Case Report

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Non-Ossifying Fibroma Mimicking Extra-Neural Metastasis in Pediatric Cerebral Anaplastic Ependymoma: A Case Report

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Objective: This case report focuses on the differential diagnosis of non-ossifying fibroma and extra-neural metastasis in pediatric cerebral anaplastic ependymoma. **Methods:** Magnetic resonance imaging, computed tomography, positron emission tomography, and biopsy were performed. **Results:** An 11-year-old patient who had undergone surgical removal of an anaplastic ependymoma was referred for a positron emission tomography examination for follow-up. The positron emission tomography revealed a fluorodeoxyglucose-avid lesion in the left proximal tibia, raising suspicion of bone metastasis. Subsequently, a biopsy was performed, and the lesion was confirmed to be a non-ossifying fibroma. **Conclusion:** This case highlights that imaging features of bone lesions on positron emission tomography scans should be correlated with findings of conventional imaging modalities to improve diagnostic accuracy and prevent unnecessary invasive procedures in oncology patients.

Keywords: Fibroma, Ependymoma, Neoplasm metastasis, Positron-emission tomography

Introduction

Ependymoma is the third most common primary brain tumor in pediatric patients, accounting for 10% of all primary central nervous system neoplasms.[1] It can spread through cerebrospinal fluid to the spinal cord and metastasize to other areas such as the lungs, lymph nodes, pleural, liver, scalp, and bones.[2-7] Positron emission tomography (PET) is a type of imaging that provides functional information based on glucose uptake and is commonly used to grade tumors, differentiate between active tumors and benign growths, and plan post-

surgical treatments in oncology practice. We present a case of a pediatric patient who had a prior diagnosis of cerebral anaplastic ependymoma and was found to have non-ossifying fibroma on a PET scan, which was initially suspected to be bone metastasis.

Case report

An 11-year-old boy was admitted to the hospital with symptoms including dizziness, poor appetite, headache, low vision, and occasional seizures, persisting for the last month. Initial magnetic resonance imaging (MRI) examination revealed a T2WI heterogeneously hyperintense lesion containing an internal cystic component with irregular enhancement in the fourth ventricle, resulting in obstructive hydrocephalus (Figure 1). There was no evident abnormality on the spine MRI.

The patient underwent surgical resection with ventriculoperitoneal shunt placement and showed clinical improvement. The tumor was pathologically proven to be anaplastic ependymoma (grade III). However, the post-operative MRI examination revealed a residual tumor in the fourth ventricle, tectal region (Figure 2).

Subsequently, the patient received chemotherapy and radiotherapy as additional treatment options. Following that, the patient was routinely monitored by MRI every six months, which revealed a stable residual tumor with no apparent relapse at the primary tumor site.

