clear consciousness; (5) The medical records are complete. Exclusion criteria: (1) Mental abnormalities; (2) Merge cancer; (3) Pregnancy and lactation period; (4) CT examination and magnetic resonance imaging are contraindicated; (5) Not willing to participate in the research.

2.2 Method

After admission, the patient underwent a comprehensive physical examination, observing and inquiring about their symptoms and signs. Inquire about the patient's medical history, such as whether there were any triggers before the onset of upper abdominal pain, the characteristics of symptoms, and whether there were any other accompanying symptoms. Understand whether the patient has a similar medical history. Perform blood tests on patients and require them to undergo CT scans and magnetic resonance imaging examinations. (1) CT scan: Perform a spiral CT scan (64 layers) on the patient. The working voltage of CT equipment is 120kV, and the current is 220mA. Set the CT scan slice thickness to 2mm and the pitch to 3:1. Assist the patient in changing their position to supine. The starting point of the scan is the lower part of the patient's kidney, and the endpoint of the scan is the top of the liver. Perform a routine CT scan on the patient to obtain clear images. Afterwards, decide whether to perform enhanced CT scans on the patient based on the actual situation. Inject contrast agent into the body through the patient's elbow vein using a high-pressure injector, with a controlled injection rate of 3mL per second. Perform arterial phase CT enhanced scan on the patient within 25-30 seconds after the completion of contrast agent injection. Perform intravenous phase CT enhanced scan on the patient 70-80 seconds after the completion of contrast agent injection. Perform delayed CT enhanced scan on the patient within 180-300s seconds after the completion of contrast agent injection. The CT scanning operation is performed by the same experienced CT doctor on the machine, using the same CT equipment and methods. The image data is uniformly uploaded to the workstation for image post-processing. Two senior doctors conducted double-blind review of the film and provided their respective diagnostic opinions. The same diagnostic opinion can provide a clear diagnosis for the patient. There are different diagnostic opinions, and after joining a doctor, the minority obeys the majority. (2) Magnetic resonance imaging technology: layer thickness of 3.0mm, interlayer spacing of 1.0mm. Perform transverse and coronal scans, as well as T1WI and T2WI sequence scans Transverse T1WI: repetition time set to 10ms, echo time set to 2.3ms. Perform a coronal FIESTA sequence scan with a repetition time set to 3.85ms and an echo time set to 1.65ms. Application of breath triggered fat suppression spin echo sequence for T2WI scanning, with TR and TE of 300ms and 90ms, respectively. During DWI sequence scanning, TR and TE were 4000ms and 60ms, respectively, with a matrix of 256×256 . One excitation was performed, and the FOV was 42cm. Imaging starts from the upper edge of the liver and ends at two levels below the horizontal segment of the duodenum. After the routine examination is completed, the patient will undergo enhanced magnetic resonance imaging, with one scan at 20s, 60s, and 300s after injection of contrast agent. TR and TE are 4ms and 2ms, respectively, with a FOV of 42cm. The number of motivational words is once. The image was reviewed by two senior doctors (double-blind method), and when the diagnostic opinions were the same, the patient was directly diagnosed. When there is a disagreement on the diagnosis, one doctor will be added to determine the final diagnosis based on the principle of majority rule.

2.3 Observation Indicators

Compare the accuracy, sensitivity, and specificity of CT scanning and magnetic resonance imaging techniques in diagnosing acute pancreatitis.

2.4 Statistical Processing

The data (conformity rate, sensitivity, specificity) were analyzed for differences using SPSS 25.0 software. Count data is represented in the form of numbers and rates (n,%), and statistical analysis of

data differences is completed through the chi square test. The inspection standard is 0.05. $P < 0.05$ indicates that there is a statistically significant difference in the data.

3. Results

3.1 Comparison of CT Scan and Magnetic Resonance Imaging Techniques in the Diagnosis of Acute Pancreatitis

76 patients who underwent examination were diagnosed with acute pancreatitis in 42 cases and other acute abdominal conditions in 34 cases through comprehensive examination, imaging, biochemical testing, and other diagnostic methods. There were 42 positive cases and 34 negative cases. The diagnosis of suspected acute pancreatitis patients by CT scan: 37 positive cases and 39 negative cases. The diagnosis of suspected acute pancreatitis patients using magnetic resonance imaging technology: 42 positive cases and 34 negative cases. As shown in Table 1, the results are presented.

