

Comparison of Osteosarcoma CT and MRI Diagnostic Value

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Abstract: Osteosarcoma is a primary malignant bone tumour disease. Osteosarcoma of femur has a high degree of malignancy and rapid progression. Early diagnosis, defining the extent and extent of invasion of osteosarcoma are of great significance to improve clinical efficacy and prognosis. Traditionally, X-ray plain film is used to diagnose osteosarcoma of femur, which is simple and easy, but it is difficult to accurately determine the extent of lesion. With the continuous development of imaging technology, CT and MRI have been widely used in clinical diagnosis of various diseases and evaluation of curative effect, and achieved certain results. In this study, 33 cases of femoral osteosarcoma were selected, and the imaging features and diagnostic value of CT and MRI of femoral osteosarcoma were compared and analyzed.

1. Introduction

Osteosarcoma is a common bone malignancy in clinic. The incidence of osteosarcoma in adolescents is high. Local lesions of osteosarcoma at the onset stage may be accompanied by pain, obvious mass, dysfunction of movement, etc. The prognosis is poor. Studies have shown that early diagnosis, early intervention, prevention and treatment are effective measures to improve the survival rate of osteosarcoma patients. CT and MRI are commonly used in the clinical diagnosis of osteosarcoma, but there are obvious differences in the degree of pathological changes between the two imaging examinations. Therefore, to explore the accuracy and imaging characteristics of CT and MRI imaging in detecting osteosarcoma is of great significance for clinical selection of appropriate imaging methods.

2. Test materials and methods selected

Thirty three patients with 17 males and 16 females, who have primary osteosarcoma confirmed by biopsy and pathology were selected. Their ages ranged from 14 to 46 years, with an average age of (30.17 ± 2.35) years. Location of onset: 4 cases of humerus, 7 cases of tibia, 18 cases of femur, 1 case of ulna. Clinical symptoms: 30 patients complained of local pain after admission, including 9 cases of mass, 3 cases of skin swelling, and 7 cases of limited activity. Exclusion criteria: distant metastasis, lack of CT or MRI imaging data, secondary osteosarcoma. All 30 patients were examined by CT and MRI after admission. The detection methods are as follows:

CT scanning: Scanning parameters: slice thickness and spacing were 5 mm, and coronal and sagittal plain scanning were performed by 200 mAs current. 100 ml iodophor alcohol injection was injected intravenously, and then the arterial and venous phases were scanned.

MRI scanning: Scanning parameters: slice thickness and spacing were 3 mm and 1.5 mm, respectively. They were scanned in three directions: transverse, coronal and sagittal. Note Gd-DTPA 0.1 mmol/kg enhanced scan, FSE sequence: T1WI (TR/TE: 401 ms/10 ms), T2WI (TR/TE: 4480 ms/116 ms). CT and MRI imaging data were analyzed by 2 to 3 experienced radiologists, all of whom read the films blindly.

3. Test results of observed indicators

Based on the results of pathological examination, the accuracy of two kinds of imaging diagnosis

of osteosarcoma was analyzed; the accuracy of two kinds of imaging examination for the related signs of osteosarcoma was analyzed; and the imaging characteristics of osteosarcoma on CT or MRI were analyzed. Statistical software SPSS 19.0 was used to analyze the data, expressed by% and F test was performed between groups, $P < 0.05$ was the difference.

The accuracy of CT or MRI in the diagnosis of osteosarcoma was different ($P > 0.05$), as shown in Table 1.

Table 1. Accuracy comparison of CT and MRI in osteosarcoma diagnosis

Group	Number of cases	Accuracy	Misdiagnosis
CT	33	26 (86.67)	4 (13.33)
MRI	33	28 (93.33)	2 (6.67)

The accuracy of MRI in diagnosing bone destruction, periosteal reaction and soft tissue mass was 100.0%, 83.33% and 96.67% respectively, higher than that of CT, and the accuracy of CT in diagnosing bone tumors was higher than that of MRI ($P < 0.05$), with statistical significance, as shown in Table 2.

Table 2. Related-accuracy of CT and MRI in osteosarcoma diagnosis

Osteosarcoma sign	CT	MRI
Bone destruction	26 (80.0)	303(100.0) ^{ab}
Tumor bone	31 (98.7) ^a	19 (56.7) ^b
Periosteal reaction	16 (46.7)	27 (83.3) ^{ab}
Soft tissue mass	26 (73.3)	31 (96.7) ^{ab}
Codman triangle	31 (63.3)	15 (43.3)

Imaging features of CT osteosarcoma: High density of cartilage tissue was seen in 33 cases of intramedullary cavity. In 29 cases, dense ethmoidal holes were found in the cortex. The intramedullary tumors were linked to the mass near the cortical interruption. In 5 cases, the cortex became thinner but unevenly distributed.

