

# **<sup>18</sup>F-FDG PET finding of an inflammatory abdominal aortic aneurysm leading to fatal rupture: case report**

Zdeněk Řehák<sup>1</sup>, Petr Szturz<sup>2</sup>, Hana Hladká<sup>3</sup>,  
Jiří Vaniček<sup>4</sup>, Jaroslav Staniček<sup>1</sup>

<sup>1</sup>Department of Nuclear Medicine, PET Centre, Masaryk Memorial Cancer Institute, Brno, Czech Republic

<sup>2</sup>Department of Internal Medicine — Hematology and Oncology, University Hospital Brno, Czech Republic

<sup>3</sup>1<sup>st</sup> department of Internal medicine — Cardioangiology, St Anne University Hospital, Brno, Czech Republic

<sup>4</sup>Clinic of Imaging Methods, St Anne University Hospital, Brno, Czech Republic

[Received 8 III 2012; Accepted 28 XI 2012]

This study was funded by Institutional Resources for Supporting the Research Organization provided by the Ministry of Health of the Czech Republic in 2012.

## **Introduction**

Fluorine-18-fluorodeoxyglucose positron emission tomography (<sup>18</sup>F-FDG PET) is routinely used mainly for diagnostics and monitoring of many oncological diseases. However, fluorine-18-fluorodeoxyglucose as a radiopharmaceutical is not an exclusively tumour-specific tracer and numerous inflammatory diseases may be evaluated as well. An inflammatory lesion showing high <sup>18</sup>F-FDG accumulation is likely to have high metabolic activity.

Herein we report a case of a man, who presented with low-back pain and increased acute-phase proteins due to inflammatory abdominal aortic aneurysm.

## **Case report**

We present the case of a polymorbid 55-year-old male with medical history of arterial hypertension, chronic obstructive bron-

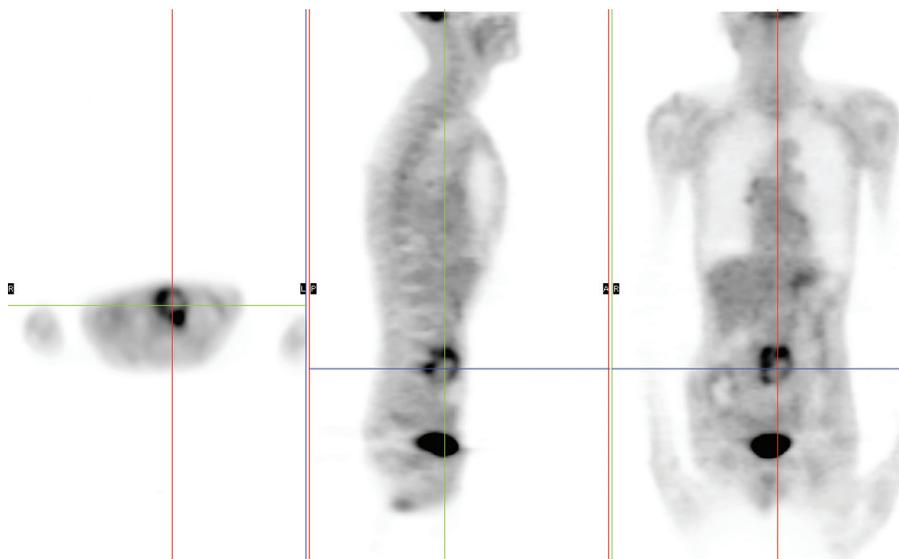
chopulmonary disease, ischemic disease of the lower extremities, peptic ulcer disease, status post left femoral popliteal bypass 3 years ago and status post benign tumour (chondroid hamartoma) resection of the left lung. The patient complained of low-back pain and weight loss of 15 kg in the past year. Laboratory tests showed C-reactive protein elevation (81 mg/l) as well as elevated erythrocyte sedimentation rate (45 mm/h) and CEA (carcinoembryonic antigen) levels (3.7 µg/l), without further biochemical or haematological pathologies. Previously performed examinations failed to reveal a clear aetiology (gastroscopy and colonoscopy showed bulbitis and internal haemorrhoids, respectively).

