

Role of Fluoroethyl Tyrosine Positron Emission Tomography FET-PET-Computed Tomography Ct Scan in Differentiating Ewing's Sarcoma from Osteomyelitis

Abstract

Ewing sarcoma is one type of undifferentiated reticulocystic sarcoma. For confirmation of Ewing sarcoma cytological confirmation is needed and hence is very difficult to differentiate between Ewing sarcoma and Osteomyelitis via CT scan and X-ray. FDG PET is very nonspecific tracer in terms of differentiation between malignant or inflammatory lesions but in case of Ewing sarcoma, it shows increased LAT1 transporter expression which was utilized specifically to target the tumour cells and differentiate them from inflammatory lesion. Thus, FET positron emission tomography-computed tomography can serve as a useful tool in diagnosing recurrence or residual Ewing's sarcoma from infective pathology. Besides, it is also helpful in monitoring response to therapy.

Keywords: Ewing's Sarcoma; Flouro-Ethyl Tyrosine; Osteomyelitis

Case Report

History

A 20-year-old male, who was a known case of Ewing's sarcoma in the region of Right humerus, had been operated upon for the sarcoma and had received radiotherapy. He was referred to our institute for PET-CT for the evaluation of recurrence. At the time of the study, the boy complained of a palpable swelling in the vault of the skull and discharging sinus from the Right humerus where he had received radiotherapy and a surgical implant 5 years back

Investigations

An ^{18}F -FDG PET-CT study was performed 60 min after intravenous injection of 370 MBq ^{18}F -FDG, after 6-h fasting with a whole-body full-ring PET-CT camera. The CT portion was performed according to a soft-tissue protocol and acquisition on a 16-slice scanner. Finally, the acquisition of PET emission images was performed (2 min per bed position).

The CT data were used for attenuation correction of PET emission images and for fusion with PET data for accurate

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Case Report

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localization of lesions. Nonattenuated data were reconstructed after scan acquisition had been completed. Reconstruction of attenuation-corrected data was executed concurrently. All digital images were interpreted on a dedicated Xeleris™ workstation.

There was evidence of a FDG-avid lytic-sclerotic lesion with destructive pattern in the mid-humerus and distal humerus with associated soft-tissue mass. Another poorly defined lytic lesion was seen in the high frontoparietal region of the skull vault with an associated soft-tissue mass extending into the scalp. A large extradural component was noted indenting the underlying brain parenchyma. The lesion showed heterogeneously increased FDG uptake.

The patient was called again after 2 days for FET PET/CT scan. The study was performed 60 min after intravenous injection of 370 MBq ^{18}F -FET, and PET/CT images were acquired and reconstructed using the similar procedure as mentioned before.

FET PET-CT revealed no uptake of tracer in the lytic-sclerotic lesion of the humerus, but an increased uptake was noted in the lytic lesion of the skull. The patient was followed up with cytopathological reports from both lesions, i.e., from the skull and left humerus. The skull lesion confirmed recurrence of small-round-cell tumor, whereas biopsy from the right humerus reflected only inflammatory cells and chronic infectious osteomyelitis.

Discussion

FDG/PET has unprecedented utility in diagnosing, staging and evaluating response to therapy for Ewing's sarcoma but it is non-specific and most of the times its scan findings regarding evaluation of response to therapy are misleading, specially in post-surgical cases where graft infection chances are very high

[1]. The radiological findings of Ewing Sarcoma is similar to that of Osteomyelitis [2]. Therefore, a situation may often arise with a diagnostic dilemma of residual disease or a postsurgical infection while following such cases. This may also lead to uncertainty in deciding the further course of management. Mostly false negative results have been observed via fine needle aspiration cytology of Malignancy or residual tumour [3]. As FDG is no specific it shows uptake in both malignancy and infection, so differentiating between both isn't possible this way [1]. FDG has inferior capability in distinguishing neoplastic from inflammatory or treatment-related lesions as opposed to an aminoacid PET tracer [4]. A need, therefore, arises to differentiate malignant pathology from infective pathology through imaging modalities where detection through invasive cytological procedures is difficult to perform (e.g., lesions involving spinal cord) [5]. It has been found that Ewing's sarcoma has increased LAT1 transporter expression at the cell surface [6-9]. This property has been utilized to specifically target the tumor cells and differentiate them from inflammatory lesions. FDG scan shows an increased uptake in the lesion of skull and Right humerus, whereas FET uptake was noted only in the skull lesion. Thus, FET PET-CT can serve as a useful tool in diagnosing recurrence or residual Ewing's sarcoma and response to therapy.

Conclusion

FET PET/CT can be used to differentiate a malignant lesion of Ewing's sarcoma from osteomyelitis and can be used as a sole modality for recurrence/residual evaluation and response to treatment. However, further studies and research is required to validate its utility as a sole modality.

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