



A new way to look at inflammatory bowel disease

John Mernagh, MD; Sat Somers, MB ChB

Technology: Positron emission tomography (PET)

Use: PET scanning with fluorine-18-labelled fluorodeoxyglucose (^{18}F FDG) measures regional glucose metabolism. In the healthy patient radioactivity is seen only in the brain and heart. Increased radioactivity can be seen in other parts of the body where there is increased glucose metabolism, including the inflamed bowel. Thus, ^{18}F FDG PET scanning is a useful noninvasive tool in the diagnosis of inflammatory bowel disease (IBD).

History: PET scanning with ^{18}F FDG has proven its usefulness in the investigation of the brain¹ and neoplasia.² Much less has been written about its use in the investigation of IBD.³⁻⁵ Our studies have shown that this technology can reliably identify inflammation in the bowel secondary to IBD (Figure).^{4,5}

In one of our studies⁴ 86 patients (44 males and 42 females; mean age 14 [range 2-48] years) with clinical signs of IBD were examined. PET was performed at the time of initial presentation or during flare-up of established IBD. Endoscopy was performed to confirm the diagnosis. Fifty-six patients had true-positive PET scans, 20 had true-negative scans, 1 patient with gastric Crohn's disease had a false-negative scan, and 4 patients had false-positive scans (in 3 the PET scans showed mild inflammation, and in 1 patient diarrhea of unknown cause was diagnosed). Five patients with active IBD had negative PET scans, but they had been taking steroid therapy for at least 1 week before scanning; these patients were excluded from the study. The sensitivity of the PET scanning was 98%, specificity 83%, positive predictive value 93% and negative predictive value 95%.

PET scanning with ^{18}F FDG is now routinely used at our institution to investigate IBD. To our knowledge this is the only site in Canada and the United States where the technology is used for this purpose. It is especially helpful when investigating IBD in children and adolescents, since there is often reluctance to use barium or endoscopy because of the greater trauma associated with these techniques. We have found PET scanning to be very useful not only for screening patients with suspected IBD but also for making the definitive diagnosis and monitoring treatment.^{4,5}

Promise: PET scanning is a highly sensitive, easy and noninvasive method for assessing and following up IBD. The intensity of the inflammation can be quantified by measuring the intensity of radioisotope activity in the involved bowel.^{4,5} This measurement allows monitoring of the treatment of IBD and reduces the need for repeated small-bowel studies and endoscopy.

Problems: There are currently only 7 PET scanners in Canada, 2 of which are at our institution. Also, FDG must be



PET study using ^{18}F FDG to measure glucose metabolism in bowel of 13-year-old girl with known Crohn's disease who presented with acute flare-up of symptoms. Image is reconstructed in 3-D and in coronal, transverse and sagittal planes. Significantly increased radioisotope activity (bright yellow) is evident throughout colon.

either bought or produced in house with a cyclotron. With the newer, cheaper scanners the cost of a PET scan is similar to that of a CT scan. The primary limitation of the technique is its lack of specificity in differentiating inflammation from neoplasia. In most cases the history and clinical findings can be used to help differentiate the 2. In uncertain cases PET scanning would be able to direct further investigations by identifying the area of abnormality.

Prospects: The establishment of more PET sites is currently being planned in Canada. The use of PET to evaluate IBD should then increase. This technology has the promise of being the diagnostic tool of choice in the investigation of IBD, especially in children and adolescents.⁵

Competing interests: None declared.

References

1. Jamieson D, Alavi A, Jolles P, Chawluk J, Reivich M. Positron emission tomography in the investigation of central nervous system disorders. *Radiol Clin North Am* 1988;26:1075-88.
2. Strauss LG, Conti PS. The applications of PET in clinical oncology. *J Nucl Med* 1991;32:623-48.
3. Hannah A, Scott AM, Akhurst T, Berlangieri S, Bishop J, McKay WJ. Abnormal colonic accumulation of fluorine-18-FDG in pseudomembranous colitis. *J Nucl Med* 1996;37:1683-5.
4. Mernagh JR, Thompson M, Jacobson K, Coates G, Somers S, Nahmias C. Assessment of inflammation in inflammatory bowel disease with PET. 1998 Scientific Assembly and Annual Meeting of the Radiological Society of North America; 1998 Nov 29-Dec 4; Chicago. *Radiology* 1998;209(Suppl):172.648.
5. Skehan SJ, Issenman R, Mernagh J, Nahmias C, Jacobson K. 18F-fluorodeoxyglucose positron tomography in diagnosis of paediatric inflammatory bowel disease. *Lancet* 1999;354:836-7.

The authors are with the Department of Radiology, Hamilton Health Sciences Corporation — McMaster Site, Hamilton, Ont.