Case Presentation

F-18 FDG PET-Positive Cortical Fibrous Defect in a Patient with Peripheral T Cell Lymphoma (PTCL).

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INTRODUCTION

Fibrous cortical defects (FCD) are relatively common skeletal lesions that are often discovered incidentally on radiographs of children and young adults. They are most often located in the metaphysis or diametaphyseal junction of the distal femur or proximal tibia[1–5]. Fibrous cortical defects generally undergo spontaneous regression over time and are rarely seen radiographically after the second decade of life [2, 3]. FCD histological appearance is that of whorled proliferations of spindle cells intermixed with multinucleate giant cells, and "foam" cells. **(Fig 1)**. In some cases the central abnormality may be also surrounded by leucocyte infiltration[13].

Conventional radiographic, CT, and MRI characteristics of fibrous cortical defects have been well described[1–4]. Several studies have also described the appearance of fibrous cortical defects on Tc-99m methylene diphosphonate (Tc-99m MDP) bone scintigraphy [5,6]. On CT a fibrous cortical defect is defined as a radiolucent, cortically based round to ovoid absence of bone measuring less than 2.0 cm in greatest diameter, with sharp sclerotic margins and no associated soft-tissue or bone marrow abnormality. MRI image usually shows cortically based soft tissue replacing bone without involvement of extraosseous soft tissues. On MR, the cortical defect often has a bright centre and a dark peripheral margin on T2-weighted images and shows central enhancement and a dark peripheral margin on contrast-enhanced T1-weighted images[7]. Bone scan shows markedly increased radionuclide accumulation in both early perfusion and delayed bone imaging in typical cortical defects. . However, absence of markedly increased tracer accumulation does not mean this diagnosis should be excluded.

The use of F-18 fluorodeoxyglucose positron emission tomography (FDG-PET) is established for the staging of malignant disease[8]. However, it is well known that FDG is not a tumor-specific agent and intense FDG uptake can occur in many non-malignant conditions such as infection, active inflammation, healing trauma and benign tumors[9]. As a consequence, increased FDG uptake in a benign lesion can be misinterpreted as a site of metastatic disease in patients with known malignancy. Very few reports have described the appearance of fibrous cortical defects on PET/CT [7].

Key Words: FDG PET/CT, Fibrous cortical defect, benign.

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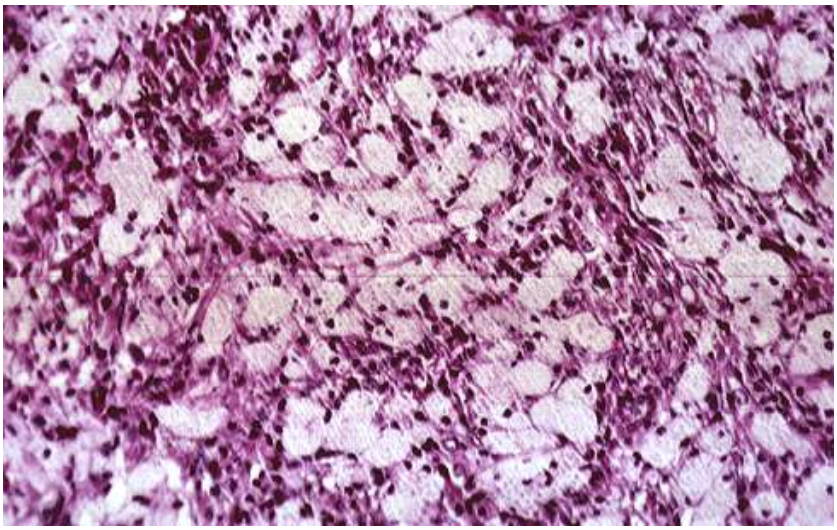
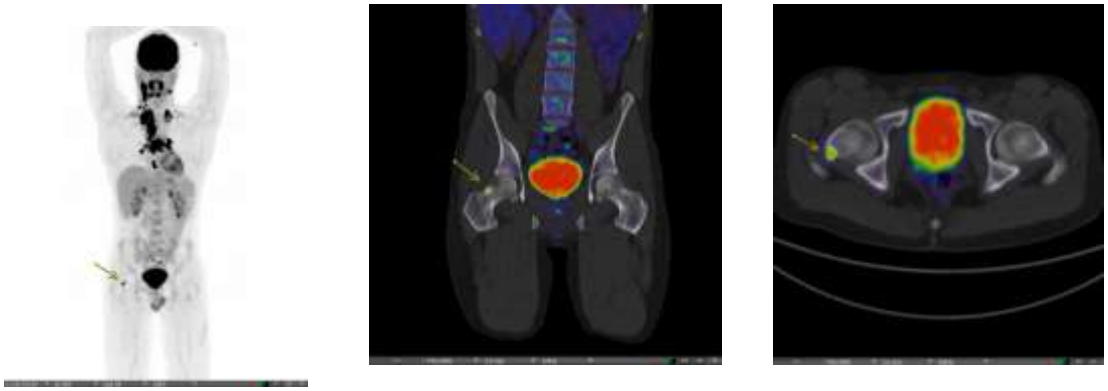
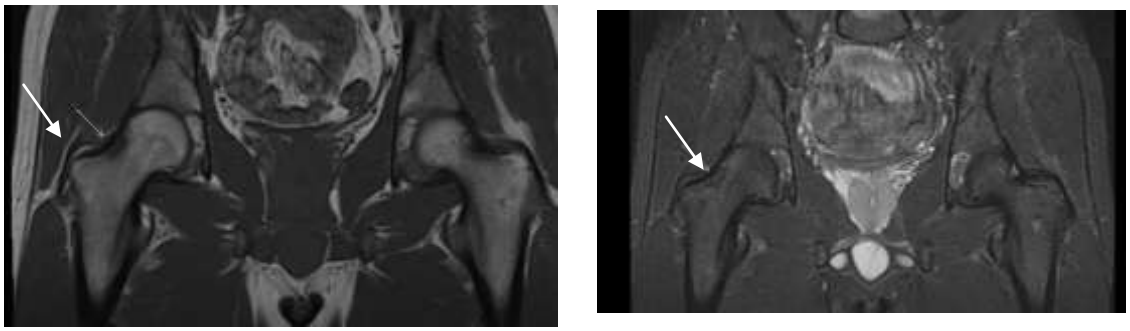