Therefore, the patient was indicated for <sup>18</sup>F-FDG PET examination to exclude occult malignancy (elevation of inflammatory markers, CEA tumour marker and presence of cachectization). We performed <sup>18</sup>F-FDG PET scanning in euglycaemia after fasting for 6 hours and oral hydration. <sup>18</sup>F-FDG PET scan images of the body, at the extent from the proximal thirds of femurs to the cranial base, were obtained 60 minutes after intravenous injection of <sup>18</sup>F-FDG (341 MBq). Data acquisition was performed on a PET scanner ECAT ACCEL SIEMENS in a 3D mode. Emission and transmission scans were reconstructed using an iterative reconstruction algorithm. On acquired data, attenuation correction was applied. For semiquantitative analysis, maximum standardized uptake values (SUV<sub>max</sub>) were measured. Finally, off-line image fusion of PET and computed tomography (CT) data sets was performed.

The <sup>18</sup>F-FDG PET scan detected high <sup>18</sup>F-FDG uptake (SUV<sub>max</sub> = 4.3) circularly around the distal abdominal aorta and left common iliac artery (Figure 1). Further sites of pathological <sup>18</sup>F-FDG uptake were not found. On the fusion PET/CT scan these sites were precisely localised into the abdominal aorta wall, left common iliac artery and also paraorticly and parailiacly. The central photopenic (non-active) area corresponded with the artery lumen (Figure 2). Thus, the finding proved a metabolic active inflammation — periaortitis.

Unfortunately, soon after the PET examination the patient died unexpectedly. Autopsy determined the cause of death as fatal aneurysm rupture of the distal part of abdominal aorta leading to a haemorrhagic shock. No malignancy was revealed.

*Correspondence to:* Petr Szturz, MD, PhD  
Department of Internal Medicine — Hematology and Oncology,  
University Hospital Brno  
Jihlavská 20, 625–00 Brno, Czech Republic  
Tel: +420532233064, Fax: +420532233603  
e-mail: petr.szturz@fnbrno.cz



**Figure 1.** 18F-FDG PET: High FDG uptake in the distal abdominal aorta wall, aortic bifurcation, paraaortically and left parailiacally, without further pathological FDG uptake



**Figure 2.** CT scan: aneurysm of the abdominal aorta at its bifurcation (the black arrow) extending up to the common iliac artery. Around there is an inflammatory abscess formation with pyogenic membrane (the white arrows) propagating in the vicinity

## Discussion

Not only malignancies may be the cause of pathological 18F-FDG PET finding, but also some inflammatory diseases [1]. 18F-FDG uptake is not specific for tumours. For instance, in large vessel vasculitis (LVV) PET examination is used not only in primary diagnostics, but for inflammation activity monitoring during therapy as well. Concerning LVV, increased glucose metabolism proves active inflammation [2]. Sometimes even inflammatory infiltrate of an atherosclerotic plaque may lead to PET positivity; it is supposed that activated macrophages are mainly responsible for increased 18F-FDG uptake [3, 4].

Chronic periaortitis (including 3 entities: idiopathic retroperitoneal fibrosis - IRF, inflammatory abdominal aortic aneurysms — IAAA and perianeurysmal retroperitoneal fibrosis — PRF) may also be manifested in an increased 18F-FDG uptake in concentric wall thickening with a perivascular cuff around the abdominal aorta.

This disease is frequently accompanied by low-back pain, weight loss, anaemia, fatigue, high erythrocyte sedimentation rate and elevated C-reactive protein levels [5–7]. In patients with IRF, decrease in metabolic activity of the inflammation in correlation with erythrocyte sedimentation rate, C-reactive protein and a CT documented thickening was described and documented in a series of 18F-FDG PET scans during therapy with corticosteroids or tamoxifen [8, 9].

