^{99m}Tc-hydrazinonicotinyl-Tyr3-octreotide single-photon emission computed tomography–computed tomography in detection of functional neuroendocrine tumour in patient presenting with Zollinger–Ellison syndrome

A 20-year-old male presented with recurrent black-coloured stools, anaemia and abdominal pain in good performance status with no co-morbidities. Upper gastrointestinal endoscopy was suggestive of multiple ulcers in the duodenum up to D3, hypertrophied gastric folds. Biopsy from ulcer revealed superficial chronic non-specific duodenitis. Serum gastrin was 3917 pg/mL. The patient was referred for ^{99m}Tc-hydrazinonicotinyl-Tyr3-octreotide (HYNIC-TOC) scintigraphy for localisation. Scan findings revealed intense radiotracer intense focal tracer concentration inferior to the left lobe of the liver. Single-photon emission computed tomography (SPECT)-computed tomography (CT) revealed soft-tissue density lesion measuring 4.3 cm × 6.2 cm, inferior to the left lobe of the liver probably arising from the head of the pancreas or duodenum. The lesion was maintaining fat planes with stomach and liver [Figures 1 and 2]. The intensity of somatostatin receptor expression suggests well-differentiated benign neuroendocrine tumour. The patient underwent surgical resection of tumour. Post-operative histopathological examination was suggestive of a pancreatic neuroendocrine tumour with Grade II morphology. After resection, the serum gastrin had fallen to 78 ng/mL.

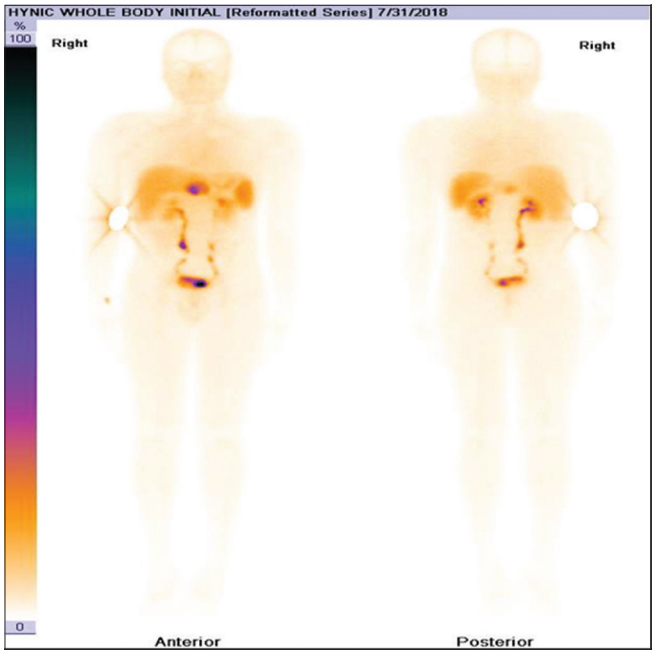

Figure 1: Anterior and posterior planar images of ^{99m}Tc-hydrazinonicotinyl-Tyr3-octreotide scintigraphy showing increased tracer accumulation in the region between the liver and stomach. Physiological distribution in the liver, spleen, kidneys and bladder can be seen

Gastrinomas are postulated to originate from stem cells of the ventral pancreatic bud, as a result of aberration of neuroendocrine cells during normal embryonic rotation of the ventral pancreas.[1] Various imaging modalities can be used for the diagnosis of Zollinger–Ellison syndrome (ZES). These include endoscopic ultrasonography, CT, magnetic resonance imaging, somatostatin receptor expression with ^{111}Indiethylene triamine penta acetic (DTPA) octreotide (Octreoscan), ^{68}Ga labelled 1,4,7,10-tetraazacyclo-dodecane-N, N', N'', N'''-tetra acetic acid (DOTA) tyrosine 3 octreortate (TATE) or ^{68}Ga DOTA-1-NaI3-octreotide (NOC) and ^{99m}TcHYNIC-TOC.[2]