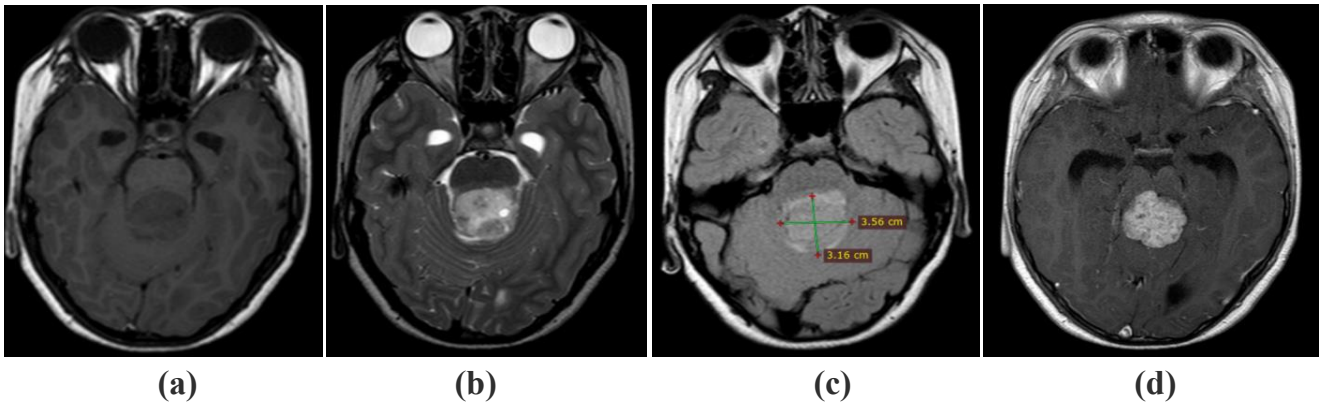

Figure 1: Magnetic resonance imaging of the 11-year-old boy with anaplastic ependymoma. (a) T1-weighted image, (b) T2-weighted image, (c) fluid-attenuated inversion recovery (FLAIR), and (d) contrast-enhanced T1-weighted image. MRI demonstrated T1WI hypointense, T2WI/Flair hyperintense, and heterogeneous lesion containing an internal cystic component with irregular enhancement in the fourth ventricle.

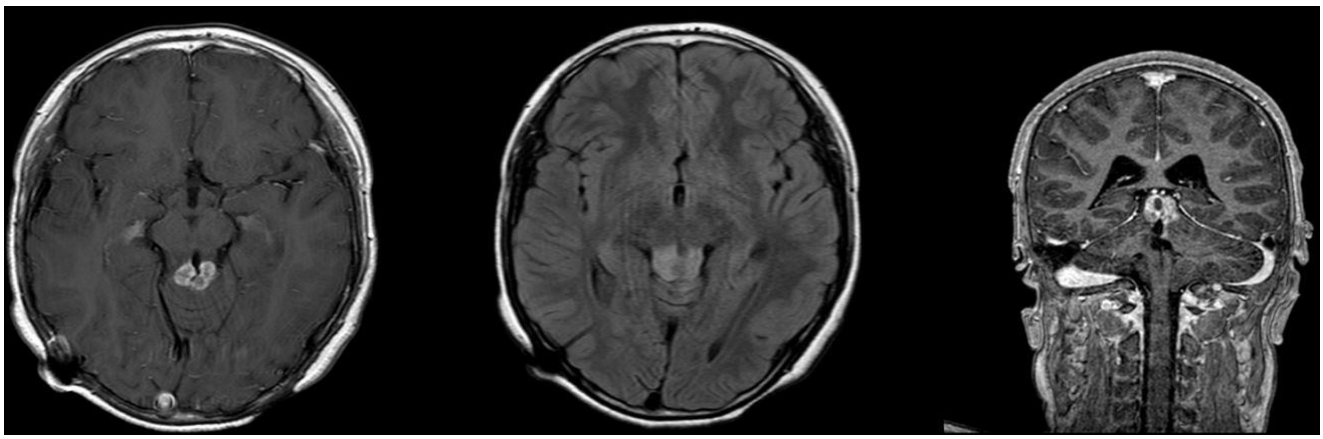

Figure 2: Magnetic resonance imaging of the 11-year-old boy with anaplastic ependymoma in the tectal region.

Two years later, the patient was referred for a PET examination for follow-up. The PET demonstrated a fluorodeoxyglucose (FDG) avid lesion in the left proximal tibia, raising suspicion of malignancy (Figure 3).

Additional images of the lower extremities were obtained, including MRI and computed tomography (CT), to rule out potential bone metastasis. The lesion appeared as central radiolucency with a sclerotic rim on CT imaging (Figure 4) and a T1WI, T2WI heterogeneous hypointense lesion on MRI (Figure 5).

