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Comparison of the Accuracy of ^{99m}TC-MDP and ^{99m}TC-SC Bone Scanning Imaging for the Diagnosis of Chronic Osteomyelitis

Houwei Xu[1], Ting Tang[2], Zhiliang Yin[1], Jia Qu[3], Yao Geng[1], Xuemei Zhong[4,*], Lu Chen[5,*]

[1]*Department of Orthopedics, Chengfei Hospital of Genertec Medical, Chengdu, China*

[2]*Department of Geriatric Medicine, Chengfei Hospital of Genertec Medical, Chengdu, China*

[3]*Department of Medical Administration, Chengfei Hospital of Genertec Medical, Chengdu, China*

[4]*School of Clinical Medicine, Chongqing Medical and Pharmaceutical College, Chongqing, China*

[5]*Department of Orthopedics, Affiliated Hospital of North Sichuan Medical College, Nanchong, China*

[*]**Corresponding Authors:** Lu Chen, Department of Orthopedics, Department of Orthopedics, Affiliated Hospital of North Sichuan Medical Collage, Maoyuan South Road 1, Shunqing District, Nanchong, 637001, China. Tel: +86-0817-2239379. E-mail: 18057819@qq.com

Xuemei Zhong, School of Clinical Medicine, Chongqing Medical and Pharmaceutical College, No. 82, Daxuecheng zhong Rd, Shapingba Dist, Chongqing, 401331, China. Tel: +86-0817-2239379. E-mail: 10840@cqmpc.edu.cn

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Abstract

Background: There is a lack of effective imaging tools for the clinical confirmation of chronic osteomyelitisis. At present, there are few studies/reports on the diagnosis of chronic osteomyelitisis by nuclear medicine at home and abroad. In this study, we retrospectively observed the accuracy of ^{99m}TC-MDP and ^{99m}TC-SC bone scanning imaging for the diagnosis of chronic osteomyelitisis and explored the clinical value of the two nuclear medicine imaging modalities for the diagnosis of chronic osteomyelitisis.

Methods: Patients who underwent ^{99m}TC-MDP or ^{99m}TC-SC bone scan imaging with surgical treatment for suspected chronic osteomyelitisis in our hospital from January 2019 to December 2022 were retrospectively analyzed. They were categorized into the ^{99m}TC-MDP group and ^{99m}TC-SC group according to their bone scan imaging modality. The bone scan results were also compared with the postoperative pathology and culture results to clarify the accuracy of the two imaging modalities.

Results: A total of 72 patients were included, including 38 patients in the ^{99m}TC-MDP group and 34 patients in the ^{99m}TC-SC group. A total of 51 patients were diagnosed with chronic osteomyelitisis. Bone scanning imaging in the ^{99m}TC-MDP group showed positive results in 29 cases and negative results in 9 cases, consistent with the final pathologic diagno-

sis in 24 cases and inconsistent with the final pathologic diagnosis in 14 cases. Bone scanning imaging in the ^{99m}TC-SC group showed positive results in 27 cases and negative results in 7 cases, consistent with the final pathologic diagnosis in 29 cases and inconsistent with the final pathologic diagnosis in 5 cases. The sensitivity, specificity, misdiagnosis rate, leakage rate, positive predictive value, negative predictive value, and accuracy of ^{99m}TC-MDP bone scan for the diagnosis of chronic osteomyelitisis were 80% (20/25), 30.77% (4/13), 69.23% (9/13), 20% (5/25), 68.97% (20/29), and 44.44% (4/9), respectively, 63.16% (24/38); the sensitivity, specificity, misdiagnosis rate, leakage rate, positive predictive value, negative predictive value, and accuracy of ^{99m}TC-SC bone scan for diagnosing chronic osteomyelitisis were 92.31% (24/26), 62.5% (5/8), 37.5% (3/8), 7.69% (2/26), and 88.89% (24/27), respectively, 71.43% (5/7), 85.29% (29/34). The accuracy of the two tests by chi-square test (2) was 2=8.25, P<0.05, so ^{99m}TC-SC bone scanning imaging was more accurate than ^{99m}TC-MDP bone scanning imaging in diagnosing chronic osteomyelitisis.

Conclusion: Based on the current results, ^{99m}TC-SC has a higher diagnostic accuracy for chronic osteomyelitisis than ^{99m}TC-MDP bone scan imaging.

