

Acute multifocal osteomyelitis: Tc-99m Methylendiphosphanate, Tc-99m HMPAO leucocytes and Tc-99m (V) dimercaptosuccinic acid imaging

Akut multifokal osteomyelit: Tc-99m Methylendiphosphanate, Tc-99m HMPAO lökosit ve Tc-99m (V) dimercaptosuccinic acid görüntüleme

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Abstract

A 13 years old male was referred to nuclear medicine department for evaluation of suspected acute multifocal osteomyelitis. The staphylococcal infection was showed by blood culture. We performed Tc- 99m methylendiphosphanate (MDP) bone scan, Tc-99m HMPAO leukocyte scan and Tc-99m (V) dimercaptosuccinic acid (DMSA) scintigraphy. In this case, we were able to compare the bone and soft tissue uptakes of Tc-99m (V) DMSA with Tc-99m MDP and Tc-99m HMPAO leucocytes uptakes; simultaneously. Tc-99m (V) DMSA uptake was similar to Tc-99m MDP and Tc-99m HMPAO leucocytes.

Key words: Tc-99m (V) DMSA, osteomyelitis, Tc-99m MDP, Tc-99m HMPAO, leukocyte.

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Öz

13 yaşındaki erkek çocuk, şüpheli akut multifokal osteomyelit tanısı için nükleer tıp bölümüne sevk edildi. Kan kültürü ile stafilokok enfeksiyonu gösterildi. Tc-99m MDP kemik, Tc-99m HMPAO lökosit tüm vücut taraması ve Tc-99m (V) dimercaptosüksinik asit tüm vücut sintigrafisi yapıldı. Kemik ve yumuşak doku enfeksiyonunun Tc-99m (V) DMSA tutulumu, Tc-99m MDP ve Tc-99m HMPAO lökosit tutulumları ile eş zamanlı olarak değerlendirildi. Tc-99m (V) DMSA tutulumu, Tc-99m MDP ve Tc-99m HMPAO lökosit sintigrafisinde görülen tutulumuna benzerdi.

Anahtar kelimeler: Tc-99m (V) DMSA, osteomyelit, Tc-99m MDP, Tc-99m HMPAO, lökosit.

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Introduction

Several nuclear medicine procedures are being used for the evaluation of osteomyelitis. The choice of modalities depends on whether or not the bone has been injured (previously affected by other pathologic conditions) and on the site of the suspected infection [1, 2]. Multiphase bone scanning is the imaging modality of first choice for suspected osteomyelitis. Another useful test in the diagnosis of osteomyelitis is ¹¹¹In oxine or ^{99m}Tc- hexamethylpropylene amine (HMPAO) labeled leukocyte imaging as specific agent for infection. ^{99m}Tc-HMPAO labeled leukocyte imaging can safely be applied in children. This agent is more accurate at localization of lesions than ^{99m}Tc-phosphanate in children and more specific in detecting infection at site of preexisting disease [3].

^{99m}Tc(V) dimercaptosuccinic acid is taken up both by the bone lesions [4-7] and by some soft tissue infections [7-11]. We present the findings of ^{99m}Tc(V)-DMSA scan as comparison with ^{99m}Tc-MDP bone scintigraphy and ^{99m}Tc-HMPAO- leukocyte imaging in the case with multifocal osteomyelitis.

Case report

A 13-years old male was referred to nuclear medicine department for evaluation of suspected acute osteomyelitis. He has suffered fever, pain and swelling on left thigh, left knee and right foot for one week. We detected acute infection findings in blood studies, as following: leukocyte count: 14000/mm³, CRP: + + +, ESR: 60 mm/min and neutrophils 82% in blood smear. The staphylococcal infection was showed by blood culture. The patient relieved by IV vancomicine treatment.

The increased bone uptake at left sacroiliac junction, left iliac crest, left femur metaphyseal region and femoral head, distal right tibia, distal left femur and proximal left fibula were revealed by ^{99m}Tc -MDP bone scintigraphy. ^{99m}Tc -HMPAO leukocyte uptake areas in bone tissue were similar to bone scan but its accumulation intensities were less than bone scan. In addition, they were demonstrated soft tissue uptake areas in lateral of left hip, distal left tibia and proximal

left fibula by the labeled leukocyte scan. ^{99m}Tc (V)-DMSA uptake in early scans (3.hr) were observed in all localizations of soft tissue infection detected by ^{99m}Tc -HMPAO leucocyte scan. ^{99m}Tc -HMPAO leukocyte uptakes were more intense than ^{99m}Tc (V)-DMSA uptakes in localizations of soft tissue infection. In the late (6.hr) ^{99m}Tc (V)-DMSA imaging, the localisation of activity accumulation were similar to ^{99m}Tc -MDP scan (Figure 1).

