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Visualization of gallbladder with In-111 labeled octreotide in post prandial state

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Somatostatin receptor scintigraphy is widely used in the management of neuroendocrine tumors. Somatostatin receptors are present in both neoplastic and normal tissues, which may lead to misinterpretation of the scans. Here, a patient with lung carcinoid imaged with In-111 octreotide is presented. Imaging was performed 4 and 24 hours after an intravenous injection of 185 MBq In-111 octreotide in the post prandial state. Whole body and SPECT images showed accumulation of radioactivity in the gallbladder. Imaging was repeated after fatty meal ingestion to differentiate abnormal activity and physiological uptake in the gallbladder. The abdominal SPECT studies at 28 hours revealed no uptake in the gallbladder, and the scintigraphic study was reported as normal so further excessive diagnostic procedures were prevented. Gallbladder can be visualized on somatostatin receptor scintigraphy even in the post prandial state. Delayed images after fatty meal administration are important for differential diagnosis.

Key words: In-111 octreotide, gallbladder, somatostatin receptors, carcinoid tumor

INTRODUCTION

NEUROENDOCRINE TUMORS encompass a wide range of uncommon neoplasms derived from diverse tissues and cells that are believed to have a common embryological origin from neural crest and closely related tissues.[1] Since many of these tumors express cell surface receptors for somatostatin, somatostatin receptor scintigraphy (SRS) can be used in the localization of these tumors at the initial diagnosis and follow up.[1] The efficacy of SRS in localizing gastroenteropancreatic (carcinoids, pancreatic endocrine tumors) and other neuroendocrine tumors like pituitary adenomas, medullary thyroid cancer and small cell lung cancer is very well established.[2] Besides neuroendocrine tumors, somatostatin receptors are also demonstrated on normal tissues which may make the interpretation of scintigraphic images complex and difficult. Normal scintigraphic features of SRS include visualization of thyroid, liver, spleen, kidneys and in some patients the pituitary.[3] Although the main clearance of the somatostatin analogue is via kidneys, hepatobiliary clearance into the bowel also occurs.[1] Somatostatin receptor positive lesions unrelated to the pathology have been reported previously.[2] These false positive findings are accessory spleen, renal parapelvic cysts, granulomatosis lung disease, activity at the site of recent surgical incision and breast diseases.[2]

In this case report a patient with lung carcinoid who had persistant gallbladder uptake in SRS at 4 and 24-hour images after administration of In-111 [DTPA-D-Phe[1]] octreotide is presented. This finding disappeared after fatty meal administration at 28-hour images.

CASE REPORT

A 16-year-old male patient with an onset of facial edema which worsened during the last 12 months and an increased serum level of adrenocorticotropic hormone (ACTH) of 107 pg/m*l* (normal range: 0–46 pg/m*l*) and increased urinary free cortisol excretion 4539 μg/day (normal range: 21–85 μg/day) was referred to our hospital for further evaluation. A pituitary adenoma secreting ACTH was suspected, but pituitary magnetic resonance images were normal. A consecutive thoracoabdominal

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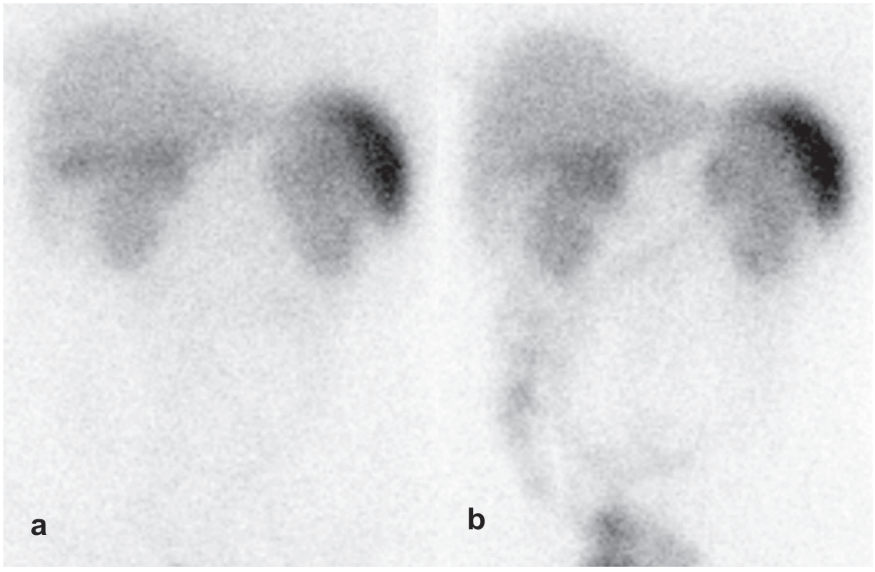

Fig. 1 Planar In-111 octreotide scintigraphy at 4 (a) and 24 (b) hours. Abdomen spot view revealed radioactivity accumulation in the liver at postprandial state which was suspicious for gallbladder.

