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Case Report Open Access

MRI Changes associated with Bone Marrow Reconversion can Mimic Infiltration with Multiple Myeloma

Sarah C Paterson[1,2], Carolyn Grove[1,3], Charles Crawley[3], Mike Scott[3], Penny Wright[4], Philip WP Bearcroft[5] and George S Vassiliou[1,3]*

[1]*Wellcome Trust Sanger Institute, Cambridge, CB10 1SA, UK*

[2]*College of Medical, Veterinary and Life Sciences, Wolfson Medical School Building, University of Glasgow, University Avenue Glasgow, G12 8QQ, UK*

[3]*Department of Haematology, Cambridge University Hospitals NHS Foundation Trust, Hills Road, Cambridge, CB2 0QQ, UK*

[4]*Department of Histopathology, Cambridge University Hospitals NHS Foundation Trust, Hills Road, Cambridge, CB2 0QQ, UK*

[5]*Department of Radiology, Cambridge University Hospitals NHS Foundation Trust, Hills Road, Cambridge, CB2 0QQ, UK*

Abstract

We describe a case of a fit 40-year-old who was referred for investigations to rule out Multiple Myeloma on the basis of an abnormal bone signal on MRI scanning. Haematological investigations including a bone marrow biopsy were normal and upon extended MRI re-scanning, bone changes were identified as those of marrow reconversion and attributed to his intensive exercise regime.

Main Text

A 40 year old male fitness enthusiast was referred to our myeloma clinic following an abnormal MRI spine done for persistent lower back pain. He had been undergoing physiotherapy for a back injury sustained in a minor accident approximately 18 months previously and suffered a recent exacerbation of his pain after a therapy session. An MRI scan of his spine, performed at another hospital, showed diffusely abnormal low signal on the T1 images in all of the lumbar vertebral bodies, which raised the possibility of myelomatous deposits, hence the referral to us. He was a non-smoker and had no significant past medical history with the exception of being involved in two car accidents, 10 years and 18 months previously. He lived with his wife and had previously taken oral diazepam 5 mg for back pain.

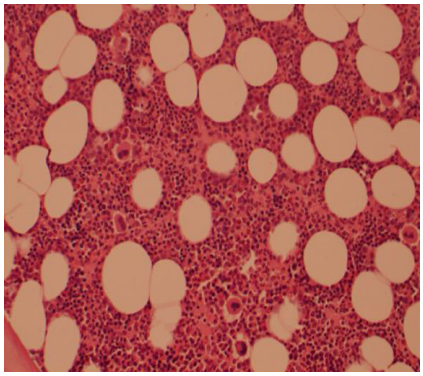

Figure 1: Mildly hypercellular marrow for age showing normal haematopoiesis and a cellularity of approximately 60%. No abnormal infiltrate is seen (x20).

Figure 2a: T1 weighted images of the lumbar spine show abnormally dark marrow signal from the vertebral bodies. The marrow signal at this age should be fatty, and should almost parallel the brightness of the subcutaneous fat on this sequence.

Investigations for myeloma were normal including serum protein electrophoresis, serum free light chains, creatinine, calcium and alkaline phosphatase. A urine test for Bence-Jones proteins was negative. Additionally, a bone marrow biopsy taken from the right posterior iliac crest showed increased cellularity with normal trilineage haematopoiesis and less than 2% plasma cells (Figure 1). Incidentally he was found to have a raised alanine aminotransferase (154, NR 10-44 iu/l) that later resolved spontaneously. Hepatitis serology was normal.

A repeat MRI of the spine & pelvis was performed to image other haemopoietic sites including the site of bone marrow biopsy. This showed loss of the fatty signal in the T1-weighted images in the lumbar spine and areas of the pelvis (Figure 2a and 2b) with sparing of the proximal femora (Figure 2c). These changes are characteristic of chronic hypoxia as seen in long-distance runners. In fact, on further questioning, it became clear that the patient had taken part in two half-marathons within the previous few months and was training for another long-distance race.

The change in the signal on T1 weighted MRI scan, specifically a decrease in the signal as seen in this patient, can be attributed to an

***Corresponding author:** Vassiliou GS, Haematological Cancer Genetics, Wellcome Trust Sanger Institute, Wellcome Trust Genome Campus, Hinxton, Cambridge, CB10 1SA, UK, Tel: +44 1223 494908, E-mail: gsv20@sanger.ac.uk

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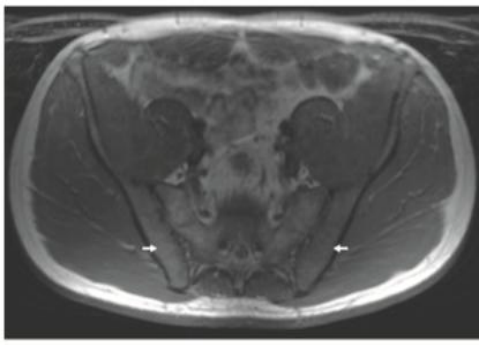

Figure 2b: T1 weighted sequence through the pelvis shows similarly abnormal low signal within the pelvic marrow (arrows).

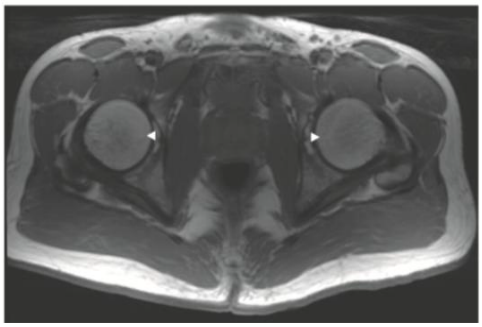

Figure 2c: T1 weighted images through the hips show almost normal fatty marrow within the femoral head, a region characteristically late to undergo reconversion to red marrow (arrowheads).

increase in the presence of red (haematopoietic) marrow compared to yellow (fatty) marrow [1]. Normally, red converts to yellow bone marrow during childhood as part of the physiological aging process. It follows a set pattern with conversion occurring in the peripheral bones before the axial skeleton. This process is normally complete by approximately 20-30 years of age [2]. Even within long bones there is a specific pattern of marrow conversion. It occurs first in the epiphyses and then in the diaphyses before continuing in the distal metaphyses and then the proximal metaphyses [3]. In this case, frequent intermittent hypoxia associated with regular long-distance running was thought to have led to reconversion of the normal yellow marrow back to red marrow leading to the appearances seen on MRI. Such reconversion follows the reverse pattern to that seen with marrow conversion in childhood and occurs in the axial skeleton before the long bones, which explains why the proximal femora were spared. The appearance of these lesions can sometimes be misinterpreted as infiltrative disorders affecting the spine such as multiple myeloma as was suspected in this case. As well as frequent exercise-induced hypoxia, these changes can sometimes be seen in association with very heavy smoking, severe obesity and administration of haematopoietic growth factors [1,4,5]. Although uncommon, the possibility of marrow reconversion should be considered in individuals with diffuse bony changes on MRI, particularly given the characteristic appearances of this phenomenon.

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