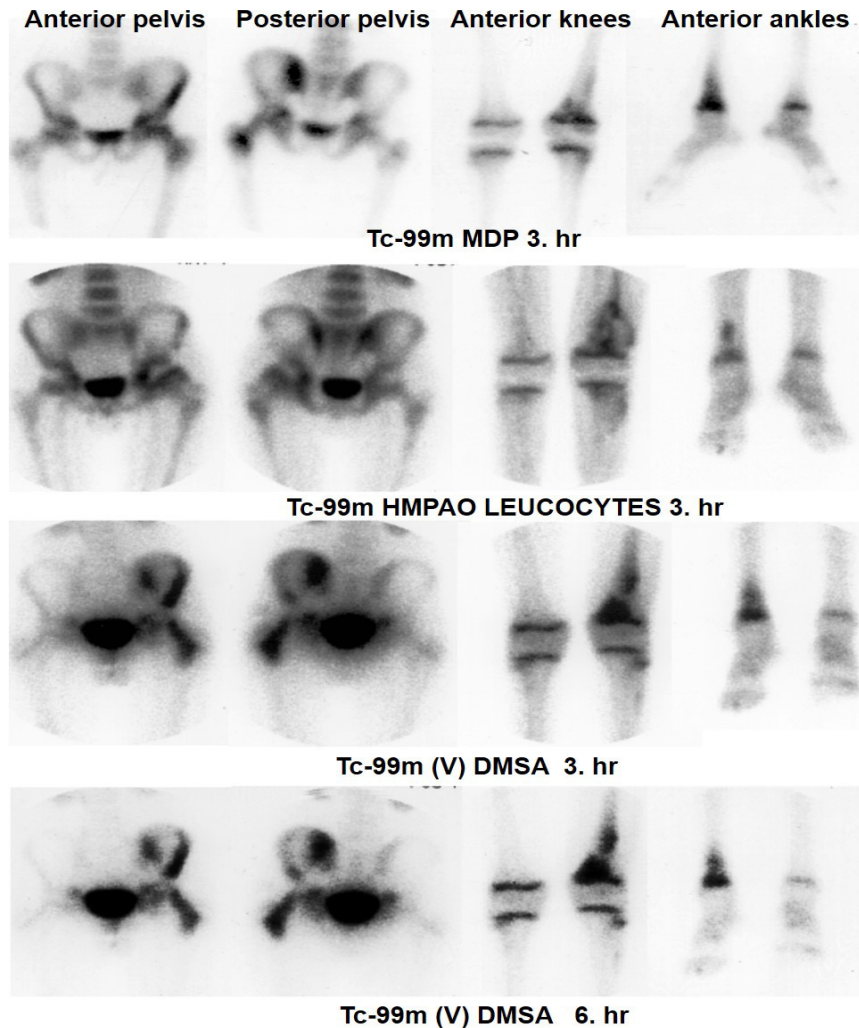


Figure 1. Bone scintigraphy, leukocyte scan and Tc-99m (V) DMSA scan were obtained using 370 MBq (10mCi) Tc-99m MDP, 185 MBq (5 mCi) Tc-99m HMPAO leucocytes and 185 MBq (5 mCi) Tc-99m (V) DMSA [14]; respectively. All of scintigraphy studies were acquired by LEAP collimator in 256 x 256 matrix size. Planar images were obtained at 3th hour for Tc-99m MDP and Tc-99m HMPAO leucocytes. Tc-99m (V) DMSA scans were performed at 3th and 6th hours. The period between scans of each radiopharmaceutical was two days. Uptake areas of Tc-99m HMPAO leucocytes in bone tissue were similar to bone scan and Tc-99m (V)-DMSA scan. Tc-99m (V) DMSA accumulation in the late (6.hr) was similar localizations to Tc-99m MDP uptakes. Tc-99m (V) DMSA uptake in early phase (3.hr) scan and late phase (6.hr) scan were observed in the all infected localizations of soft tissue and bone detected by Tc-99m HMPAO leucocyte scan

Discussion

In the case reported here, we were able to compare simultaneously $^{99m}\text{Tc(V)}$ -DMSA uptakes of the bone and soft tissue infection with ^{99m}Tc -MDP and ^{99m}Tc labeled WBC scintigraphies. Because normal bone uptake of $^{99m}\text{Tc(V)}$ -DMSA was less than ^{99m}Tc -MDP, $^{99m}\text{Tc(V)}$ -DMSA scan delineated bone infection areas better than ^{99m}Tc -MDP scan. Early and late $^{99m}\text{Tc(V)}$ -DMSA uptakes showed similar behaviors with use of ^{99m}Tc labeled WBC and ^{99m}Tc -MDP scintigraphies in the assessment of soft tissue and bone infection; respectively.