Keywords: ^{99m}TC-MDP; ^{99m}TC-SC; Chronic osteomyelitisis; Diagnostic methods; Nuclear medicine

Introduction

Chronic osteomyelitisis is primarily a continuation of acute/chronic bone infection and acute suppurative osteomyelitisis, with symptoms typically limited to local and general manifestations. Systemic symptomatic manifestations only occur when there is poor local drainage. Open fractures and infections following internal/external fixation of fractures are the main causative factors. The disease has a long incubation period, making treatment challenging, with some cases remaining incurable for years or even decades. Moreover, the increasing prevalence of drug-resistant bacteria due to antibiotic misuse further elevates the risk of chronic osteomyelitisis in recent years [1]. Delayed optimal treatment reduces the likelihood of cure, while inaccurate clinical diagnosis prohibits long-term intravenous antibiotic therapy [2, 3]. Therefore, early diagnosis plays a crucial role in facilitating timely management; however, due to atypical initial symptoms in patients with chronic osteomyelitisis, early and accurate detection remains difficult [4, 5].

Currently, the diagnosis of acute and chronic osteomyelitisis and infection following internal/external fixation of fractures primarily relies on clinical manifestations, laboratory blood test indicators, as well as CT and CT-MRI imaging. However, these methods suffer from poor sensitivity and low accuracy. Prior to an acute attack, most patients with chronic osteomyelitisis exhibit negative results in these diagnostic tests. Blood inflammatory markers such as white blood cell count, neutrophil count, high sensitivity reactive protein (CRP), interleukin-6 (IL-6), and erythrocyte sedimentation rate (ESR) are considered non-specific indicators for diagnosing chronic osteomyelitisis [6-8]. Furthermore, imaging studies also have limitations in diagnosing chronic osteomyelitisis. While DR examination can be performed in patients with acute infection symptoms, features like fixation aseptic loosening, focal osteoporosis, and cortical thinning lack specificity during the subacute or chronic stages of infection [9]. Although CT is more useful than DR in this regard, its application is limited due to poor result sipecificity and increased artifacts caused by metal fixators commonly present in patients with chronic osteomyelitisis. MRI is another option but it is expensive and has similar sensitivity to CT; therefore it is rarely used [10].

The gold standard for diagnosing chronic osteomyelitisis still relies on intraoperative histological staining observation, bacterial culture, and identification [11]. However, this method is invasive and costly, causing patient discomfort and potentially introducing external bacteria through improper operation on bone tissue, leading to false positive results that are difficult for patients to accept. With the continuous advancement of nuclear medicine technology and theory, various bone scanning imaging

techniques are playing an increasingly prominent role in detecting osteomyelitisis. These include technetium-99m-methylene diphosphonate bone imaging (^{99m}TC-MDP), technetium-99m-leukocyte labeling imaging (^{99m}TC-HMPAO), and technetium-99m-sulfur colloid imaging (^{99m}TC-SC). Currently, there are limited reports on the use of nuclear medicine imaging technology in diagnosing chronic osteomyelitisis. This study aims to retrospectively compare ^{99m}TC-MDP bone scan imaging with ^{99m}TC-SC bone scan imaging to evaluate their clinical value in diagnosing chronic osteomyelitisis by examining changes in bone tissue reflected by these modalities against postoperative histopathological results.

Materials and Methods

The Ethics Committee of our hospital approved this study (Ethics review number: 2023032). Personal information and medical conditions of all participants were securely stored in the hospital database prior to their utilization in the study, and written informed consent forms were obtained from all participants regarding their participation.

Patient Selection

A retrospective analysis was conducted on patients admitted to our hospital between January 2019 and January 2023 for suspected cases of "chronic osteomyelitisis" who underwent ^{99m}Tc-MDP bone scan or ^{99m}Tc-SC bone imaging along with surgical treatment.

Inclusion criteria: (1) Patients diagnosed with chronic osteomyelitisis in the outpatient/emergency department and admitted for surgical treatment, as well as ^{99m}Tc-MDP bone scan or ^{99m}Tc-MDP bone scan imaging. (2) Age requirement: over 18 years old. (3) Pathological tissue specimens were obtained during the operation and sent for examination, ensuring clear results. (4) Follow-up period exceeding 6 months. (5) Complete clinical and imaging data throughout the follow-up.

Exclusion criteria: (1) Patients with tuberculosis infection indicated by pathological examination and culture will be excluded. (2) Individuals who have an allergy to ^{99m}Tc-MDP or ^{99m}Tc-SC contrast agents, or are unable to tolerate the examination, will not be included. (3) Patients with severe cardiovascular diseases or malignant tumors will be excluded from the study. (4) Participants with incomplete perioperative or follow-up medical records will not be considered.

