CASE OF THE MONTH

Increased renal uptake of technetium-99m HEDP in a patient with breast cancer

J H CHUAH, MB, ChB, MRCS and C F LOUGHRAN, FRCR

Department Of Radiology, Macclesfield District General Hospital, Victoria Road, Macclesfield, Cheshire SK10 3BR, UK

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A 53-year-old woman was diagnosed with invasive lobular carcinoma of her right breast, with evidence of lymphovascular invasion. She was otherwise healthy. There was no history of previous medical problems. Following diagnosis, she underwent right mastectomy and axillary node clearance. Post-operatively, she was referred for chemotherapy (5-fluorouracil, epirubicin and cyclophosphamide). Three days following commencement of her

chemotherapy, she underwent bone scintigraphy as part of her staging investigation (Figure 1). She also underwent a CT examination (Figure 2). Routine haematological and biochemical tests were unremarkable. Her serum creatinine ($54 \mu\text{mol l}^{-1}$) and calcium (2.30 mmol l^{-1}) were normal. Alkaline phosphatase (173 IU l^{-1}) was mildly elevated.

What is the most likely cause of the findings on the bone scintigram?

Address correspondence to: Chris Loughran, Department Of Radiology, Macclesfield District General Hospital, Victoria Road, Macclesfield, Cheshire SK10 3BR, UK. E-mail: chris.loughran@echeshire-tr.nwest.nhs.uk

Figure 1. An isotope bone scan.

Figure 2. An axial CT section through the kidneys.

Discussion

The scintigram demonstrates intense bilateral diffuse uptake of the radioactive tracer in both kidneys. It does not show any evidence of metastatic bone disease (Figure 1). The CT study shows normal appearances of both kidneys, with normal cortical enhancement and no evidence of renal obstruction or any other renal abnormality (Figure 2).

The reported incidence of high renal uptake of technetium-99m ($^{99}\text{Tc}^{\text{m}}$) hydroxyethylidene diphosphate (HEDP) on bone scintigraphy ranges from 2% to 15% [1, 2]. This finding has been termed "hot kidneys", and is an incidental benign and transient condition [2]. A number of conditions are well known to be associated with this phenomenon. Gentili et al [1] described this scintigraphic pattern in a variety of different conditions; well-recognised causes include hyperparathyroidism, hypercalcaemia, iron overload, cirrhosis and sickle cell disease. Bilateral diffuse increased renal uptake of $^{99}\text{Tc}^{\text{m}}$ HEDP has also been described in patients who have undergone chemotherapy. In those reported cases, the abnormal changes have been associated with the administration of cisplatin [1].

Previous studies have suggested that the high renal uptake seen is more commonly observed the shorter the time between the scintigram and the administration of chemotherapy. This feature is less common as the interval between chemotherapy and scintigraphy increases [3]. In the case described here, there was only a three-day interval between commencement of her chemotherapy and the scintigram. In a study evaluating hot kidneys in patients treated with chemotherapy, Igari et al [4] reported 24 hot kidneys out of 76 bone scans (31.6%) performed more than three weeks after chemotherapy. In another study by Sato et al [3], hot kidneys were seen in 15 out of 21 bone scans (71.4%) performed within 17 days after chemotherapy.

The exact mechanism that gives rise to abnormal renal tracer uptake has not been established. However, it is

known not to correlate with any specific malignancy or the presence of metastasis [2]. The postulated aetiology of post-chemotherapy high renal uptake is excess tissue calcium owing to local tissue damage as a result of treatment [2]. However, it is not known to be associated with a high serum calcium level, unlike hot kidneys, which are associated with hyperparathyroidism and hypercalcaemia [2, 5].

In a previous study on post-chemotherapy hot kidneys, a correlation between the frequency of hot kidneys and raised serum creatinine levels was reported in patients treated with cisplatin [4]. However, Samuel and Dhuri [2] failed to show any correlation between post-chemotherapy hot kidneys and abnormal creatinine levels, although the details of the chemotherapy were not specified.

Although the precise cause for this phenomenon remains unclear, it appears to have a benign course. By itself, it is not of clinical concern. In the case illustrated here, there were no biochemical features to suggest renal impairment, either at the time of the study or on repeated testing. Further investigation of the kidneys in similar clinical circumstances is unlikely to be rewarding and warranted.

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