Paediatric gastric and intestinal Crohn's disease detected by $^{18}$F-FDG PET/CT

Abstract

We present a case of gastric and intestinal Crohn’s disease associated with extra-intestinal manifestations of fever, rash in the lower limbs, in a 12 years old boy. Fluorine-18 fluorodeoxyglucose positron emission tomography/computed tomography ($^{18}$F-FDG PET/CT) was performed for the diagnosis of the disease causing fever of unknown origin. Gastroscopy showed polypoid hyperplasia and ulcers in the stomach and their pathology suggested gastric Crohn’s disease. Intestinal Crohn’s disease was also diagnosed. Corticosteroids were temporarily effective. During 2 years of follow-up, there were clinical remissions and relapses confirmed by endoscopy in both the stomach and the small intestine.

Introduction

Crohn’s disease can affect all gastrointestinal tract, but rarely the stomach. Gastric and intestinal endoscopy are first used for its diagnosis [1]. Fluorine-18-fluorodeoxyglucose ($^{18}$F-FDG) hybrid positron emission tomography and computed tomography scan (PET/CT) has often been used to diagnose mucosal inflammation in cases of gastrointestinal Crohn’s disease in adults and children [2-7]. To our knowledge, this is the first report published of $^{18}$F-FDG uptake on a PET/CT scan in a pediatric patient with gastric and intestinal Crohn’s disease.

Case report and Discussion

A 12 years old boy presented with intermittent fever of unknown origin of 40 days duration. The concurrent symptoms included sore throat, abdominal pain and nausea. These symptoms were relieved by antibiotics and gastric mucosal protective agents. The boy also had weight loss. His white blood cells were 11.7×10$^9$/L, with neutrophils 83,4%, red blood cells 3,73×10$^{12}$/L, hemoglobin 107g/L, platelets 220×10$^9$/L, C-reactive protein 86mg/L and erythrocyte sedimentation rate 46mm/h. Blood culture was negative. Bone marrow biopsy showed inflammatory lesions. Abdominal ultrasound showed enlarged pancreas with uniform echo and peri-pancreatic and mesenteric lymph nodes (the largest lymph node was 18mm x 8mm).

The $^{18}$F-FDG PET/CT scan demonstrated diffuse heterogeneous uptake of the gastric walls (Fig. 1A arrows). The corresponding CT images showed a slight thickening of the gastric walls (Fig. 1B). The fused PET and CT images with the yellow areas confirmed that the $^{18}$F-FDG uptake was focal (Fig. 1C). The MIP image showed a similar pattern (Fig. 1D arrows). Gastroscopy was performed, and its images showed multiple gastric areas of polypoid hyperplasia and ulcers of the gastric wall (Fig. 2A arrows). Pathology films after biopsy during gastroscopy showed granuloma and multiple inflammatory cells (Fig. 2B).

Subsequently, the patient received corticosteroid treatment. Ultrasound gastroscopy performed after a 10 days course of corticosteroids showed normal gastric wall (Fig. 2C and 2D). After two years, the patient had again intermediate fever, weight loss and shapeless stools positive for haemoglobin. Colonoscopy showed polypoid hyperplasia and ulcers with thickening of the small intestinal wall (Fig. 3A). Biopsy performed during colonoscopy showed granuloma and multiple inflammatory cells (Fig. 3B).
The clinical presentation of Crohn’s disease is primarily determined by the location and extent of the disease. With upper gastrointestinal tract involvement, nausea, vomiting, and abdominal pain prevail. Children and adolescents presenting with Crohn’s disease usually have weight loss. Our case had all these symptoms and also fever. Crohn’s disease may affect any part of the gastrointestinal tract, sometimes more than one part, and can cause local inflammation [8]. Its clinical course is characterized by a succession of periods of clinical relapse and remission, as in our case in which lesions in the intestine were also diagnosed 2 years later after diagnosis of the gastric lesions.

Endoscopy has been considered the gold standard to diagnose and assess Crohn’s disease [1]. However, endoscopy is unpleasant for the patient, sometimes incomplete because of unreachable segments of the stomach, and can assess only mucosal lesions, although the disease may sometimes affect deeper parts of the gastrointestinal wall [5]. Focally enhanced gastritis (FEG) is typified by small collections of lymphocytes and histiocytes surrounding a small group of foveolae or gastric glands, often with infiltrates of neutrophils. Interestingly, the significance of FEG was commonly observed in younger patients, with the peak in the 5 to 10 years of age group (80%). Therefore, FEG may be associated with disease activity and the presence of granulomas in pediatric Crohn’s disease [9].

The 18F-FDG PET/CT scan is a noninvasive technique that can localize and semiquantify inflammatory gastrointestinal areas [2-5].

However, CT and 18F-FDG PET/CT examinations are associated with substantial exposure to ionising radiation. Even with child-adapted low-dose protocols, patients undergoing a single 18F-FDG PET/CT examination are exposed to ionising radiation in the order of 10-20mSv, which is equivalent to roughly 700-750 chest radiographs [10]. Therefore, 18F-FDG-PET has to be discussed as a tool for the determination of extent and degree of Crohn’s disease considering its additional radiation exposure. For pediatric patients 18F-FDG PET/CT can play a role in the diagnosis and management of the underlying disease in cases of fever of unknown origin.

In conclusion, to our knowledge this is the first reported 18F-FDG PET/CT examination of gastric and intestinal Crohn’s disease. A pattern with diffuse heterogeneous uptake of 18F-FDG PET/CT in the gastric wall, may indicate among other diagnoses, the diagnosis of gastric Crohn’s disease.

The authors declare that they have no conflicts of interest.

Bibliography


The second terrace with view to the third of the Asklepion, in Kos, the island where Hippocrates was born. Photo from Prof. Andreas Otte.