In some patients with IAAA, correlation between periaortic 18F-FDG uptake and intensity of inflammatory cell infiltration was found [10]. The process seems to depend upon the release of matrix metalloproteinases focally produced and/or activated by inflammatory cells, which leads to degradation of elastin and collagen in the aneurysm wall. Increased metabolic activity in the wall of the IAAA on PET scan reflects increased rupture risk better than aneurysm size [11, 12]. Also another case report found a potential link between high wall stress and accelerated metabolism in aortic aneurysm wall [13].

Unfortunately, in our patient the inflammation of artery wall aneurysm, accompanied by increased 18F-FDG uptake, led as far as to fatal rupture.

## References

1. Larson SM. Positron Emission Tomography in oncology and allied diseases, in Devita VT, Hellman S, Rosenberg SA (eds). *Cancers, Principles and Practice of Oncology*, 2nd Ed, Philadelphia, JB Lippincott Publishing, 1999; 3: 1–12.
2. Belhocine T, Blockmans D, Hustinx R, Vandevivere J, Mortelmans L. Imaging of large vessel vasculitis with (18)FDG PET: illusion or reality? A critical review of the literature data. *Eur J Nucl Med Mol Imaging* 2003; 30: 1305–1313.
3. Vallabhajosula S, Machac J, Knesaurek K. Imaging atherosclerotic macrophage density by Positron Emission Tomography using 18-fluorodeoxyglucose (FDG). *J Nucl Med* 1996; 37: 38.
4. Chang ChY, Cheng ChY, Shih WJ. Applications of FDG PET/CT in Atherosclerosis and its Potential for Monitoring Therapeutic Responses. *J Med Sci* 2009; 29: 107–117.

5. Salvarani C, Pipitone N, Versari A, et al. Positron emission tomography (PET): Evaluation of chronic periaortitis. *Arthritis Care and Research* 2005; 53: 298–303.
6. Young PM, Peterson JJ, Calamia KT. Hypermetabolic activity in patients with active retroperitoneal fibrosis on F-18 FDG PET: report of three cases. *Ann Nucl Med* 2008; 22: 87–97.
7. Johnston PW, Kennedy PT, Blair PH. Periaortitis complicating aortic dissection. *Eur Heart J* 2007; 28: 442.
8. Sakamoto A, Okamoto K, Ishizaka N, Tejima K, Hirata Y, Nagai R. 18F-fluorodeoxyglucose positron emission tomography in a case of retroperitoneal fibrosis. *Int Heart J* 2006; 47: 645–650.
9. Jansen I, Hendriksz TR, Han SH, Huiskes AW, van Bommel EF. 18F-fluorodeoxyglucose positron emission tomography (FDG-PET) for monitoring disease activity and treatment response in idiopathic retroperitoneal fibrosis. *Eur J Intern Med* 2010; 21: 216–221.
10. Defawe OD, Hustinx R, Defraigne JO, Limet R, Sakalihan N. Distribution of F-18 fluorodeoxyglucose (F-18 FDG) in abdominal aortic aneurysm: high accumulation in macrophages seen on PET imaging and immunohistology. *Clin Nucl Med* 2005; 30: 340–341.
11. Sakalihan N, Hustinx R, Gomez P, Nchimi A, Limet R: Increased metabolic activity in the wall of the AAAs with PET scanning reflects increased rupture risk better than size: Technique and results of 18F-Fluorodeoxy Glucose Scanning. In VEITHsymposium: 37th Annual Symposium on Vascular and Endovascular Issues, New York, 2010. VEITHsymposium online library, accessed May 19, 2011: <http://www.veithsymposium.org/pdf/vei/1708.pdf>
12. Reeps C, Essler M, Pelisek J, Seidl S, Eckstein HH, Krause BJ. Increased 18F-fluorodeoxyglucose uptake in abdominal aortic aneurysms in positron emission/computed tomography is associated with inflammation, aortic wall instability, and acute symptoms. *J Vasc Surg* 2008; 48: 417–423
13. Xu XY, Borghi A, Nchimi A, et al. High Levels of 18F-FDG Uptake in Aortic Aneurysm Wall are Associated with High Wall Stress. *Eur J Vasc Endovasc Surg* 2010; 39: 295–301.