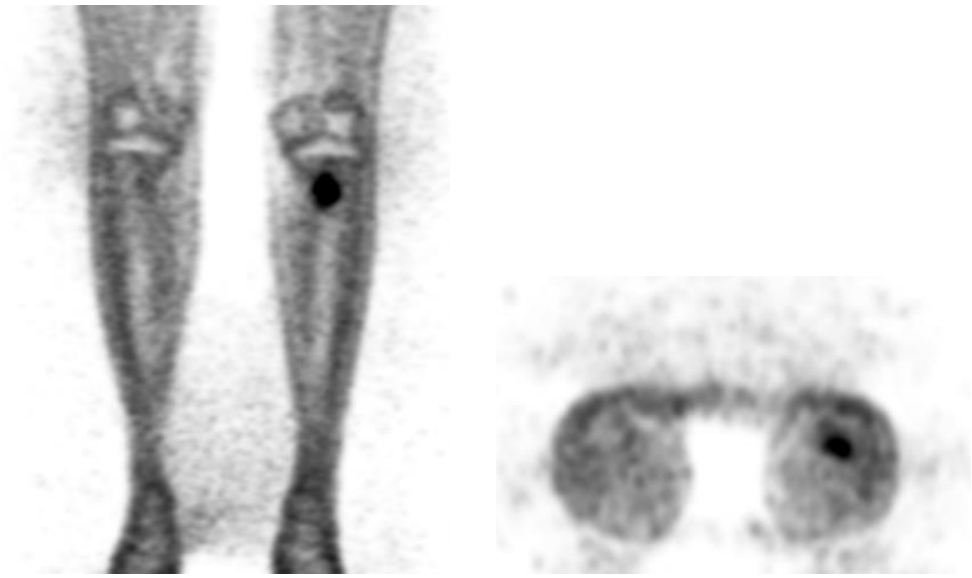

Figure 3. Positron emission tomography of the 11-year-old boy with residual anaplastic ependymoma. Positron emission tomography revealed a moderate fluorodeoxyglucose avid lesion in the left proximal tibia.

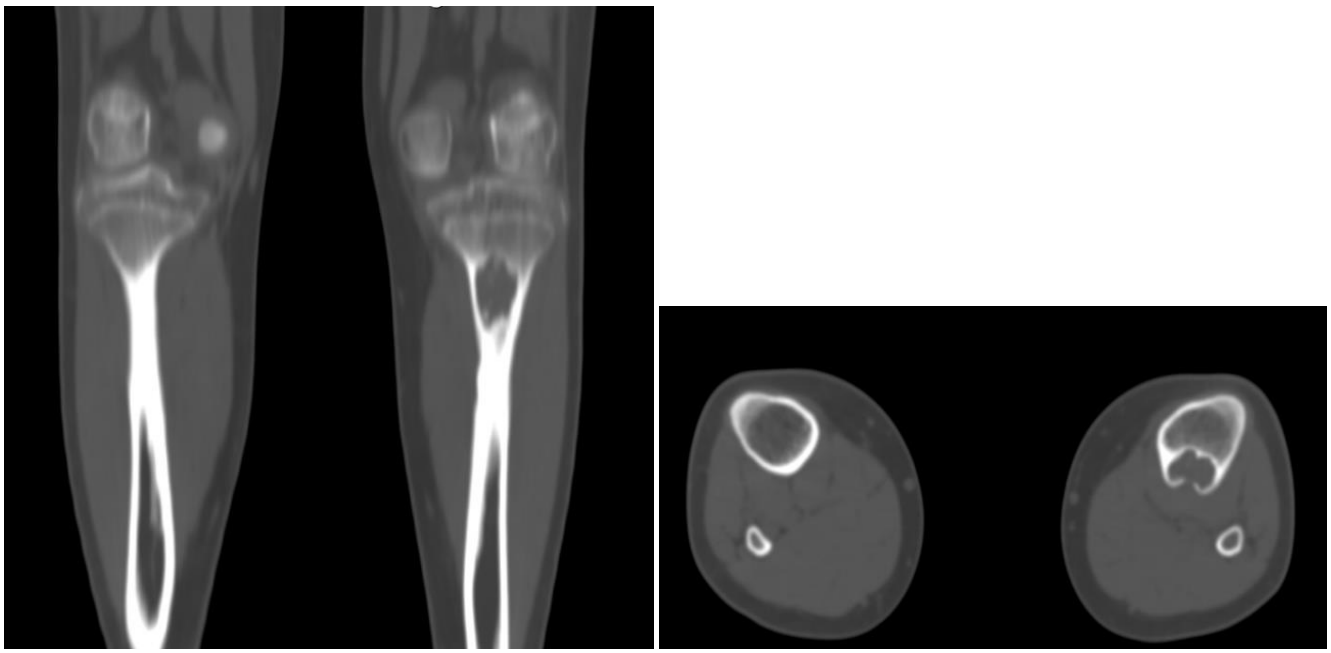

Figure 4. Computed tomography imaging of the 11-year-old boy with residual anaplastic ependymoma. Coronal and axial computed tomography demonstrated eccentric lesion with central radiolucency and cortical defect in the left proximal tibia.

The imaging features of this lesion were consistent with benign fibroid tumors. The blood test parameters were within average values. Subsequently, a biopsy was performed, and the lesion was proven to be a non-malignant fibroma (Figure 6).

It prevented the patient from receiving unnecessary chemotherapy and further invasive treatments.

