



Case Report

Abnormal ^{99m}Tc-MDP uptake in radiation nephritis: A Case Report

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Abstract

The radiation nephritis is a long-term degenerative injury involving nephron and mesangium after radiation exposure. 51 year-old male patient who underwent gastric surgery due to adenocarcinoma 18 months ago and had postoperative chemo-radiotherapy using FUFA Mayo Clinic regimen after surgical resection of gastric cancer. After one year from end of the radiation therapy, bone scan showed markedly increased ^{99m}Tc-MDP uptake in the upper pole of the left kidney.

Key words: radiation nephritis, bone, scintigraphy

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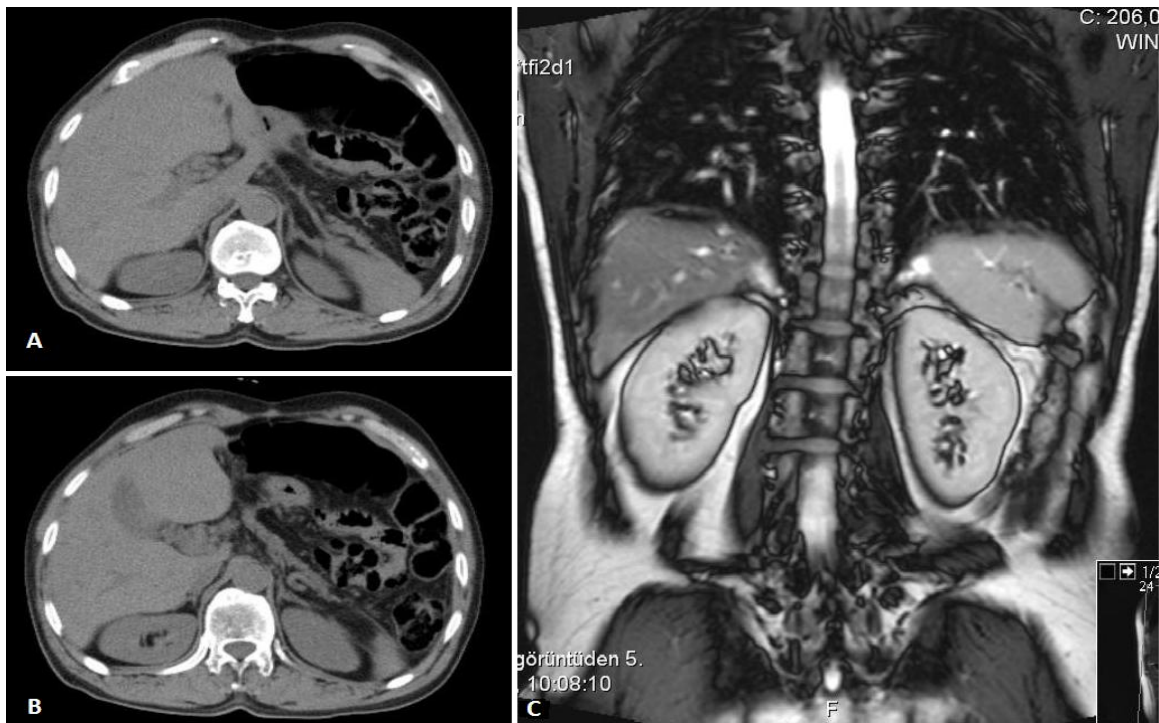
Introduction

The radiation nephritis is a long-term degenerative injury involving glomeruli, tubules and mesangium after radiation exposure as low as 2500 rads. Necrosis, atrophy and sclerosis in affected portion of the kidneys can become 3-12 months later [1-3]. The kidneys are the dose-limiting organs for radiotherapy and targeted radionuclide therapy [4,5]. Abnormal diffuse or segmental uptake of 99mTc-methylene diphosphonate (MDP) in irradiated renal tissue was previously published by a small number of literatures [6-12]. This case report showed an increased 99mTc-MDP uptake in the affected upper pole of the left kidney after one year from end of the radiation therapy.