Fig. 1: Histologic section of a fibrous cortical defect demonstrating typical interlacing bundles of spindle-shaped fibroblasts, with collections of "foam" cells scattered within the stroma.



A. Whole body PET (maximal intensity projection) B. Coronal PET/CT image C. Axial PET/CT image

Fig. 2: The initial FDG-PET/CT examination at the time of initial staging of the lymphoma demonstrates highly metabolically active supra-diaphragmatic disease (A), with incidental focal moderate FDG uptake in the neck of right femur, arrowed in (A), (B) and (C).



A . T 1W pre-contrast coronal image B. T2W fat saturated coronal image

Fig. 3: Baseline MRI shows an appearance suggestive of a fibrous cortical defect in the same location (see arrows).

CASE REPORT:

We describe a case of an FDG-PET-positive fibrous cortical defect in a patient with peripheral T cell lymphoma. A 20 year old male was referred for initial staging of biopsy proven nodal disease. On physical examination, there were palpable cervical nodes from which the excisional biopsy had been taken. Computed tomography (CT) of the neck and chest showed lymphadenopathy in bilateral cervical and mediastinal nodal stations. Bone marrow aspiration and trephine were normal. Baseline staging FDG-PET/CT showed extensive metabolically active lymph nodes in the cervical and mediastinal nodal stations with no abnormal nodal uptake below the diaphragm. The maximal semiquantiative uptake value (SUV max) of the nodal disease ranged from 5.6 to 12.2. In addition, there was small area of increased FDG uptake in the super lateral aspect of the right femoral neck. It showed relatively less tracer uptake compared to the forementioned FDG avid lesions with SUV max of 4.7 **(Fig1)**. This was interpreted by two nuclear medicine specialists as likely benign pathology. The patient proceeded to clarification of its nature by MRI. The MRI showed a well defined cortical defect that had low signal on T1 weighted images, intermediate signal on T2 weighted images and smooth enhancement on post intravenous Gadolinium based contrast T1 weighted images. The MR appearance was consistent with a benign fibrous cortical defect **(Fig2)**. The patient received a total of 3 cycles of Hyper-CVAD chemotherapy. After two cycles of chemotherapy, he had a second FDG-PET/CT scan, which showed complete metabolic response of all the mediastinal and most of the cervical lymph nodal groups apart from two residual nodes. The right femoral neck uptake was still present with mild decrease in FDG uptake (SUV max 3.5). Follow up MRI was performed 2 days after the second PET/CT and showed stable unchanged morphological appearance and size of the right femoral neck defect. The third PET/CT performed 4 weeks later showed the same level of uptake with the same SUV max (3.5). The mild serial reduction in FDG uptake of the target lesion on the follow up PET/CT scan may be statistical variation; or else reduction of fibroblast activity secondary to chemotherapy.