$^{99m}\text{Tc(V)}$ -DMSA is localized in bone lesions like ^{99m}Tc -MDP localizations. Some authors have postulated that pentavalent core of $^{99m}\text{Tc(V)}$ -DMSA (TcO_4^{3-}) resembles the phosphate ion (PO_4^{3-}) and that it accumulates in bone lesions by a mechanism similar to that for phosphate [7, 12-14].

As a result, $^{99m}\text{Tc(V)}$ -DMSA scan performed at 3. hr and 6. hr was able to show the multifocal osteomyelitis foci.

Conflict of interest: No conflict of interest was declared by the author.

References

1. Elgazzar AH, Abdel Dayem HM, Clark JD, Maxon III HR. Multimodality imaging of osteomyelitis. *Eur J Nucl Med* 1995;22:1043-1063. <https://doi.org/10.1007/BF00808418>
2. Ertay T. Enfeksiyon-enflamasyon: moleküler görüntüleme kullanılan SPECT radyofarmasötikleri. *Nucl Med Semin* 2016;2:63-70. <https://doi.org/10.4274/nts.010>
3. Lantto T, Kaukonen JP, Kokkola A, Laitinen R, Vorne M. Tc-99m HMPAO labeled leucocytes superior to bone scan in the detection of osteomyelitis in children. *Clin Nucl Med* 1992;17:7-10. <https://doi.org/10.1097/00003072-199201000-00003>
4. Jeghers O, Puttemans N, Urbain D, Ham HR. Technetium-99m DMSA uptake by metastatic carcinoma of the prostate. *J Nucl Med* 1986;27:1223-1224.
5. Wulfrank D, Schelstraete KH, Small F, Fallais CJ. Analogy between tumor uptake of technetium-99m (V) dimercaptosuccinic acid (DMSA) and technetium-99m-MDP. *Clin Nucl Med* 1989;14:588-593.
6. Sarikaya A, Sen S, Hacimahmutoglu S, Pekindil G. $^{99m}\text{Tc(V)}$ -DMSA scintigraphy in monitoring the response of bone disease to vitamin D3 therapy in renal osteodystrophy. *Ann Nucl Med* 2002;16:19-23. <https://doi.org/10.1007/BF02995287>
7. Devranoğlu G, Sayman HB, Sönmezoğlu K. Comparative evaluation of Tc-99m (V) DMSA with Tc-99m MDP in primary bone tumours. (Abst) *Eur Nucl Med* 1995;22:737 (Oral Presentation 52) 26–30 August 1995, EANM Congress Brussels, Belgium <https://doi.org/10.1007/BF00845427>
8. Lin WY, Chao TH, Wang SJ. Early detection of intra-abdominal abscesses with Tc-99m (V) DMSA scanning and comparison with Ga-67 imaging. *Clin Nucl Med* 2002;27:753-754. <https://doi.org/10.1097/00003072-200210000-00022>
9. Sun SS, Kao CH. Demonstration of skeletal tuberculosis with Tc-99m (V) DMSA scintigraphy and a negative Ga-67 scan. *Clin Nucl Med* 2002;27:539. <https://doi.org/10.1097/00003072-200207000-00021>
10. Lee BF, Chiu NT, Wu DC, et al. Use of ^{99m}Tc (V) DMSA scintigraphy in the detection and localization of intestinal inflammation: comparison of findings and colonoscopy and biopsy. *Radiology* 2001;220:381-385.
11. Lee BF, Chiu NT, Chang JK, Liu GC, Yu HS. Technetium-99m(V)-DMSA and gallium-67 in the assessment of bone and joint infection. *J Nucl Med* 1998;39:2128-2131.
12. Hirano T, Otake H, Yoshida I, Endo K. Primary lung cancer SPECT imaging with ^{99m}Tc pentavalent DMSA. *J Nucl Med* 1995;36:202-207.
13. Jeghers O, Puttemans N, Urbain D, Lefebvre J, Ham H. Comparison of $^{99m}\text{Tc(V)}$ -dimercaptosuccinic acid preparations. *Appl Radiat Isot* 1987;38:13-18. [https://doi.org/10.1016/0883-2889\(87\)90229-2](https://doi.org/10.1016/0883-2889(87)90229-2)
14. Babbar A, Kashyap R, Chauhan PS. A convenient method for the preparation of ^{99m}Tc pentavalent DMSA and its evaluation as a tumour imaging agent. *J Nucl Biol Med* 1991;35:100-104.

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