^{18}F-FDG PET imaging in granulomatosis with polyangiitis

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Abstract

The paper gives an overview of the literature data on uptake of fluorine-18-fluorodeoxyglucose (^{18}F-FDG) into the different tissue lesions which may occur in granulomatosis with polyangiitis (formerly called Wegener's syndrome). It discusses the cellular mechanisms of such ^{18}F-FDG uptake, which provide a basis for its interpretation in the context of ^{18}F-FDG positron emission tomography (PET) for inflammatory conditions.

The case about granulomatosis and polyangiitis (GPA), published in the present issue of HJMN [1] indicates the diagnostic importance of position emission tomography/computing tomography (PET/CT) with fluorine-18-fluorodeoxyglucose (^{18}F-FDG). This syndrome of granulomatosis and polyangiitis was formally called Wegener's syndrome. Its diagnosis may be challenging. The ^{18}F-FDG PET/CT showed activity in multiple lung nodules, which were subsequently biopsied, showing revealing non-caseous necrotizing granulomatous inflammation with eosinophilia and vasculitis.

This case further attests to the ability of ^{18}F-FDG PET to depict the lesions in Wegener's granulomatosis, as has been described in many case reports. These have included lung nodules [2-12], paranasal or sinus involvement [2, 4, 8-12], parapharyngeal space lesions [10], otitis media [10,11], parotid involvement [9], an orbital mass [13], tracheal involvement [10], mediastinal involvement [4, 9], mediastinal and hilar lymph nodes [10, 12], periaortitis [2, 14] or great vessel involvement [10], meningeal involvement [14], prostate gland involvement [9], skin [10], duodenal [10], adrenal [10] and splenic involvement [10, 15], although one of the latter cases was classified as a disseminated visceral giant cell arteritis. In a patient with possible duodenal involvement [10], endoscopy revealed gastrointestinal bleeding, but large vessel involvement could not be demonstrated by conventional imaging methods. One case series reported that kidney lesions could not be detected by ^{18}F-FDG PET/CT [11], while another series found kidney lesions in 3 patients out of 10 with renal involvement based on laboratory findings [10]. Anyway, the physiological tracer uptake in the kidney interferes with the identification of tissue lesions [10]. In one published case, enhanced tracer uptake in the ascending aorta and aortic arch was ascribed to concomitant Takayasu's arteritis [5]. Ito et al. (2013) in 2 patients with nasal mucosa thickening and 3 with exudative otitis media described lesions that were clearly abnormal on ^{18}F-FDG PET but hardly detectable on CT [11].

A variety of in vitro and in vivo experiments have addressed the mechanism of accumulation of ^{18}F-FDG in active inflammatory processes. These have shown uptake of ^{18}F-FDG in neutrophils [16-17] as well as in macrophages [18-19] and lymphocytes [20-21]. In neutrophils, deoxyglucose uptake has been shown to be a marker of priming [22]. In lymphocytes, activation by concanavalin A increases uptake of ^{18}F-FDG [20]. Enhanced glycolysis in activated inflammatory cells has been shown to be sustained by increased numbers or affinity of glucose transporters in the cell membrane [23-25].

In the case presented by Gykiere et al., ^{18}F-FDG accumulation correlated histologically with the granulomatous inflammation including giant cells, histiocytes, neutrophils, and eosinophils as well as with the infiltration of lymphocytes, plasma cells and histiocytes in the surrounding tissue [1].

Of course, these uptake mechanisms are shared by several types of infectious or inflammatory diseases. In the patient reported by Gykiere et al., the differential diagnosis may have included tuberculosis, sarcoidosis and histoplasmosis [1].

As is pointed out in the case report [1], none of the findings on PET are specific for GPA but, taking into account the clinical context, they nevertheless may contribute to early diagnosis. The utility of ^{18}F-FDG PET or PET/CT in fever or inflammation of unknown origin is well documented now [26-27].Many connective tissue diseases [7, 28] and in particular many types of vasculitis [29] may be recognized on PET. In these diseases, PET may guide biopsy taking, and, since it is a whole body examination, it may determine the extent of the disease. Moreover, owing to the functional nature of the information it may

determine the extent of the disease. Moreover, owing to the functional nature of the information gained by ^{18}F-FDG-uptake, PET allows to monitor disease activity dur-ing and after treatment. The standardized uptake value (SUV) provides a way to do this in a semiquantitative manner.

The authors declare that they have no conflicts of interest.

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