Somatostatin receptor scintigraphy (SSR) is the most sensitive imaging modality for gastrinomas in patients with ZES.[3] SSR using Octreoscan is an established diagnostic modality in the imaging of different somatostatin receptor-expressing tumours. However, the physical characteristics of ^{111}In are not optimal for gamma camera imaging. Overexpression of cell surface Somatostatin receptors in well-differentiated neuroendocrine tumours can be exploited for imaging and therapy with radiolabeled somatostatin analogues. Radiolabelled somatostatin analogue has three parts; somatostatin analogue (Octreotide), chelator (DOTA, DTPA) and radionuclide (^{111} In, ^{99m}Tc and ^{68}Ga for diagnosis; ^{177}Lu

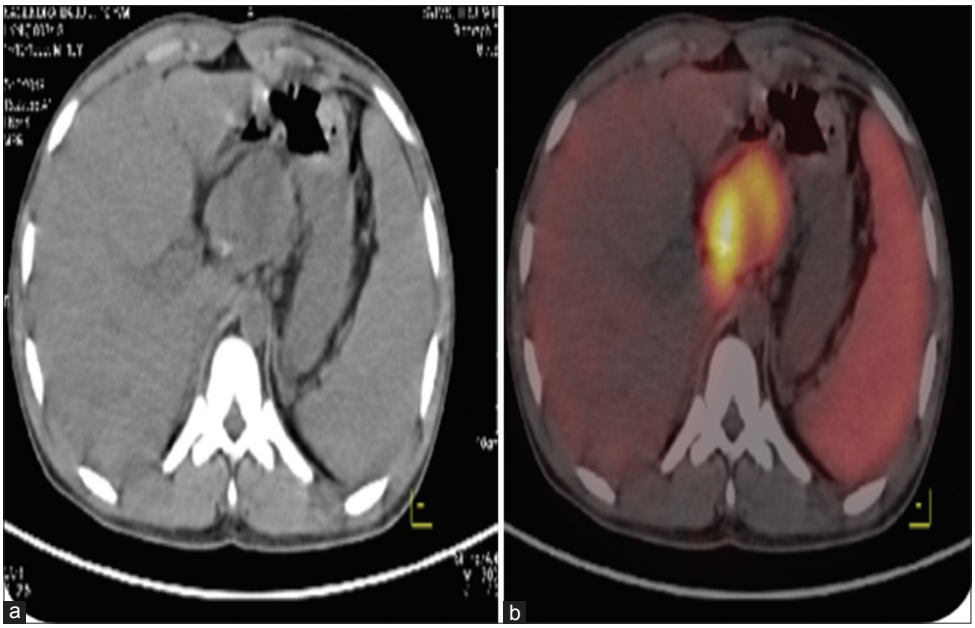

Figure 2: Axial computed tomography (a) and fused positron emission tomography/computed tomography (b) images showing increased radiotracer uptake in the soft-tissue density lesion arising from the head of the pancreas

and ^{90}Y for therapy). Optimal method for the diagnosis of gastroenteropancreatic neuroendocrine tumours is SSR positron emission tomography (PET)-CT with ^{68}GaDOTATATE or DOTANOC. Certainly, a ^{68}Ge/^{68}Ga generator is very expensive. Although PET-CT has higher spatial resolution, SSR SPECT-CT can be used for initial evaluation in places where PET-CT is not available. Hence, the availability of ^{99m}Tc-labelled SSR analogues allows a wide use of SSR with good imaging quality. ^{99m}Tc-HYNIC-TOC has favourable imaging characteristics in the detection of SSR-positive tumours due to specific and high receptor affinity, good biodistribution, faster renal excretion, lower radiation exposure, high imaging quality and relatively easy availability.[4] In the current era of multimodality imaging, SPECT-CT plays an important role in localising small lesions. SSR imaging is also useful in the evaluation of other neuroendocrine tumours, oncogenic osteomalacia, medullary carcinoma thyroid, thyroglobulin-elevated negative iodine scan of differentiated thyroid cancer and pituitary adenomas.

^{99m}Tc-HYNIC-TOC scintigraphy is highly useful for localisation of functional neuroendocrine tumour-like gastrinomas and can be used as initial modality to localise in patients presenting with syndromes of pancreatic hormone excess.

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Conflicts of interest
There are no conflicts of interest.

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