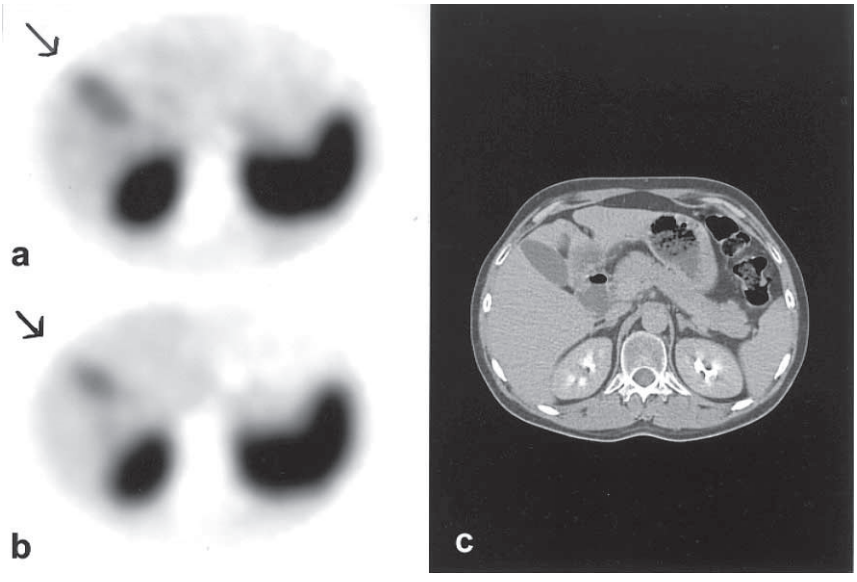

Fig. 2 4 hour (a) and 24-hour (b) abdomen SPECT images showed better delineation of the gallbladder (*arrows*). Abdominal CT images (c) were used to differentiate anatomic localization of the gallbladder.

computed tomography (CT) showed an intraparenchymal nodule in the lower lobe of the right lung and slightly enlarged adrenal glands. With the clinical diagnosis of ACTH-secreting tumor in the lung, the patient underwent surgery and the lesion in the lower lobe of the right lung was resected as well as lymph node dissection, and the pathology report revealed lung carcinoid with metastatic lymph nodes. The patient was referred to the nuclear medicine department for SRS to investigate the presence of other metastatic foci. Planar and SPECT images were obtained 4 hours and 24 hours after an intravenous administration of 185 MBq In-111 octreotide using a dual headed gamma camera (General Electric, Infinia) equipped with a medium energy-high resolution collimator. The patient was in postprandial state at the time of both images. Anterior whole body and planar abdominal images (Fig. 1) showed abnormal radioactivity accumulation in the liver region. SPECT study was helpful in differentiating between physiological gallbladder activity and abnormal liver uptake due to metastasis (Fig. 2). Abdominal CT images were also used to differentiate the anatomic localization of the gallbladder (Fig. 2). Besides

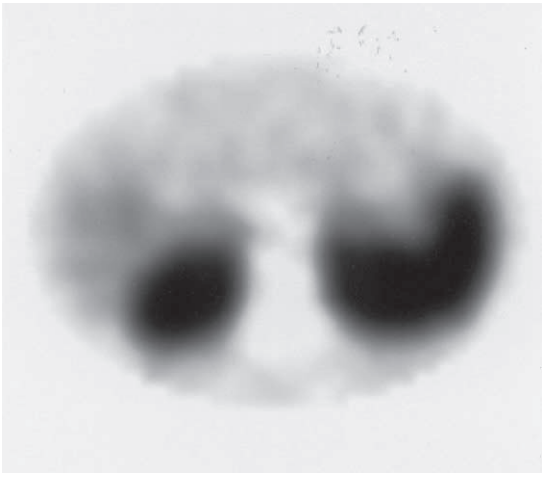

Fig. 3 28-hour abdomen SPECT images, performed after fatty meal ingestion, were free of radioactivity accumulation in the gallbladder.

gallbladder, radioactivity uptake in the right paratracheal region in the thorax and lateral side of the right lung were also noted in the thorax SPECT and spot images, respectively.

Since there have been reports of neuroendocrine carcinomas located in the gallbladder[4,5] as well as false positive uptakes of the radioactivity in the same location, abdomen was reevaluated with SPECT after a fatty meal and chocolate ingestion. This time there was no uptake in the gallbladder, and abdomen SPECT images were interpreted as normal (Fig. 3). The radioactivity in the lateral side of the right lung was attributed to the recent surgery. The radioactivity uptake in the right paratracheal region was clarified as a lymph node in thorax CT which was performed after SRS scintigraphy.

