Inferior Vena Cava Tumour Thrombus from Nonseminomatous Germ Cell Tumour Detected with F-18 FDG PET/CT

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Abstract: 21-year-old male presented with recently diagnosed metastatic nonseminomatous germ cell tumour and left orchidectomy. CT demonstrated mixed density in the inferior vena cava (IVC) extending from the union of the common iliac veins to the level of the liver just below the confluence of the hepatic veins. Retroperitoneal nodal disease and deposits in the left lung were suspicious for metastatic deposits. F-18Flurodeoxyglucose (FDG) PET/CT images demonstrated avid FDG uptake within the lumen of the IVC from the level of the renal veins, with extension into both renal veins, to the level of T10.

While benign and malignant thrombi have previously been demonstrated on F18-FDG PET imaging, this case highlights the use of F-18 FDG PET/CT when identifying tumour thrombosis in patients with nonseminomatous germ cell tumour.

Keywords: Nonseminomatous germ cell tumour, F-18 FDG PET/CT, tumour thrombus, testicular carcinoma.

HISTORY

The patient in this case study is a 21 year old male who was recently diagnosed with nonseminomatous germ cell tumour. A left orchidectomy was performed and an inguinal lymph node proved positive for metastatic spread. The patient was referred to our department for diagnostic staging with CT followed by F-18 FDG PET/CT.

IMAGING FINDINGS

Abdominal CT with oral and intravenous contrast enhancement demonstrated a large retroperitoneal mass effacing the left kidney and psoas muscle, consistent with nodal disease. The coronal and transaxial images demonstrate left kidney hydronephrosis with reduced perfusion, thought to be caused by compression of the left renal artery from the tumour mass. Mixed density was noted in the IVC extending from the union of the common iliac veins to the level of the liver just below the confluence of the hepatic veins. The IVC was enlarged and the images were consistent with a large thrombus (Figure **1a**). Transaxial contrast enhanced thoracic CT image demonstrated a 7mm x 9mm focal lesion in the upper lobe of the left lung, highly suspicious for a metastatic deposit. A left sided pleural effusion was also noted (Figure **1b**).

F-18 FDG PET-CT imaging was performed from base of the brain to mid-thigh. The large retroperitoneal mass demonstrated on CT showed avid FDG uptake on the fused PET/CT coronal images consistent with metastasis, central photopaenia suggested necrosis. Avid FDG accumulation was noted in the lumen of the IVC in the coronal and transaxial images from the level of the renal veins, with extension into both renal veins, to the level of T-10 (Figure **2a**). This only represented the superior portion of the thrombus identified on CT. It is postulated that the FDG negative thrombus represents benign thrombus extension secondary to the FDG avid proximal tumour thrombus. Transaxial thoracic images demonstrated two foci of avid FDG uptake in the left lung consistent with metastatic disease, seen in the upper lobe and apical segment of the lower lobe (Figure **2b**). The relatively increased uptake in the spleen and bone marrow is thought to be related to reticuloendothelial response to recent surgery and underlying malignancy. The remainder of tracer accumulation is physiological.

The patient immediately commenced both anticoagulation therapy and chemotherapy and returned to the department two months later for a follow-up PET/CT. F-18 FDG PET/CT imaging was again performed from base of the brain to mid-thigh. Sites of FDG avidity demonstrated on the initial PET/CT all demonstrated normal physiological tracer accumulation. The standardised uptake value (SUV) max value of the IVC in the initial scan was 14.5g/ml lean body weight (LBW) and in the follow-up scan the SUV max value was 2.2g/ml (LBW). The SUV max of the IVC in a healthy male is 1.7g/ml (LBW) with a standard deviation of 0.8g/ml (LBW) [1]. During this

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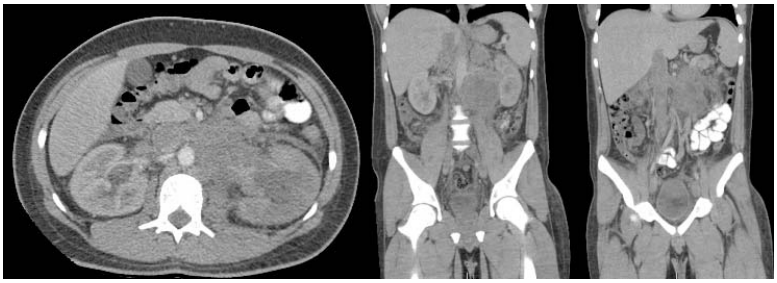

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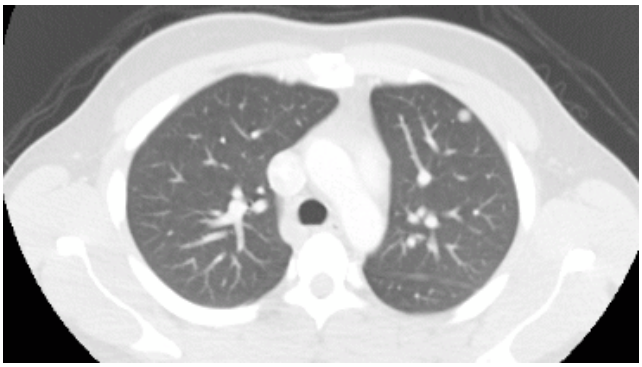