The management of daily activities following admission

All subjects were routinely tested for white blood cell count (blood routine), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), interleukin-6 (IL-6) and other inflammatory indicators after admission. If there were open wounds and local secretions, bacterial culture and drug sensitivity test were completed. DR And CT examination of the lesion site were performed to preliminarily determine the size of the lesion and whether there was bone change. None of the patients received antibiotics before surgical treatment (before the removal of pathological specimens).

^{99m}Tc-MDP and ^{99m}Tc-SC bone scans

On the day of the examination, the patient could eat normally and receive ^{99m}TC-MDP 20-25 mCi or intravenous injection after evaluation of no obvious contraindication ^{99m}TC-SC 3-12 mCi, 1000 to 1500ml of water was consumed within half an hour after injection to promote bone absorption of the imaging agent and excretion of the drug, and whole body bone scan imaging was performed approximately 2-4 hours later. After the initial dynamic imaging, the imaging activity of the suspicious location after the injection of radioactive contrast agent was visualized, and the lesion site and the region of interest were magnified and compared.

The results of ^{99m}TC-MDP and ^{99m}TC-SC bone scan were interpreted by two experienced nuclear medicine experts. In case of in-

consistent conclusions, consensus was reached through collective discussion among nuclear medicine experts. Compared with the same part of the contralateral limb, an abnormal concentration of ^{99m}TC-MDP and ^{99m}TC-SC imaging agent in the same part of the contralateral limb but no concentration of ^{99m}TC-MDP and ^{99m}TC-SC imaging agent in the same part of the contralateral limb suggests that the site may have infection, and the scan result was considered to be positive. Then the scanning results were compared with the lesions seen during the operation, the surgical area tissue specimen culture and pathological examination standard for comparison. The two nuclear medicine experts who evaluated the bone scans were unaware of the clinical parameters and the location of suspicious lesions.

Surgery-Related treatments

All 72 patients were treated with diagnostic/therapeutic surgery. The lesions were cut open and suspicious/diseased tissues were taken for pathological examination. The patients with lesions confirmed during the operation were treated with debridement and elimination of pathological dead space. Among the patients with chronic osteomyelitisis after internal fixation, 12 patients retained the internal fixator, 6 patients changed to external fixator fixation, and 4 patients were replaced due to the loosening of the internal fixator. According to the results of pathological examination and culture, sensitive antibiotics were used regularly, inflammatory indicators were reviewed regularly, and wound dressing was changed routinely.

Determination of Final Results

Pathological biopsy and culture results obtained during the operation. In pathological specimens, chronic osteomyelitisis was considered when there was a large amount of dead bone tissue, reactive fibrous tissue and a large amount of inflammatory cell infiltration in the bone tissue. If the culture results suggested bacterial growth, osteomyelitisis was definitely confirmed. A soft tissue inflammatory lesion was diagnosed if there were no inflammatory changes in the bone tissue but an inflammatory reaction was present in the surrounding soft tissue.

Statistical Analysis

Quantitative data were expressed as mean ± standard deviation (M±SD). For comparison of quantitative data between groups, was used 2 test. Ordered qualitative data were compared using the Mann-Whitney rank sum test. SPSS 22.0 software was used for statistical analysis. $P< 0.05$ was considered statistically significant.

Results

Statistical Result

A total of 72 patients were enrolled and divided into ^{99m}TC-MDP group (n = 38) and ^{99m}TC-SC group (n = 34) according to the different bone scanning methods. There were 38 males and 34 females, aged from 34 to 78 years, with an average age of 53.36±11.50 years. There were no significant differences in age (P = 0.304), gender (P = 0.500) and body mass index (BMI) (P = 0.940) between the two groups.

A total of 51 patients were diagnosed with chronic osteomyelitisis. Among them, in the ^{99m}TC-MDP group, 29 cases had positive results of bone scan imaging, 9 cases had negative results, 24 cases were consistent with the final pathological diagnosis, and 14 cases were inconsistent with the final pathological diagnosis, as shown in Table 1. In the ^{99m}TC-SC group, 27 cases had positive results, 7 cases had negative results, 29 cases were consistent with the final pathological diagnosis, and 5 cases were inconsistent with the final pathological diagnosis, as shown in Table 2. By comparing the predictive diagnosis and final diagnosis of chronic osteomyelitisis between ^{99m}TC-MDP and ^{99m}TC-SC bone scan, 24 cases of ^{99m}TC-MDP was consistent with the final diagnosis, and the accuracy rate was 63.16%. Fourteen cases of ^{99m}TC-MDP were inconsistent with the final diagnosis, including 9

cases of misdiagnosis and 5 cases of missed diagnosis. Similarly, 29 cases in ^{99m}TC-SC group were consistent with the final diagnosis, and the accuracy rate was 85.29%. Five cases were inconsistent with the final diagnosis, including 3 cases of misdiagnosis and 2 cases of missed diagnosis, as shown in Table 3.