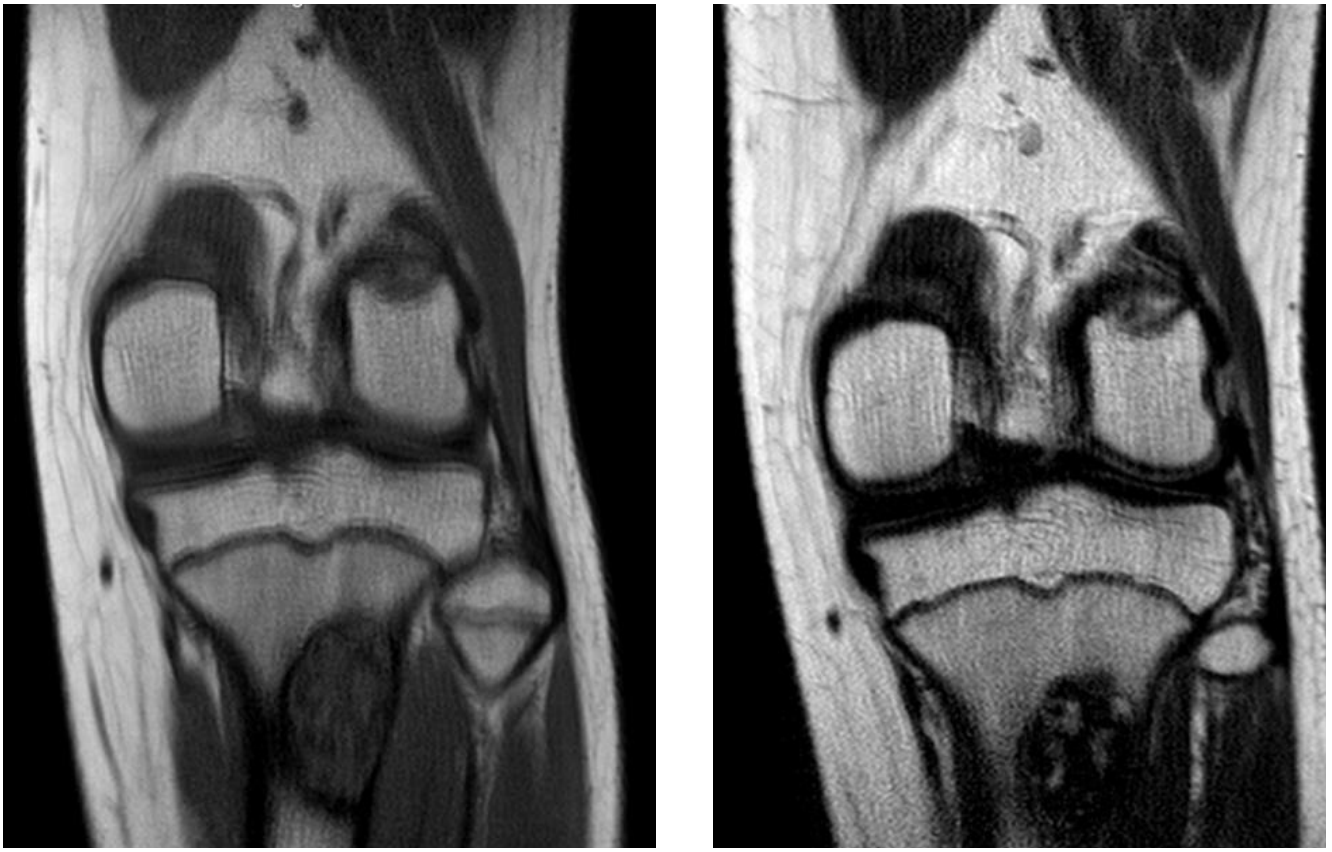

Figure 5. Magnetic resonance imaging of an 11-year-old boy with residual anaplastic ependymoma. Magnetic resonance imaging showed a T1W1/T2W1 hypointense heterogeneous lesion in the proximal tibia.

