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Research Progress of CT and MRI Imaging In Liver Focal Small Lesions

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Abstract

Focal small lesions of the liver are space occupying lesions with a diameter of ≤ 3cm in the human liver, which can be divided into benign and malignant lesions. Benign lesions usually do little harm to patients, but malignant lesions need to be paid attention to. If they are not diagnosed and treated in time, they can progress to liver cancer and cause death. At present, imaging technology is often used in the diagnosis of hepatic space occupying lesions, but small focal lesions are more special and difficult to diagnose, which has always been the focus of abdominal CT and MRI application. In this paper, we reviewed the progress of CT and MRI in the diagnosis of focal liver diseases.

Keywords

CT; MRI; Focal small liver lesions; Imaging research; Progress.

1. OBJECTIVE

Focal small lesions of liver are common space occupying lesions of liver in clinic. There are many kinds of lesions. Most patients have no obvious symptoms and are difficult to be detected by patients and clinicians. Most of them are diagnosed by imaging technology during physical examination. And some studies suggest that focal nodular hyperplasia of the liver, primary liver cancer, liver adenoma and other diseases occur in the early stage, lack of typical imaging features, which is easy to be confused, resulting in misdiagnosis and missed diagnosis, resulting in patients missing the best opportunity for early diagnosis and treatment of liver cancer or unnecessary surgery for benign nodules [1]. Therefore, it is of great significance to seek effective diagnostic methods for the differential diagnosis of small focal liver lesions. In recent years, with the continuous development of CT and MRI technology, remarkable results have been achieved in the detection and characterization of small focal liver lesions. This paper reviews the research on abdominal CT and MRI in the diagnosis of small focal liver lesions in recent years, so as to provide reference for the differential diagnosis of small focal liver lesions.

2. CT DIAGNOSIS OF FOCAL SMALL HEPATIC LESIONS

At this stage, abdominal CT diagnosis of small focal liver lesions is widely used. With the continuous innovation of medical technology, CT technology has been improved, especially the advent of multi-slice spiral CT, which greatly improves the diagnosis rate of disease, and improves the detection and qualitative accuracy of lesions.

Multi slice spiral CT has the advantage of fast scanning, which can dynamically select the arterial phase, venous phase and balance phase of patients for scanning [2]. Its technology can be divided into the following four categories: ① thin slice CT scanning. Thin slice CT scanning refers to the CT scanning technology with thin slice thickness (slice thickness ≤ 5mm), and it is also the most commonly used CT diagnostic technology for diagnosing small structure lesions.

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This technology effectively improves the spatial resolution, has high detection rate for small lesions, and can clearly reflect the internal density and edge characteristics of small lesions, and reflects the relationship between lesions and surrounding structures, so as to realize cystic, solid and cystic Differential diagnosis of lesions. ② Multiple time dynamic scanning of different phase enhancement images. Through continuous dynamic monitoring of patients' lesions, the blood supply characteristics of internal lesions can be displayed, so as to clarify the hemodynamic characteristics of patients' lesions and further improve the accuracy of diagnosis of benign and malignant lesions. ③ CT perfusion imaging. This technology belongs to functional imaging technology. It needs to inject special contrast agent into the patient, and then conduct dynamic scanning of the same layer on the specific plane of the patient in a specific time to obtain the time density curve of the region. By analyzing the trend, intensity value, peak time and other parameters of the curve, it can evaluate the blood perfusion status of the region, so as to reflect the blood supply characteristics of the lesion tissue and provide anatomical information Abnormal tissue perfusion information caused by potential malignant lesions that may exist before surgery. This is not only conducive to the diagnosis of benign and malignant lesions, but also can provide a scientific basis for the treatment of patients [3]. ④ CT angiography. This technique is the product of spiral CT after its appearance. It refers to the three-dimensional imaging of blood vessels to show the small blood vessels in the lesion tissue of patients. At the same time, it can observe the lesion staining, lesion blood vessels, blood supply arteriovenous shunt, etc. from any angle. Similar to the anatomical image, it can comprehensively reflect the characteristics of patients' lesions, replace the conventional angiography, and has a broad application prospect.