The sensitivity, specificity, misdiagnosis rate, missed diagnosis rate, positive predictive value, negative predictive value and accuracy rate of ^{99m}TC-MDP bone scan in the diagnosis of chronic osteomyelitisis were 80% (20/25), 30.77% (4/13), 69.23% (9/13) and 20%, respectively (5/25), 68.97% (20/29), 44.44% (4/9), 63.16% (24/38); ^{99m}TC-SC bone scan for the diagnosis of chronic osteomyelitisis. The sensitivity, specificity, misdiagnosis rate, missed diagnosis rate, positive predictive value, negative predictive value and accuracy rate were 92.31% (24/26), 62.5% (5/8), 37.5% (3/8), 7.69% (2/26) and 88.89%, respectively (24/27), 71.43%(5/7), 85.29%(29/34), as shown in Table 4. The accuracy of the two methods was tested by chi-square test (2), the results were : 2=8.25， P<0.05, so ^{99m}TC-SC bone scan imaging is more accurate than ^{99m}TC-MDP bone scan imaging in the diagnosis of chronic osteomyelitisis. In addition, through calculation we found that the positive likelihood ratio and negative likelihood ratio of ^{99m}TC-SC bone scan imaging were 2.4616 and 0.123, respectively, while ^{99m}TC-MDP. The positive likelihood ratio and negative likelihood ratio of bone scan imaging were 1.16 and 0.65, respectively, so 99m could be inferred TC-SC bone scan imaging is more accurate than ^{99m}TC-MDP bone scan imaging in the diagnosis and exclusion of chronic osteomyelitisis.

Table 1: Bone scanning imaging results in the 99mTC-MDP group

99mTC-MDP results	Pathological results and bacterial culture results		Total
	(+)	(-)	
+	20	9	29
-	5	4	9
Total	25	13	38

Table 2: Bone scanning imaging results in the 99mTC-SC group

99mTC-SC results	Pathological results and bacterial culture		Total
	(+)	(-)	
+	24	3	27
-	2	5	7
Total	26	8	34

Table 3: Comparison of bone scanning imaging results between ^{99m}TC-MDP and ^{99m}TC-SC

diagnostic method	Comparation with the pathological results and bacterial culture		Total	Accuracy rate（%）
	conformity	unconformity		
99mTC-MDP	24	14	38	63.16%
99mTC-SC	29	5	34	85.29%
Total	53	19	72	73.61%
2	8.25 > 3.84 (P=0.05)		P<0.005 (2=7.88)	

Table 4: Analysis of 99mTC-MDP and 99mTC-SC bone scanning imaging results

MethodsResults	99mTC-MDP	99mTC-SC
Sensitivity	80%	92.31%
Misdiagnosis rate	69.23%	37.5%
Omission diagnostic rate	20%	7.69%
Specificity	30.77%	62.5%
Positive predictive value	68.97%	88.89%
Negative predictive value	44.44%	71.43%
Positive likelihood ratio	1.16	2.46
Negative likelihood ratio	0.65	0.123

Typical Case

Among the 51 confirmed cases, there were 14 cases of Staphylococcus aureus, 10 cases of Enterococcus faecalis, 9 cases of Enterobacter cloacae, 2 cases of Klebsiella pneumoniae, 3 cases of coagulase-negative Staphylococcus, 8 cases of Staphylococcus epidermidis, and 5 cases of Bacillus cereus. Representative histopathological images of chronic osteomyelitisis are shown in Figure 1, showing a large number of inflammatory cell infiltration or formation of dead bone tissue within the lesion. In addition, DR Is the most basic imaging diagnostic method, and we observed typical manifestations of DR (Figure 2) in the tibia of two male patients :(1) different degrees of bone resorption and osteolysis, widening of the gap between the broken ends, sclerosis, bone atrophy, and nonunion or poor union of the fracture. (2) After removal of the internal fixator, the cortical bone under the plate was absorbed and dissolved, and the dissolved bone formed a cavity around the locking nail hole. (3) Abnormal bone hyperplasia, osteoporosis, uneven density, mild periosteal reaction, and cribriform changes in cortical bone.