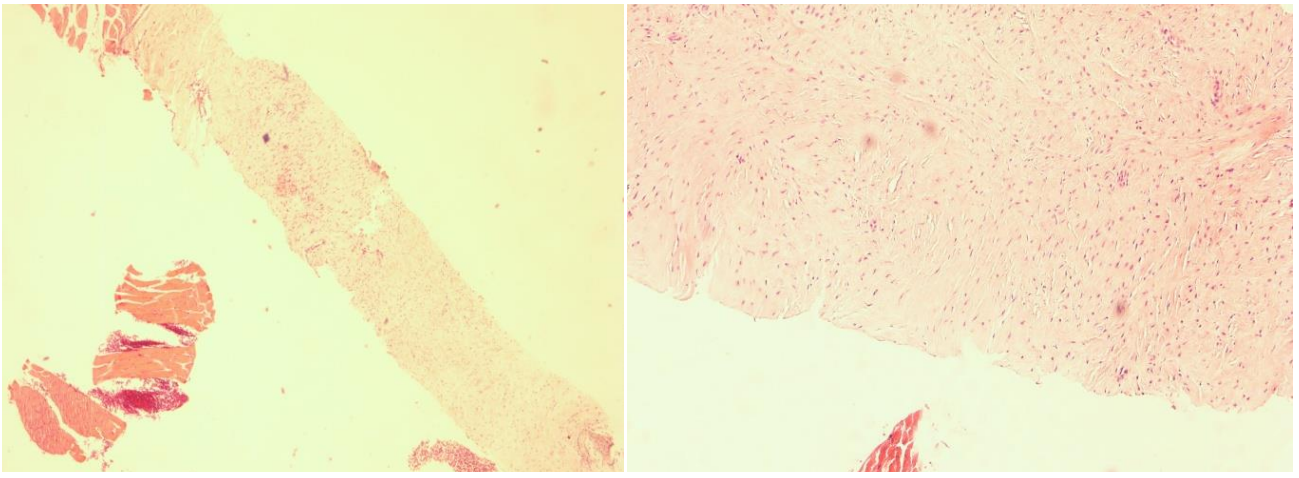

Figure 6. Biopsy of the left proxinal tibial lesion. Histologically, normal connective tissues are distributed in densey fibrous backrounds, with no evident malignant cells.

Discussion

Ependymoma occasionally relapses at the primary tumor site. It also can spread through the cerebrospinal fluid pathway. Extra-neural metastasis of ependymoma, including lung, lymph nodes, pleural, liver, scalp, and bone metastasis, has been reported in the literature.[2-6] The liver and lung are the most common sites for metastasis, followed by the bone.[4] The exact mechanism of extra-neural metastasis of brain tumors is not adequately understood. It is generally considered that the dissemination of tumor tissue resulting from invasive brain surgery allows tumor cells to access the blood or lymphatic system.[7] Duffner, et al. proposed that the prolonged survival of pediatric patients who have primary brain tumors and altered immune systems due to chemotherapy may be promoting extracranial tumor growth to become clinically significant.[8] In our case, an FDG avid lesion on PET scan, which turned out to be a non-ossifying fibroma mimicked bone metastasis, required additional examinations to prove its benign origin, which eventually prevented the patient from receiving unnecessary chemotherapy and further invasive treatment.

Non-ossifying fibroma (NOF) is the most common benign lesion of the skeletal system, frequently seen in the metaphysis of long bones in children.[9] NOF is more common in males than females and is estimated to be present in 35% of all children.[10] It typically involves the distal femur, proximal tibia, distal tibia, and fibula. NOF is usually asymptomatic and frequently found as an incidental finding in imaging studies performed for other purposes. The risk of pathological fracture may increase depending on the lesion's size. On plain radiograph, NOF appears as a multiloculated, well-defined, radiolucent lesion with a sclerotic margin, usually located in the metaphysis of the lower extremity long bones, rarely in the upper extremity and mandible. As bone grows, the lesion becomes more sclerotic and migrates away from the physis. On CT, NOF presents as an eccentric lesion with central radiolucency and cortical defect. MRI is more sensitive for evaluating bone edema, infiltration, and soft tissue changes. Depending on the lesion's content, size, and stage of healing, NOF may have variable MRI appearances. It frequently appears as hypointense on the T1WI sequence and hyperintense on the T2WI sequence and may show variable contrast enhancement. PET demonstrates increased FDG uptake in NOFs.10 During the healing phase of NOF, increased osteoblastic activity and hyperemia can be seen as the lesion is replaced by new bone.[11] However, as malignant tumors also have avid FDG uptake and overlapping imaging findings, it is pretty challenging to make a clear distinction between benign and malignant bone tumors on PET scans.