Table 1. Comparison of CT scan and magnetic resonance imaging techniques in the diagnosis of acute pancreatitis

Diagnostic methods		Comprehensive inspection	
		Positive	negative
CT scan	Positive	35	2
	negative	7	32
Magnetic resonance imaging technology	Positive	41	1
	negative	1	33

3.2 Comparison of Conformity, Sensitivity, and Specificity of CT Scan and Magnetic Resonance Imaging Techniques in the Diagnosis of Acute Pancreatitis

The diagnostic accuracy and sensitivity of magnetic resonance imaging technology for acute pancreatitis are higher than those of CT scan ($P < 0.05$). There was no significant difference in diagnostic specificity between CT scan and magnetic resonance imaging techniques for acute pancreatitis ($P > 0.05$). As shown in Table 2.

Table 2. Comparison of diagnostic accuracy, sensitivity, and specificity of CT scan and magnetic resonance imaging techniques for acute pancreatitis

Group	Example number	Diagnosis Meets(%)	Sensitivity (%)	Specificity (%)
CT scan	76	88.16(67/76)	83.33(35/42)	94.12(32/34)
Magnetic resonance imaging technology	76	97.37(74/76)	97.62(41/42)	97.06(33/34)
χ^2		4.802	4.974	0.349
P		0.028	0.026	0.555

4. Discussions

The pathogenesis of acute pancreatitis is complex and can be caused by multiple etiologies. The characteristics of disease occurrence and development are abnormal activation of pancreatic enzymes.

Biliary obstruction, long-term alcohol abuse, and bacterial infection are all closely related to the occurrence of this disease. The disease has a sudden onset and rapid progression. If the condition is not controlled in a timely manner, secondary infections may occur, and in severe cases, shock may occur, endangering life safety. Early diagnosis and treatment are the basic principles for treating acute pancreatitis. Exploring an effective diagnostic method can timely diagnose and accurately assess the severity of the condition, providing reference for the development of disease treatment plans, helping to control the condition and alleviate symptoms and signs. CT, Magnetic resonance imaging technology is widely used in clinical practice and can be used to diagnose acute pancreatitis. At present, there is no consensus on the application value of the two diagnostic methods, and there is controversy. Comparing the value of two diagnostic methods can provide a basis for the diagnosis of acute pancreatitis and improve diagnostic accuracy. The diagnostic accuracy and sensitivity of magnetic resonance imaging technology for acute pancreatitis in the study are higher than those of CT scanning. Analysis reason: CT scan is a fast volumetric scan that uses the principle of X-ray penetration, belonging to tomography, and can continuously collect image data. CT images are uniformly uploaded to the workstation for processing, which can form three-dimensional images. Doctors can choose any level for image observation. Due to the large extent of inflammation in pancreatic tissue of patients with acute pancreatitis, which affects blood flow and microcirculation, clear images can be formed [9]. However, the resolution of CT soft tissue is not high, which can affect doctors' judgment of the condition. Magnetic resonance imaging technology utilizes electromagnetic signal imaging to scan from any angle and orientation. Compared to CT scanning, magnetic resonance imaging technology has higher soft tissue resolution, can explore the pancreas, clarify non liquid components, clearly display the pancreas, and distinguish it from fat and extrapancreatic tissue [10]. When performing fat suppression sequence and rapid imaging sequence scans on patients, changes in pancreatic morphology can be clearly displayed, and tissue exudation around the pancreas can be observed. Patients with pathological changes can also undergo magnetic resonance imaging scans without being affected by the course of the disease. The application of magnetic resonance imaging technology can obtain rich imaging information with high diagnostic accuracy.

In summary, the accuracy of using magnetic resonance imaging technology in the diagnosis of acute pancreatitis is higher than that of CT scanning.

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