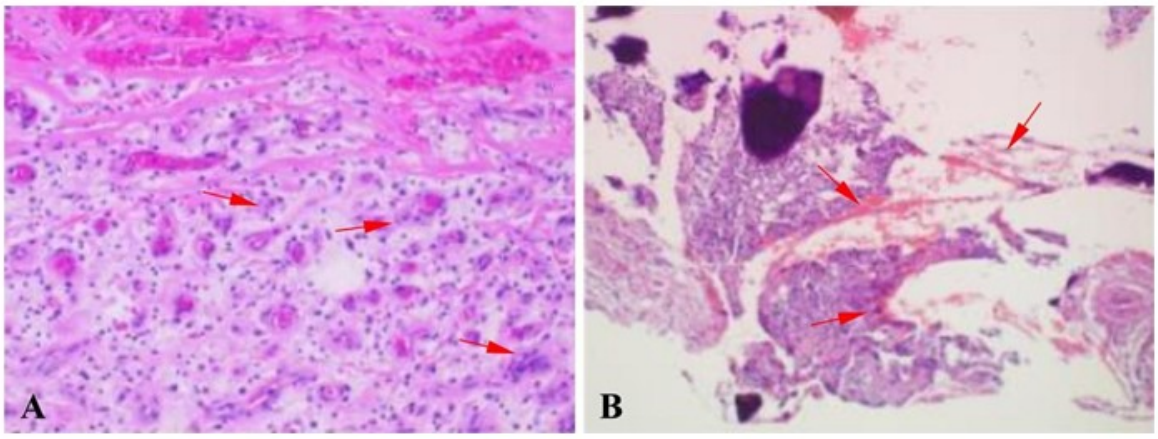

Figure 1: Histopathological images of chronic osteomyelitis. (A) Small amount of squamous epithelium, fibrous tissue, inner granulation tissue proliferation and infiltration of more lymphocytes and neutrophils were observed, suggesting chronic osteomyelitis. (B) The infiltration of inflammatory cells in the dead bone tissue and fibroadipose tissue suggested chronic osteomyelitis. (Hematoxylin and eosin staining, 1:200).

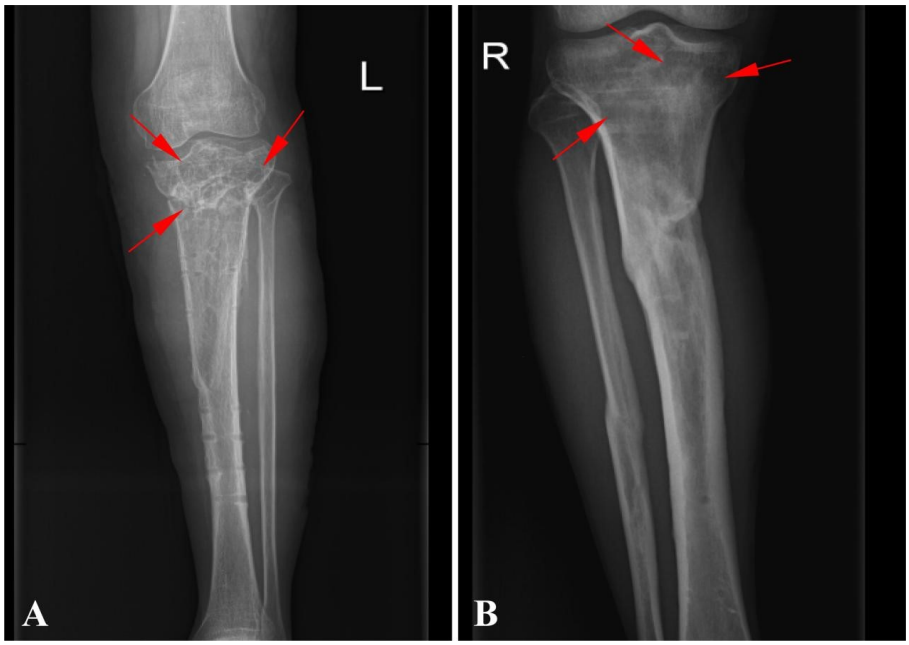

Figure 2: DR Radiograph of chronic osteomyelitis. (A) The fracture ends of the middle and upper left tibia were in good alignment after removal of internal fixation. In the middle part of the tibia, the local bone cortex was thickened, the bone density was increased, and the small cystic bone absorption was seen. The corresponding segment of the medullary cavity was not unobstructed. Results The lesions were considered to be infectious. (B) After removal of the internal fixation for the fracture of the right tibial plateau, irregular bone morphology was observed in the middle and upper part of the left tibia, with patchy density shadow in the bone marrow, uneven thickening of the bone cortex, and periosteal reaction at the edge.