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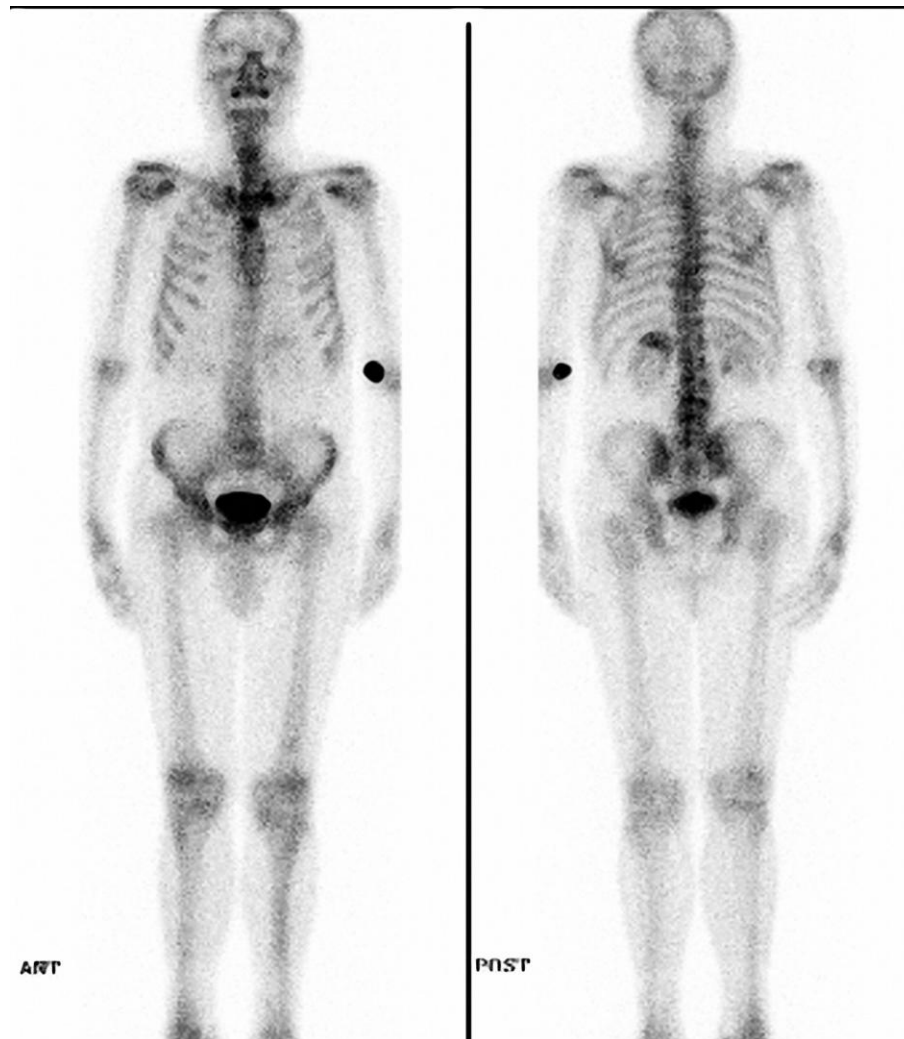
51 year-old male patient who underwent gastric surgery due to adenocarcinoma 18 month ago and had postoperative chemo-radiotherapy using FUFA Mayo Clinic regimen after surgical resection of gastric cancer. Radiotherapy was completed one year ago. Liver metastasis in segment 8 and suspicious bone lesions were noticed on current dynamic computerized tomography and magnetic resonance imaging. Both kidneys were normal in these examinations (Figure 1).

Figure 1. There was no pathologic finding of radiation nephritis on the computerized tomography (a and b) and magnetic resonance imaging (c).



99mTc-MDP bone scintigraphy was requested for evaluation of bone metastasis. After one year from end of the radiation therapy, bone scan showed markedly increased 99mTc-MDP uptake in the upper pole of the left kidney (Figure 2).

Figure 2. Whole body bone scintigraphy showed increased 99mTc-MDP uptake in the region of radiation nephritis after one year from end of the radiation therapy.



Discussion

Radiotherapy is an important modality in the treatment of neoplasia. The kidneys are the target organs in therapy with radiolabeled small molecules. The kidneys are highly radio-sensitive organs. Depending on the dose of radiation, affected portion of the kidneys and time interval since therapy, progressive and degenerative renal injury can become after latent phase and this may lead to proteinuria, hypertension or renal failure [4,13].

Radiation effects on the kidneys are well described. Late period histopathologic findings of radiation nephritis are characterized as an arterial sclerosis, glomerular hyalinization, tubular atrophy and interstitial fibrosis. In the effected region, transforming growth factor beta 1 expression in tubular and interstitial cell was started to increase at 20 wk. [14,15]. Abnormal renal 99mTc-MDP uptake is not seen in some kidney diseases which had similar histopathologic findings. Additionally, the relationship between MDP accumulation and transforming growth factor beta 1 expression is not known.

Except for radiation nephritis, abnormal 99mTc-MDP uptake in kidney was previously published in leukemia, parathyroid adenoma, multiple myeloma, melanoma, Waldenstrom's macroglobulinemia and Erdheim-Chester disease [16].