FDG uptake on PET indicates a metabolically active process and is not specific to malignancy only. Aside from physiological accumulations, the increased FDG uptake can be observed in various entities, including malignant lesions, benign lesions, inflammatory processes, infections, bone fractures, and post-radiation changes.[12,13] In the case of oncology patients who have suspected bone metastatic lesions on PET imaging, benign bone lesions like NOF should be considered as differential diagnoses before further invasive diagnostic procedures and possible chemotherapy. NOF is metabolically active, similar to malignant tumors. However, characteristic imaging features of NOF on radiography and CT can confirm its benign origin.

Our case highlights that FDG avid bone lesions in patients who are at risk for bone metastases; benign lesions like NOF should be considered in the differential diagnosis before further invasive procedures and chemotherapy. Moreover, the imaging features of bone lesions on PET scans should be correlated with findings of conventional imaging modalities to improve diagnostic accuracy and prevent unnecessary invasive treatment in oncology patients.

Reference

1. Jünger ST, Timmermann B, Pietsch T. Pediatric ependymoma: an overview of a complex disease. *Childs Nerv Syst*. 2021;37(8):2451-2463. https://doi.org/10.1007/s00381-021-05207-7
2. Kumar P, Rastogi N, Jain M, et al. Extraneural metastases in anaplastic ependymoma. *J Cancer Res Ther.* 2007;3(2):102-104. https://doi.org/10.4103/0973-1482.34689
3. Alzahrani A, Alassiri A, Kashgari A, et al. Extraneural metastasis of an ependymoma: a rare occurrence. *Neuroradiol J.* 2014;27(2):175-178. https://doi.org/10.15274/nrj-2014-10017
4. Varan A, Sari N, Akalan N, et al. Extraneural metastasis in

intracranial tumors in children: the experience of a single center. *J Neurooncol.* 2006;79(2):187-190. https://doi.org/10.1007/s11060-006-9123-3

5. Hussain M, Mallucci C, Abernethy L, et al. Anaplastic ependymoma with sclerotic bone metastases. Pediatr Blood Cancer. 2010;55(6):1204-1206. https://doi.org/10.1002/pbc.22604
6. Rousseau P, Habrand JL, Sarrazin D, et al. Treatment of intracranial ependymomas of children: a review of a 15-year experience. *Int J Radiat Oncol Biol Phys*. 1994; 28(2):381-386. https://doi.org/10.1016/0360-3016(94)90061-2
7. Itoh J, Usui K, Itoh M, et al. Extracranial metastases of malignant ependymoma—a case report. *Neurol Med Chir (Tokyo).* 1990;30(5):339-345. https://doi.org/10.2176/nmc.30.339
8. Duffner PK, Cohen ME. Extraneural metastases in childhood brain tumors. *Ann Neurol.* 1981;10(3):261-265. https://doi.org/10.1002/ana.410100311
9. Bowers LM, Cohen DM, Bhattacharyya I, et al. The non-ossifying fibroma: a case report and review of the literature. *Head Neck Pathol.* 2013;7(2):203-210. https://doi.org/10.1007/s12105-012-0399-7
10. Aoki J, Watanabe H, Shinozaki T, et al. FDG PET of primary benign and malignant bone tumors: standardized uptake value in 52 lesions. *Radiology.* 2001;219(3):774-777. https://doi.org/10.1148/radiology.219.3.r01ma08774
11. Goodin GS, Shulkin BL, Kaufman RA, et al. PET/CT characterization of fibro-osseous defects in children: 18F-FDG uptake can mimic metastatic disease. *AJR Am J Roentgenol.* 2006;187(4):1124-1128. https://doi.org/10.2214/ajr.06.0171
12. Mester U, Even-Sapir E. Increased (18)F-fluorodeoxyglucose uptake in benign, nonphysiologic lesions found on whole-body positron emission tomography/computed tomography (PET/CT): accumulated data from four years of experience with PET/CT. *Semin Nucl Med.* 2007;37(3):206-222. https://doi.org/10.1053/j.semnuclmed.2007.01.001
13. Almuhaideb A, Papathanasiou N, Bomanji J. 18F-FDG PET/CT imaging in oncology. *Ann Saudi Med.* 2011;31(1):3-13. https://doi.org/10.4103/0256-4947.75771