Imaging features of MR osteosarcoma: 33 patients had no high signal in bone marrow, which was replaced by tumor tissue. Twenty-eight patients had low signal on T1WI, 4 patients with hemorrhage showed high signal on T1WI, and the other two patients had inhomogeneous high signal on T2WI.

4. Analysis and comparison of CT and MRI diagnostic value of osteosarcoma

Osteosarcoma is one of the primary malignant tumors of bone. The incidence of osteosarcoma in males is slightly higher than that in females. Tumor cell differentiation is irregular and complex, and its clinical manifestations are also significantly different. Domestic studies have shown that osteosarcoma has a high degree of deterioration and a high fatality rate. With the development of diagnosis and treatment technology, early operation combined with chemotherapy can improve the survival rate of osteosarcoma. At present, clinical medical imaging diagnosis of osteosarcoma mainly includes two ways, namely CT and MRI, which diagnostic methods should be selected to improve the accuracy of diagnosis of tumors and related signs, which has become the focus of clinical attention. It has been pointed out that MRI can accurately distinguish the difference between normal tissue and abnormal tissue, which has unique advantages in detecting cartilage tissue lesions, but it cannot be used in differential diagnosis of diseases because it cannot show tissue calcification.

4.1 CT diagnosis value of osteosarcoma

CT has a high-density resolution, which can distinguish bone density, soft tissue density, necrotic cyst density and so on. It can identify the signs that X-ray plain film is difficult to find and affirm, and can find more small lesions, and show more clearly soft tissue masses. CT is more sensitive than CT in demonstrating cortical destruction, and MRI is more sensitive than CT in detecting early cortical destruction, especially in the diagnosis of early atypical lesions, more accurate in observing the details of lesions, and has advantages in observing soft tissue masses, their internal changes and joint invasion. However, CT is a cross-sectional imaging, it is difficult to show the periosteal triangle. It is necessary to combine the upper and lower multi-level judgement, and cannot find slight layered periosteal reaction. In addition, when the soft tissue is surrounded by muscle, it is difficult for CT to accurately determine the tumor boundary because of the similar density of the two and the presence of peritumoral muscle edema.

4.2 MRI diagnosis value of osteosarcoma

MRI is of great value in the diagnosis of osteosarcoma, in which T1WI shows different signals in different pathological conditions, while T2WI shows higher mixed signals mainly. The involvement of bone marrow in T1WI was better than that in T2WI. Normal high signal intensity of medullary cavity invasion in TiWI was replaced by tumor tissue. Some studies suggest that TiWI should be the first choice to determine the extent of osteosarcoma invasion. Abnormal signals can be seen even if the bone marrow is slightly invaded, and the extent of tumor infiltration in bone marrow is obviously larger than that in CT. It can be used to accurately judge the changes of disease after chemotherapy. Some scholars believe that the changes of tumor boundary, volume and signal after chemotherapy can help to judge the rate of chemotherapy necrosis. In patients with bone cortex breakthrough, the cortex was interrupted locally, showing mixed signals; the mass broke through the cortex and extended to the surrounding area, forming soft tissue masses, showing edema zones around the tumors, and showed excellent performance on T2WI. Dynamic contrast-enhanced MR imaging can show the lesions more clearly, mainly in the early stage of tumor tissue edge enhancement and delayed central filling. Non-uniform enhancement is common in delayed stage.

Although the specificity of MRI is not high enough, the sensitivity is high. In addition, MRI can detect small lesions, which are of great significance for the diagnosis of early onset patients, and can give patients a higher chance of survival. In addition, it has obvious advantages in judging the size and scope of tumors and jumping lesions. Compared with pathological specimens, the range shown by MRI can be up to 2 mm, which is obviously superior to that shown by CT (15 mm). The measurement of lesion size is closer to the actual measurement size after operation, and the accuracy is significantly higher than that of CT.

5. Conclusions

For patients with suspected osteosarcoma, CT or MRI of the lesion site to further evaluate the extent of tumor involvement is a necessary imaging examination for osteosarcoma. CT can find details, and has obvious advantages in displaying osteosarcoma lesions with complex structures and more overlapping sites. However, CT may miss the diagnosis of skipping lesions of osteosarcoma. The determination of the extent and stage of bone marrow invasion by CT is not as good as that by MRI. In addition, MRI can accurately show the location of the tumors with adjacent soft tissues, joints and vascular bundles, and help to judge the extent of soft tissue invasion by tumors. However, the specificity of MRI signal is not high, and the display of bone destruction, periosteal reaction and tumor bone is not as good as that of CT. Therefore, combined with their respective advantages, we can effectively guide the selection of clinical surgical methods to improve the therapeutic effect of patients and ensure a good prognosis.

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