Capsule endoscopy versus positron emission tomography for detection of small-bowel metastatic melanoma: a pilot study

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Background: Melanoma is the most common tumor to metastasize to the GI tract, where it mainly involves the small bowel.

Objective: To compare capsule endoscopy (CE) and ^{18}F-fluorodeoxyglucose (FDG) positron emission tomography (PET)-CT scanning, the current standard and most sensitive investigation modality, in detecting small-bowel metastases in patients with metastatic melanoma.

Design: A prospective study of patients with metastatic melanoma who were undergoing FDG PET-CT scanning. CE was performed and the results read by two independent observers without knowledge of the other investigation results.

Setting: Tertiary care centers.

Patients: This study involved 21 patients with a median age of 52 years (range 22-88 years).

Intervention: CE.

Main Outcome Measurements: Detection of small-bowel melanoma.

Results: FDG PET-CT scanning showed increased abdominal uptake in 12 patients, but only 5 of these patients were found to have small-bowel melanoma on CE. Importantly, in 1 patient with a bleeding small-bowel tumor on CE, the FDG PET-CT scan result was negative. One patient with positive FDG PET-CT scan results and negative CE results subsequently developed symptomatic small-bowel melanoma 10 months after CE.

Limitations: Small-bowel melanoma could not be excluded entirely in 7 patients with positive FDG PET-CT scan results and negative CE results, and follow-up is ongoing. The number of patients in this study was small.

Conclusion: CE was better than FDG PET-CT scanning in localizing small-bowel melanoma. This study suggests that CE is an ideal complementary investigation modality for patients with known metastatic melanoma undergoing preoperative work-ups and in those with unexplained anemia or GI symptoms. (Gastrointest Endosc 2011;73:750-6.)

Melanoma is the most common tumor to metastasize to the GI tract, predominantly to the small bowel.[1-5] Australia has the highest incidence of melanoma, and it has nearly doubled every 10 years.[6] In the United States, the incidence has more than tripled in the white population over the past 20 years, and it is estimated that almost 70,000 new cases of invasive melanoma will have been diagnosed in 2009.[7] In Australia, the lifetime risk of developing melanoma is 1 in 29.2,[8] whereas in the United States, it is expected to be 1 in 50 in 2010.[9] Although melanoma is

Abbreviations: CE, capsule endoscopy; FDG, ^{18}F-fluorodeoxyglucose; PET, positron emission tomography.

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responsible for only 4% of all skin cancers, it causes more than 77% of skin cancer deaths.[7]

Although small-bowel metastases can be found at postmortem examination in up to 60% of patients who die from melanoma, antemortem diagnosis is made in less than 5% of patients.[1,3,4] This is because patients typically present late, and, until recently, the available investigation modalities, including endoscopy and radiological imaging, had low sensitivity and underestimated the frequency of small-bowel involvement.[10-12] Small-bowel melanoma metastases can be asymptomatic, and, if symptoms develop, the most common are overt or occult GI bleeding, abdominal pain, and bowel obstruction.[10,13-15]

The early detection and determination of small-bowel metastases is important in the preoperative assessment of patients with melanoma. The presence of small-bowel metastases in patients undergoing surgery for recurrence or known metastases in other sites may influence patient management. Further, complete resection of small-bowel disease prolongs survival,[4,16-18] which suggests that earlier diagnosis may lead to improved patient outcomes.

We previously reported a series of 13 patients with suspected small-bowel melanoma in whom capsule endoscopy (CE) confirmed the diagnosis in 5 and excluded it in 8.[19] That study also demonstrated that CE was more sensitive than small-bowel follow-through and abdominal CT. However, only 5 of the patients had undergone positron emission tomography (PET)-CT scanning using ^{18}F-fluorodeoxyglucose (FDG), which is now a routine investigation technique for assessing the extent of melanoma metastases. PET-CT has been reported to be more sensitive in detecting visceral and nonvisceral metastases (98.7%) than either PET alone (88.8%) or CT alone (69.7%).[20] The effectiveness of CE in detecting small-bowel involvement has not been studied. The aim of this study was to compare the ability of CE and FDG PET-CT to detect small-bowel metastases in patients with known extra-GI melanoma metastases.

Take-home Message

- Neither positron emission tomography (PET)-CT scans nor capsule endoscopy detects small-bowel melanoma with 100% sensitivity; thus ^{18}F-fluorodeoxyglucose PET-CT scans and capsule endoscopy are complementary in patients undergoing assessment of metastatic melanoma, whether or not patients have GI symptoms and/or anemia.

METHODS AND PATIENTS

Twenty-one patients attending the Melanoma Institute Australia who had FDG PET-CT scans as part of the assessment of known or suspected metastatic melanoma were invited to take part in this prospective pilot study between April 2006 and May 2008. Twenty patients were classified as M1c according to the American Joint Committee on Cancer staging scale,[21] with visceral non–small-bowel metastases or any distant metastases, with an elevated serum lactate dehydrogenase level. One patient was classified M1b, with lung metastases.[21] There were 14 men and 7 women, with a median age of 52 years (range 22-88 years, interquartile range 28.5). Three patients had overt GI bleeding, and 2 others were anemic. Eight patients complained of abdominal pain, including 3 with GI bleeding or anemia. Eleven patients were asymptomatic.

CE and the PET-CT studies were performed on different days. All CEs were performed by using a small-bowel PillCam (Given Imaging, Yoqneam, Israel), as previously described.[22] Patients had only liquids after lunch on the day before CE. Bowel cleansing was performed at 5:00 PM the previous afternoon, with sodium pico sulphate 10 mg (Picoprep; Pharmatel, Pymble, Australia) or, in patients older than 70 years, 1 L of polyethylene glycol (Glycoprep; Pharmatel, Pymble, Australia). Patients then fasted for 10 hours before the procedure. Metoclopramide 10 mg (Maxolon; Valeant, Rhodes, Australia) was given orally 15 minutes before capsule ingestion.

All PET-CT scans were carried out after a 6-hour fast. FDG (325-370 MBq) was injected intravenously, and, after a 60-minute uptake period, patients were placed on the scanner bed. Oral and intravenous contrast materials were not given. The study area extended from the vertex of the cerebrum to the upper thighs, with arms typically placed at the side; arms were placed above the head if the patient's weight was greater than 90 kg. Twenty-four PET-CT scans were performed in these patients: (1) in 1 patient, a separate dedicated brain study was carried out before the body was scanned; (2) in 1 patient, the scanner malfunctioned, the data that were acquired were lost, and the scan was repeated on our second scanner; and (3) in 1 patient, the lower limbs were also included as a separate scan after the initial scan was completed. Two PET-CT scanners were used: a Biograph Duo LSO device for 24 scans and a Biograph Truepoint 64-slice PET-CT (both devices were manufactured by Siemens Healthcare, Hoffman Estates, Ill) for 4 patients. Diabetic patients were not excluded. CE findings were examined by two independent observers (E.P., W.S.S.) without knowledge of the other investigation results.

This study was approved by the Sydney South West Area Health Service Ethics Review Committee (Royal Prince Alfred Hospital zone) and was carried out in accordance with the Declaration of Helsinki. All patients gave written informed consent for the study and for use of the data and images for research purposes.