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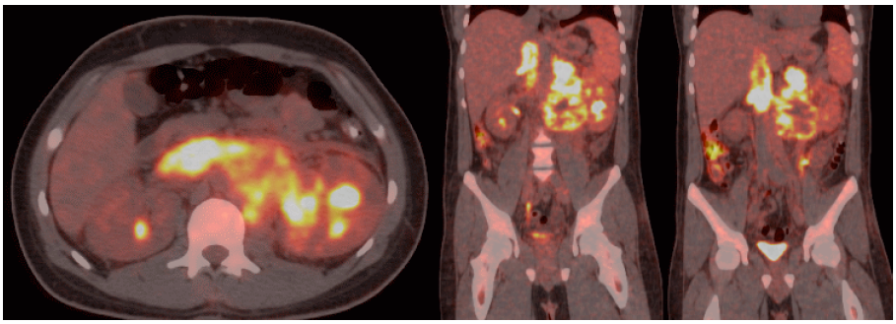
Figure 1: a and **b** Contract enhanced CT.



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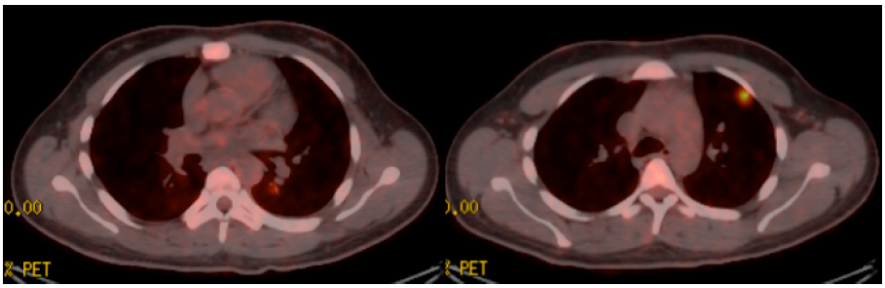

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Figure 2: a and **b** F-18 FDG PET/CT.

period of therapy the diameter of the IVC had returned to normal size (Figure **3**).

DISCUSSION

Limited data in the literature supports the differentiation of septic from aseptic thrombus using F-18 FDG, septic thrombus demonstrates increased uptake whereas aseptic thrombus demonstrates normal tracer distribution [2, 3]. The patient had undergone numerous pathology examinations since his diagnosis of testicular carcinoma with both his white cell count 9 $x10^9$/L (normal range 4-10 $x10^9$/L) and differential white cell count falling within the normal

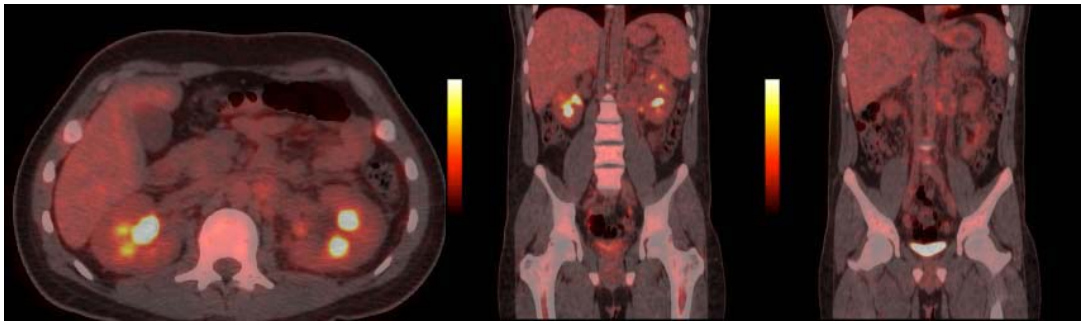

Figure 3: F-18 FDG PET/CT.

reference ranges. Bedside observations demonstrated no clinical symptoms of sepsis. It has been reported that tumour thrombus demonstrates increased FDG accumulation when compared to benign thrombus [4-7]. F-18 FDG PET imaging has demonstrated malignant thrombus caused by numerous primary carcinomas including choriocarcinoma, follicular thyroid carcinoma, rectal carcinoma and renal cell carcinoma [7-11]. Testicular cancer is one of the malignancies known to have the potential to develop a venous tumour thrombosis [12]. Since our patient had no clinical evidence of sepsis and avid F-18 FDG accumulation was noted in the thrombus, it was thought that the PET/CT diagnosed tumour thrombus rather than benign thrombus. Both the thrombus identified on CT and tumour thrombus demonstrated on PET imaging resolved with anticoagulation therapy and chemotherapy. Our report demonstrates the usefulness of F18-FDG PET/CT in differentiating thrombus from tumour thrombosis in patients with nonseminomatous germ cell tumour.

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