According to the final pathology and culture results, 51 patients were diagnosed as chronic osteomyelitisis, and the remaining 21 patients were diagnosed as internal fixation loosening, aseptic inflammation, and simple soft tissue infection. Figure 3a is a patient who was finally excluded from infection after internal fixation. The patient suffered from pain, swelling and other clinical symptoms due to bone nonunion and internal fixation failure after internal fixation of proximal tibial fracture. As can be seen from the figure, increased bone uptake was detected in ^{99m}TC-MDP bone imaging, but no inflammatory cell infiltration was detected in the final pathological examination. At the same time, the bacterial culture of the intraoperative specimen was negative. ^{99m}TC-SC concentration was also found in the distal femur of the patient shown in Figure 3b, but the final biopsy and culture results were negative. Figure 4a shows the case with the final diagnosis of osteomyelitisis, where ^{99m}TC-MDP concentration was detected in the proximal tibia, and the postoperative pathological examination and culture results of this patient were suggestive of infection. The case shown in Figure 4a also showed abnormal concentration of imaging agent in ^{99m}TC-SC imaging at the painful site of the proximal tibia, which was reflected by increased inflammatory cell uptake and increased bone metabolism. The final pathological and culture results also suggested chronic osteomyelitisis.

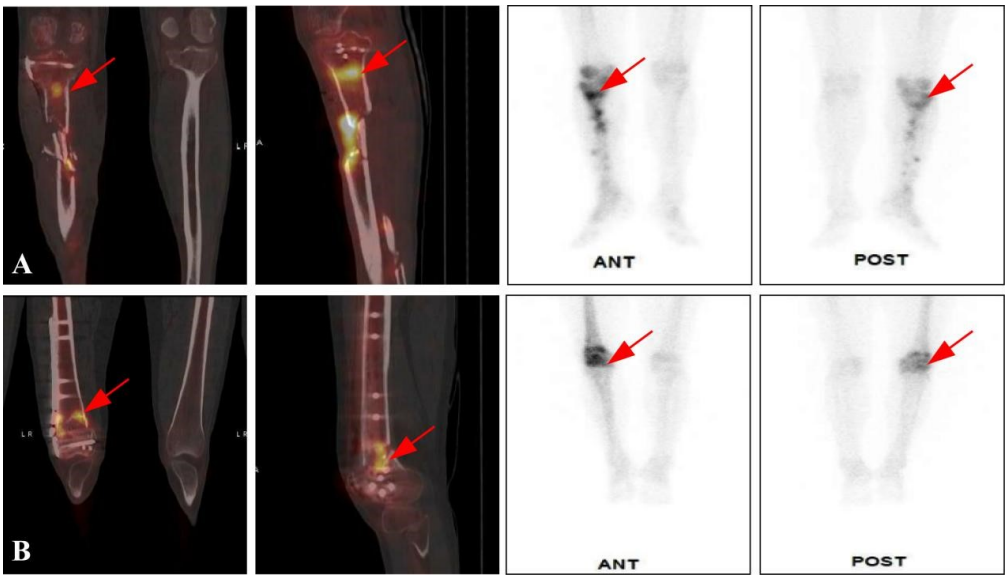

Figure 3: Bone scan imaging results of two false-positive patients. (A) Increased methylene diphosphate uptake detected on ^{99m}TC-MDP bone scintigraphy of the proximal tibia in this patient (arrow marked); (B) In this patient, increased sulfur colloid uptake was found in the distal femur. The results of two nuclear medicine tests suggested the presence of osteomyelitis, but the final surgical pathology and culture results confirmed the absence of osteomyelitis in these two patients.