In this study, the both kidneys were normal in these examinations on dynamic computerized tomography and magnetic resonance imaging. There was no publication in the literature about finding of radiation nephritis on computerized tomography and magnetic resonance imaging.

Abnormal diffuse or segmental uptake of 99mTc-MDP in irradiated renal tissue was previously published. Degirmenci et al reported that markedly increased 99mTc-MDP uptake on the left upper part of the left kidney was found three months after radiotherapy in a 9 year old boy but this was slightly visualized at the 6th month [7]. Abe et al reported that markedly increased renal 99mTc-MDP uptake due to radiation nephritis after radiotherapy to the abdomen in children was seen in the early phase (from 0 to 3 months), persisted or gradually decreased up to 7 months, and eventually became accumulation defects in the late phase (from 6 to 17 months) [11]. In this study, persistent increased 99mTc-MDP uptake in upper pole of the left kidney was showed at the 12th month after radiotherapy.

References

- 1- Palestro C, Fineman D, Goldsmith SJ. Acute radiation nephritis. Its evolution on sequential bone imaging. Clin Nucl Med. 1988;13(11):789-91
- 2- Madrazo A, Schwarz G, Churg J. Radiation nephritis: a review. J Urol. 1975;114(6):822-7.
- 3- Madrazo AA, Churg J. Radiation nephritis. Chronic changes following moderate doses of radiation. Lab Invest. 1976;34(3):283-90.
- 4- Breitz H. Clinical aspects of radiation nephropathy. Cancer Biother Radiopharm. 2004;19(3):359-62.
- 5- Dawson LA, Kavanagh BD, Paulino AC, Das SK, Miften M, Li XA, Pan C, Ten Haken RK, Schultheiss TE. Radiation-associated kidney injury. Int J Radiat Oncol Biol Phys. 2010;76(3 Suppl):108-15.
- 6- Sty JR, Kun L, Casper J, Babbitt DP. Extraosseous uptake of 99mtechnetium methylene diphosphonate: neuroblastoma or radiation therapy. Pediatr Radiol. 1980;9(1):53-4.
- 7- Degirmenci B, Uysal K, Bekis R, Cetingoz R, Kaya GC, Durak H. Tc-99m MDP, thallium-201 chloride and Tc-99m MAG3 renal uptake in subacute and chronic radiation nephritis compared. Ann Nucl Med. 2001;15(5):447-9.
- 8- Bohdiewicz PJ, Ball D, Chen P. Pseudoadrenal uptake of bone imaging agent secondary to focal acute radiation nephritis. Clin Nucl Med. 1998 Jun;23(6):387-8.
- 9- Flanagan FL, Dehdashti F. Case report: acute segmental radiation nephritis on bone scintigraphy. Br J Radiol. 1996;69(828):1175-7.
- 10- Palestro C, Fineman D, Goldsmith SJ. Acute radiation nephritis. Its evolution on sequential bone imaging. Clin Nucl Med. 1988;13(11):789-91.
- 11- Abe K, Sasaki M, Kuwabara Y, Koga H, Baba S, Kaneko K, Hayashi K, Shioyama Y, Tajiri T, Suita S, Honda H. Extraosseous accumulation of (99m)Tc-HMDP to radiation nephropathy, mimicking recurrent neuroblastoma. Ann Nucl Med. 2005;19(1):35-40.
- 12- Wymer DC, Kies MS. Adrenal simulation by renal uptake of 99mTc diphosphonate after radiotherapy. AJR 1980;134:1256-8.
- 13- Owoeye O, Malomo AO, Elumelu TN, Salami AA, Osuagwu FC, Akinlolu AA, Adenipekun A, Shokunbi MT. Nefritis por Radiación: Efecto Anti-inflamatorio de la Dexametasona en Ratas Wistar Adultas (*Rattus norvegicus*) Int. J. Morphol. 2008;26(1):69-74.
- 14- Jaggi JS, Seshan SV, McDevitt MR, LaPerle K, Sgouros G, Scheinberg DA. Renal tubulointerstitial changes after internal irradiation with alpha-particle-emitting actinium daughters. J Am Soc Nephrol. 2005;16(9):2677-89.
- 15- White DC. The histopathologic basis for functional decrements in late radiation injury in diverse organs. Cancer 1976; 37: 1126–43.
- 16- Xu YH, Song HJ, Qiu ZL, Luo QY. Multiple extraosseous accumulation of 99mTc-MDP in acute lymphocytic leukemia and reference to literature. Hell J Nucl Med. 2010;13(3):273-6.