3. MRI DIAGNOSIS OF FOCAL SMALL LESION OF LIVER

Studies have shown that MRI diagnosis can not only provide anatomical images of lesions, but also provide corresponding pathological, physiological, metabolic and other functional information, with high diagnosis rate [4]. With the application of fast imaging sequence and dynamic contrast-enhanced scanning technology, MRI technology has more and more advantages in the diagnosis of small lesions, which is recognized by clinicians.

At the present stage, the clinical application of MRI techniques are: ① optimize the imaging sequence. There are many conventional MRI sequences, such as T1WI and T2WI. Different sequences can be used to scan the same lesion, and different histological images can be obtained. The combination of different sequences can also effectively shorten the scanning time, and compare the lesion site with the surrounding normal tissue, so as to diagnose and differentiate the disease. ② Multi phase dynamic contrast-enhanced MRI was performed. This technique is similar to dynamic contrast-enhanced CT scanning, which can effectively reflect the blood supply characteristics of the lesions, dynamically observe the enhancement characteristics of the lesions, and diagnose the disease. However, compared with CT contrast agent, the viscosity of contrast agent used in this technology is lower, the dosage is less, the injection speed is faster, the signal-to-noise ratio is higher, the enhanced image is clearer, and the detection sensitivity and quality are better [5]. ③ Diffusion weighted imaging. This technology is an enhancement technology based on conventional sequence imaging, which belongs to functional imaging technology. It is mainly used to detect the water in the body of patients for differential diagnosis of lesions, and is not used alone. ④ MRI perfusion enhanced imaging. This technology is similar to CT perfusion imaging technology, but the contrast dose is small, the nephrotoxicity is low, and there is no radiation, so the application safety is higher [6]. In recent years, the application of sensitive coding and acquisition technology and fast multi-slice interference gradient echo sequence further improves the spatial and temporal resolution of MRI perfusion imaging, which is more conducive to the early detection and qualitative of small focal liver lesions, and has a

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broad application prospect. ⑤ Application of specific contrast agent. In the traditional MRI examination, the non-specific contrast agent magenweisen is often used as the contrast agent, which has high limitation and poor effect. In recent years, more and more attention has been paid to clinical specific contrast agents [7], which can be divided into two categories: contrast agents that can be specifically absorbed by reticuloendothelial cells (such as superparamagnetic iron oxide granules contrast agent), contrast agents that can be specifically absorbed by hepatocytes (such as bisbisbisbisbisbisbisbisbisbisbisbisphenol, modico, ferric ammonium citrate), which can reflect the functional state of lesions in the early stage, Improve the effect of differential diagnosis. ⑥ Contrast enhanced magnetic resonance angiography. At this time, a new technology based on the application of fast imaging sequence and specific contrast agent, mainly for the diagnosis of patients with intravenous injection of magnetic contrast agent, can effectively shorten the time of blood vessel T1, collect the blood vessel signal in the focus area through fast imaging sequence, and reconstruct it by maximum intensity projection, volume rendering and other technologies, so as to clearly reflect the blood vessels in the focus tissue of patients, and improve the quality of life The accuracy of differential diagnosis. ⑦ Magnetic resonance spectroscopy. This technology is still under research, mainly through 31P spectrum and 1H spectrum for living organ tissue metabolism, biochemical changes and compound quantitative analysis, this technology has non-invasive, but for the diagnosis of small focal liver lesions is limited, need to rely on hardware facilities, positioning sequence improvement to improve the diagnosis effect [8].

4. SUMMARY

Limited small lesions of the liver is a common clinical space occupying lesion, which is harmful. If the differential diagnosis is not limited, it is likely to cause patients with malignant space occupying lesions to miss the best opportunity of treatment, and patients with benign lesions to carry out unnecessary surgical treatment. Therefore, it is necessary to select effective diagnostic techniques for differential diagnosis. CT and MRI are common imaging examination techniques in clinic, which have many advantages, such as simple operation, low cost, good detection effect, etc. with the continuous development of medical technology, the new changes derived from these two techniques, such as CT angiography and contrast-enhanced magnetic resonance angiography, have significantly improved the diagnostic ability. However, at this stage, there is still a lack of clinical research on the practical application of new technology, which will be the focus of future research.

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