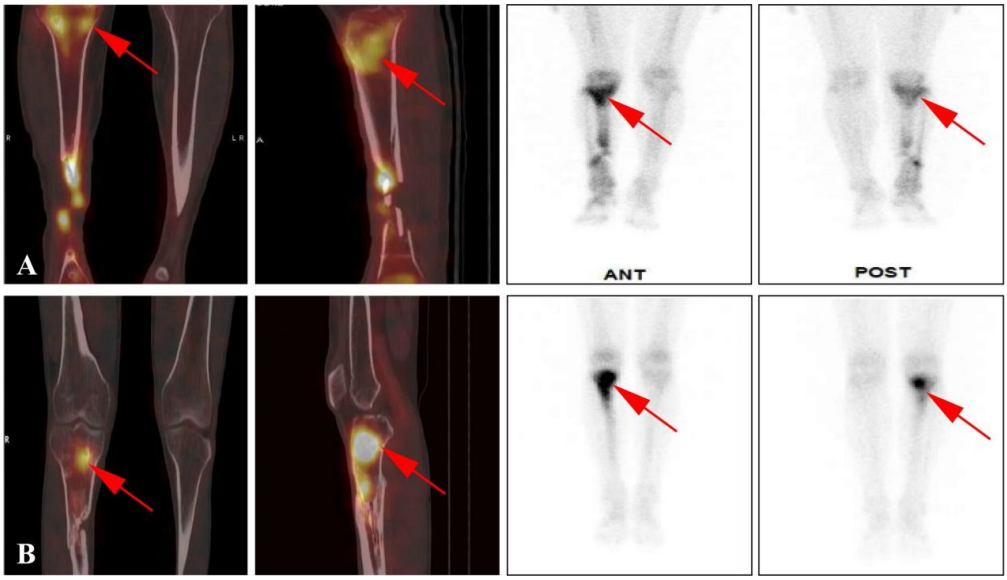

Figure 4: Bone scan imaging results of two true positive patients. (A) A 56-year-old man with open fracture of the right proximal tibia underwent closed reduction and external fixation of the right tibial fracture. The external fixator was removed 2 months after the operation, and the open reduction and internal fixation of the right tibial fracture was planned. The final pathology and culture results were also positive. (B) A 63-year-old man presented with nonunion of the right proximal tibia fracture, and a significant increase in sulfur colloid uptake at the fracture stump was detected by ^{99m}TC-SC bone scan (arrow marked), which was finally confirmed as chronic osteomyelitis by surgical pathological examination.

Discussion

Chronic osteomyelitisis is one of the most common and serious complications of bone tissue infection and internal/external fixation of fractures, especially open fractures with severe soft tissue injury [12, 13]. There are many factors that can cause infection after fracture surgery. The factors that increase the risk of infection after internal/external fixation surgery include open

wound, severely contaminated wound, of soft tissue, tissue vascular division. Poor cloth, multiple surgery-related injuries, immune impairment, diabetes, metal and other internal fixation implants [14]. The development of chronic osteomyelitisis not only prolongs hospital stays and increases costs, but also increases the risk of nonunion and amputation. Therefore, early diagnosis and timely surgical timing of chronic osteomyelitisis are very important. When chronic osteomyelitisis is highly suspected, surgical treatment should be performed as soon as possible. In addition, when the skin and soft tissue are coexisting with poor healing, if only the soft tissue infection is treated with antibiotics without thorough surgical removal of the lesion, the early symptoms of bone infection will be covered up, and then severe infection and chronic osteomyelitisis will develop, greatly increasing the difficulty of treatment [15].

At present, there is a lack of simple and effective specific detection methods for the diagnosis of chronic osteomyelitisis. With the continuous development of orthopedics and nuclear medicine theory, the role of radionuclide imaging in the evaluation of internal fixation implant-related infection is constantly improving. ^{99m}TC-MDP has been used for decades to reflect the tissue metabolic changes in chronic osteomyelitisis and is still a routine test for the diagnosis of chronic osteomyelitisis and periprosthetic infection. However, the degree of diphosphate accumulation deposited in bone tissue reflected by ^{99m}TC-MDP bone imaging mainly depends on the active degree of bone metabolism and local blood flow status, so its accuracy in the diagnosis of chronic osteomyelitisis has been controversial [16]. Because most patients have a physiological inflammatory response after trauma or surgery. The enhanced bone repair ability accompanied by the increased bone metabolism can lead to false positive results of ^{99m}TC-MDP imaging. Similarly, local soft tissue aseptic inflammatory stimulation, injury and infection can also increase local blood perfusion, resulting in false positive ^{99m}TC-MDP imaging results.