DISCUSSION

The somatostatin analogue octreotide has been shown to bind to somatostatin receptors both in neoplastic and non-neoplastic tissues.[6] Uptake of radioactivity is important since localization of the primary tumor, decision of resectability and type of surgical resection are planned according to SRS in gastrointestinal neuroendocrine tumors.[2]

The clearance of somatostatin analogue is predominantly by renal route and only 2% of the In-111 octreotide is cleared through the hepatobiliary system.[7] Because of this low hepatobiliary excretion, demonstration of the tracer in the gallbladder area was claimed as suggestive of a tumor previously.[8] Krausz et al.,[7] reported three patients with insulinoma who were studied with SRS after an overnight fast. The patients had gallbladder uptake which disappeared in the scan following a meal. Kipper et al.[9] presented a case with carcinoid whose abdominal view at 4 hours was negative and had no activity in the gallbladder region on SRS. However, tracer accumulation in the gallbladder region was noted on the 24-hour image and the patient underwent surgical resection, but no metastasis was found.

The unusual point of our case was visualizing the gallbladder at both 4 and 24-hour images. Moreover, abdominal scans were not performed at the fasting state. So the effect of time interval and fasting state on image interference was not obvious in our patient as stated previously.[7,9] SPECT permitted better anatomic delineation than planar imaging and also with the help of CT, differentiation between liver metastasis and gallbladder region could be done. Differentiation between pathologic uptake of the tracer due to hepatic metastasis and physiologic accumulation in the gallbladder due to hepatobiliary excretion was important, and so abdomen SPECT study was repeated after a fatty meal and chocolate ingestion at 28-hour images. Nonvisualization of the radioactivity in the gallbladder avoided further diagnostic steps.

The impact of SRS in the management of patients is high. It may detect resectable tumors that would be unrecognized with conventional techniques. Being aware of physiological uptake and overexpression of somatostatin receptors by non-neuroendocrine tumoral process is important to prevent unnecessary surgical procedures. Although only 2% of the injected dose of In-111 octreotide is secreted via liver, our patient showed that gallbladder uptake can be seen in SRS even in the non fasting state. Delayed images may also demonstrate radioactivity accumulation in gallbladder. Careful interpretation is important and reevalution after fatty meal administration is warranted.

REFERENCES

1. Shapiro B, Fig LM, Gross MD, Shulkin BL, Sisson JC. Neuroendocrine Tumors. In: *Nuclear Oncology*, Aktolun C, Tauxe WN (eds), Berlin Heildelberg; Springer-Verlag, 1999: 3–31.
2. Gibril F, Reynolds JC, Chen CC, Fang Y, Gobel SU, Serrano J, et al. Specificity of somatostatin receptor scintigraphy: A prospective study and effects of false-positive localizations on management in patients with gastrinomas. *J Nucl Med* 1999; 40: 539–553.
3. Kwekkeboom DJ, De Jong M, Krenning EP. Somatostatin Receptor Scintigraphy. In: *Diagnostic Nuclear Medicine*, Sandler MP, Coleman RE, Patton JA, Wackers FJ, Gottschalk A (eds), Philadelphia; Lippincott Williams & Wilkins, 2003: 735–746.
4. Sakaki M, Hirokawa M, Sano T, Horiguchi H, Wakatsuki S, Ogata S. Gallbladder adenocarcinoma with florid neuroendocrine cell nests and extensive paneth cell metaplasia. *Endocr Pathol* 2000; 11 (4): 365–371.
5. Kuwabara H, Uda H. Small cell carcinoma of the gallbladder with intestinal metaplastic epithelium. *Pathol Int* 1998; 48: 303–306.
6. Kwekkeboom DJ, Krenning EP. Somatostatin Receptor Imaging in Oncology. In: *Nuclear Oncology*, Aktolun C, Tauxe WN (eds), Berlin Heildelberg; Springer-Verlag,

1999: 345–357.
7. Krausz Y, Shibley N, De Jong RBJ, Yaffe S, Glaser B. Gallbladder visualization with In-111 labeled octreotide. *Clin Nucl Med* 1994; 19 (2): 133–135.
8. Krenning EP, Bakker WH, Kooij PP, et al. Somatostatin receptor scintigraphy with Indium 111-DTPA-D-Phe-1-Octreotide in man: metabolism, dosimetry and comparison with iodine-123-Tyr-3-octreotide. *J Nucl Med* 1992; 33: 652–658.
9. Kipper MS, Krohn LD. Gallbladder visualization at twenty-four hours with octreotide scintigraphy. Potential false-positive finding. *Clin Nucl Med* 1997; 22: 253–254.