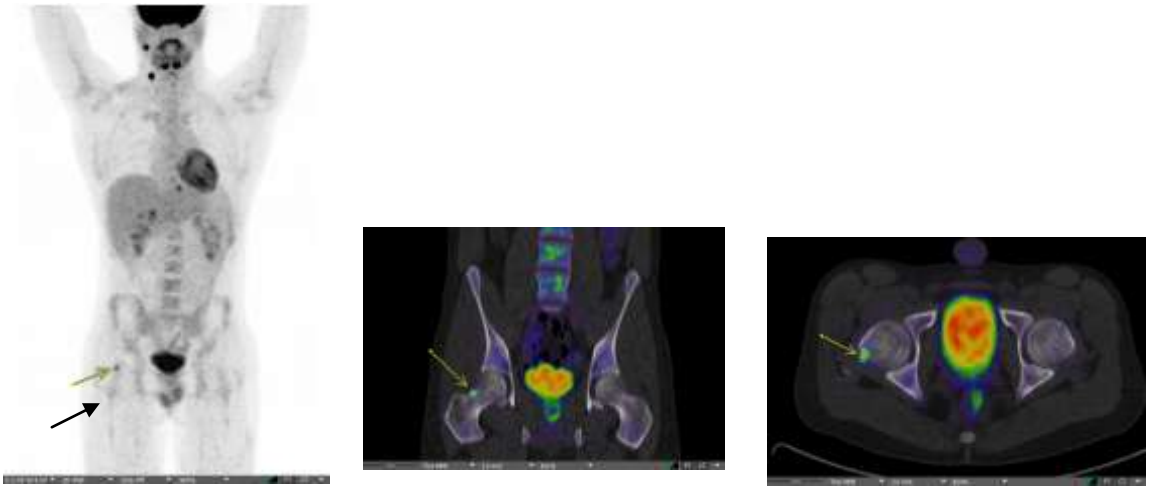
DISCUSSION

With the increased use of FDG PET/CT in staging and restaging of cancer, there has been increased recognition of FDG uptake in incidental benign lesions. Unless care is taken, benign lesions may be misinterpreted and result in inaccurate staging.

Discrimination on FDG PET is hazardous because of SUV max overlap in many malignant and many benign histologies. The SUV max values of benign bone tumours range from 3.8 to 7.2 in case reports [10-12].

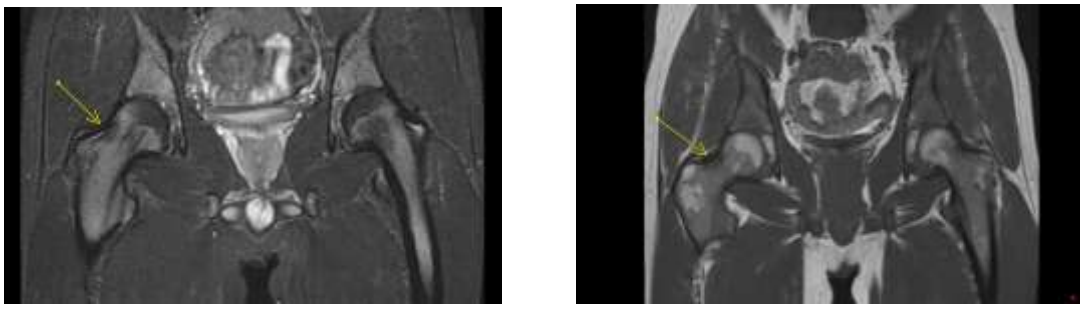
Diagnostic MR and CT may be utilised for non-invasive clarification and may be sufficient if appearance is classical.

There are few reports in the literature describing uptake in fibrous cortical defects. In 2006, Geoffrey and colleagues reported FDG uptake in 4 cases of fibrous cortical defect. In all the 4 cases, FDG uptake was mild with SUV max ranging from 0.7 to 1.8 and size ranging from 1.3 to 1.9 cm.



A. Whole body PET (maximal intensity projection B. Coronal PET/CT image C. Axial PET/CT image

Fig. 4: Follow up FDG-PET/CT shows remission of most of the metabolically active supra-diaphragmatic disease (A), with persistent and only mildly reduced FDG uptake in the neck of right femur arrowed in (A), (B) and (C).



A . T 1W pre-Gd coronal image B. T2W fat saturated coronal image

Fig. 5: Follow up MRI shows almost the same size and appearance of the right neck of femur fibrous cortical defect, (see arrows).

On repeated FDG PET/CT, they found no significant change in SUVs in those lesions that showed visual qualitative changes in 18F-FDG uptake over time. Hence the variability in SUV measurements among lesions that were determined qualitatively to have similar or very different 18F-FDG uptake suggests a poor correlation between the subjective assessment of metabolic activity in the lesions and this quantitative parameter [7].

In this case FDG PET/CT strongly suggested that the right femoral uptake was benign given unusual location (cortex), no CT mass, lower activity than elsewhere and no adjacent disease. Yet in a young adult with extensive supra-diaphragmatic lymphoma it is reasonable to exclude infra-diaphragmatic

lymphoma in any area of FDG uptake because of upstaging implications. This was achieved with MRI for reasons of radiation dose reduction in a younger adult we found mildly reduced FDG uptake (and a mild drop in SUV max) on the follow up FDG PET/CT. The size of the cortical effect was practically the same on the baseline and on the follow up MRI. In this case, the behaviour on imaging was sufficient to avoid biopsy and rely on serial multimodality correlation.

Greyson and Pang reported a similar phenomenon with 99mTc MDP uptake. They studied 10 patients with nonossifying fibromas and fibrous cortical defects and found variable level of 99mTc MDP uptake at variable developmental stages of the lesions. Inactive or healed lesions showed no uptake of 99mTc MDP on three-phase bone scans, while those in the healing or involutional stage showed faint to moderate uptake on delayed imaging [5].

In conclusion, we report a case of FDG PET- positive fibrous cortical defect in a patient with PTCL disease. The value of our report is that unlike previously reported studies we have now shown that fibrous cortical defect can have a moderately high SUV max, which should be taken into consideration during interpretation of FDG PET studies.

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