In recent years, inspired by the fact that ^{99m}TC-SC can be specifically engulfed by monocyte-macrophages in vivo, the role of ^{99m}TC-SC bone scanning imaging in assisting the diagnosis of chronic osteomyelitisis has become more and more prominent. Under physiological conditions, mononuclear-macrophages are mainly distributed in the liver (80%-85%), spleen (10%) and red bone marrow (5%) [17], while in normal adults, red bone marrow is scattered in the trunk, skull, femur and proximal 1/3 of the humerus. The early stage of acute inflammation is dominated by neutrophil infiltration, while the late stage of inflammation and chronic inflammation are dominated by a large number of monocyte-macrophages infiltration [18], and sulfur colloid can be specifically phagocytized by monocyte-macrophages. Therefore, unlike neutrophil infiltration caused by surgical trauma, ^{99m}TC-SC has higher specificity, sensitivity and accuracy in the diagnosis of chronic osteomyelitisis.

However, there is still a lack of clinical evidence for ^{99m}TC-SC bone scanning imaging in the diagnosis of chronic osteomyelitisis. In this study, the results of laboratory examination, DR, CT, ^{99m}TC-MDP and ^{99m}TC-SC bone scanning imaging were observed in 72 patients with highly suspected chronic osteomyelitisis, and the results were compared with the results of surgical examination and culture. Finally, ^{99m}TC-SC bone scan is more accurate than ^{99m}TC-MDP bone scan in the diagnosis of chronic osteomyelitisis. At present, the radionuclide imaging used in the diagnosis of infection after internal/external fixation of fractures and prosthetic joint replacement includes 99m technetium imaging (including 99m labeled ciprofloxacin imaging, 99m labeled antimicrobial peptide imaging, 99m labeled sulfamethoxomab imaging), 67 gallium imaging, 111 indium imaging (^{111}In--WBC), and so on 18F-fluorodeoxyglucose positron emission tomography (18F-FDG-PET) [19]. It has been reported that ^{111}In--WBC radiodrug is sensitive to detect osteomyelitisis and soft tissue infection due to its chemoattractive accumulation at the site of acute infection, but the specificity of ^{111}In-WBC scanning is greatly affected by its physiological distribution due to the specific phagocytosis of reticuloendothelial cells [20]. That is, changes in ^{111}In-WBC uptake may represent infection or may simply be hemodynamically active bone marrow [21]. Some scholars also proposed that the diagnostic accuracy of ^{111}In-WBC and ^{99m}Tc-SC combined imaging for bone and joint infection was higher than that of ^{99m}TC-MDP scanning alone or ^{111}In-WBC combined with ^{99m}TC-MDP scanning [22]. Although theoretically speaking. The diagnostic accuracy of ^{111}In-WBC and ^{99m}TC-SC combined imaging for bone and joint infection is high, but it is limited by the poor safety of the two imaging agents used at the same time, the difficult control of drug metabolism, the long interval time and the high cost [23].

This study has certain limitations. First, this was a single-center retrospective study involving only a small number of patients, which resulted in small sample size, large sampling error, and lack of high-quality representative results. Secondly, due to the retrospective study, the patients included in the study were poorly managed during hospitalization and after surgery, and there may be a few patients who used antibiotics independently before receiving bone imaging, which may also cause errors in the results of bone scanning imaging and surgical pathological tissue detection. Therefore, multicenter prospective studies with larger numbers of patients and cost-effectiveness studies are urgently needed to confirm the results of this study.

Conclusion

In conclusion, the results of this study suggest that ^{99m}TC-SC bone scan has higher accuracy, sensitivity and specificity than ^{99m}TC-MDP bone scan in the diagnosis of chronic osteomyelitisis. ^{99m}TC-SC bone scan imaging is expected to be one of the new non-invasive methods for the diagnosis of chronic osteomyelitisis.

Declaration

Ethics Approval and Consent to Participate

The Ethics Committee of Chengfei Hospital of Genertec Medical approved this study (Ethics review number: 2023032). Personal information and medical conditions of all participants were securely stored in the hospital database prior to their utilization in the study, and written informed consent forms were obtained from all participants regarding their participation.

Consent for Publication

Not applicable

Competing Interests

The authors declare that there is no conflict of interest in this study.

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Authors' Contributions

Houwei Xu: Conceptualization, Methodology, Software, Investigation, Formal Analysis, Writing - Original Draft;

Ting Tang: Data Curation, Writing - Original Draft;

Zhiliang Yin: Visualization, Investigation;

Jia Qu:Resources, Supervision;

Yao Geng:Software, Validation

Xuemei Zhong: Visualization, Writing - Review & Editing

Lu Chen: Visualization, Writing - Review & Editing

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Availability of Data and Materials

The datasets used and analysed during the current study available from the corresponding author on reasonable request.

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