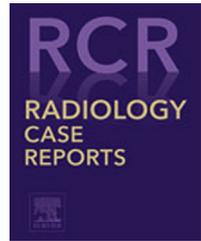
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Molecular Imaging

Hindgut gastropancreatic neuroendocrine carcinoma mimicking hydatid disease

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ABSTRACT

Primary neuroendocrine tumors of the colon are usually very rare and difficult to spot on a nonfunctional imaging. Metastatic lesions are mostly hypervascular, with only a small percentage appearing as cystic or hypovascular lesions. We present a case of a 34-year-old Hispanic female with a history of dull aching upper abdominal pain lasting for a few months. Initial abdominal ultrasound revealed multiple cystic lesions replacing the hepatic parenchyma concerning for a hydatid disease. Liver biopsy was obtained due to negative serology for hydatid disease, which surprisingly revealed a metastatic neuroendocrine tumor of unknown etiology. The primary disease was depicted within the sigmoid colon on a whole-body Octreotide single-photon emission computed tomography-computed tomography done following the biopsy.

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Introduction

Primary neuroendocrine tumors (NETs) of the distal colon are extremely rare. Newer researches have shown near-complete recovery if the primary tumor is resected, even if metastases exist [1].

The diagnosis incidence of the NETs has significantly increased in recent years [1,2].

NETs with somatostatin receptors can be easily depicted on functional imaging such as OctreoScan and Gallium-68 receptor positron emission tomography-computed tomography [3,4].

Case report

A 34-year-old Hispanic woman without significant medical history presented with a vague upper left quadrant pain. An abdominal ultrasound obtained demonstrated multiple cystic lesions within the liver, some of which showed internal septations as well as daughter cysts concerning for a hydatid disease (Fig. 1).

A computed tomography (CT) scan of the abdomen was performed, showing multiple low attenuation lesions throughout the liver with a majority identified as cystic lesions and a few

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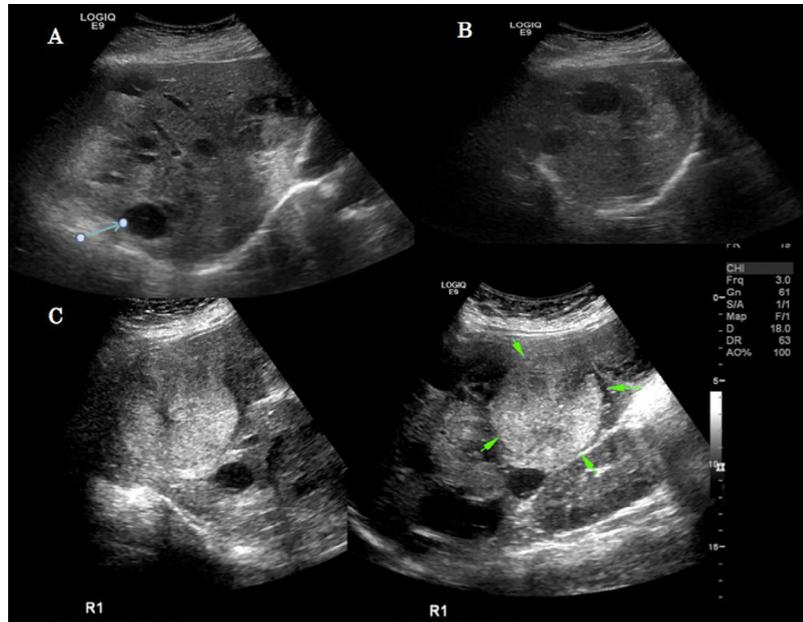


Fig. 1 – Abdominal US images showing (A, B) cystic lesions in segment V and VII of the liver (blue arrow). (C) Large hyperechoic solid lesion (green arrows). US, ultrasound.

solid lesions. Cystic lesions showed a thick capsule with internal septations suggestive of *Echinococcus* disease. The largest lesion was identified as 8.8 cm in size (Fig. 2). The two solid masses were indeterminate.

Magnetic resonance imaging (MRI) of the liver was performed using a hepato-specific paramagnetic gadolinium-based contrast agent (Eovist, Bayer HealthCare LLC, Whippany, NJ), revealing findings consistent with a hydatid disease with cyst classification following the World Health Organization guidelines into CE1 through CE4 subdivisions (Fig. 3). There were also complex cysts in the pancreatic head and in the retroperitoneum suggestive of extrahepatic hydatid disease.

A solid lesion in segment V/VI was indeterminate.

Common tumor markers including AFP, CA 19-9, and CEA were all negative. The patient was empirically started on

albendazole for presumed hydatid disease before possible drainage or surgical resection. No ova or parasites were detected. *Echinococcus* antibody, immunoglobulin G, serum by enzyme-linked immunosorbent assay was negative.

There was no significant response to the treatment, and the abdominal pain persisted. The patient was further evaluated and underwent exploratory laparotomy, liver biopsy, appendectomy, and cholecystectomy. Pathology surprisingly revealed a neuroendocrine carcinoma of unknown primary origin (Figs. 4, 5).

The patient had a follow-up nuclear medicine Octreotide (single-photon emission computed tomography [SPECT]) scan depicting a primary tumor in the rectosigmoid area with metastases to the liver, pancreas, and upper abdominal lymph nodes (Fig. 6). Laboratory work was done to check for

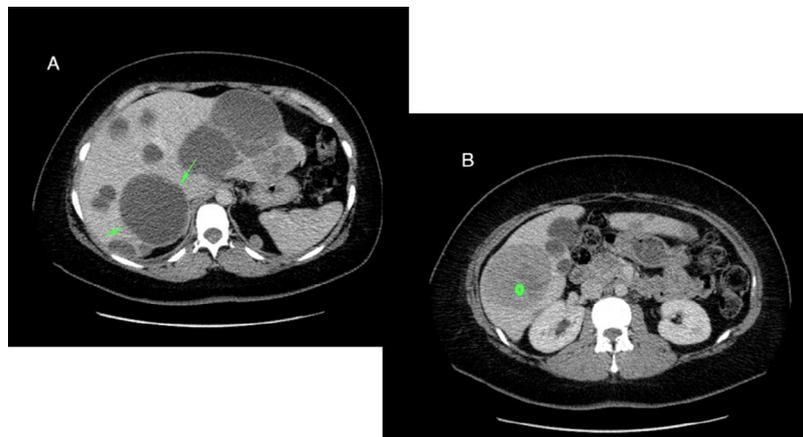


Fig. 2 – (A) CT images showing an encapsulated hypodense lesion in segment VII/VIII of the liver with no appreciable enhancement of the capsule (green arrows); smaller hypodense lesions are present in both hepatic lobes. (B) Slightly hypoattenuating solid mass within segment V/VI (green circle). CT, computed tomography.

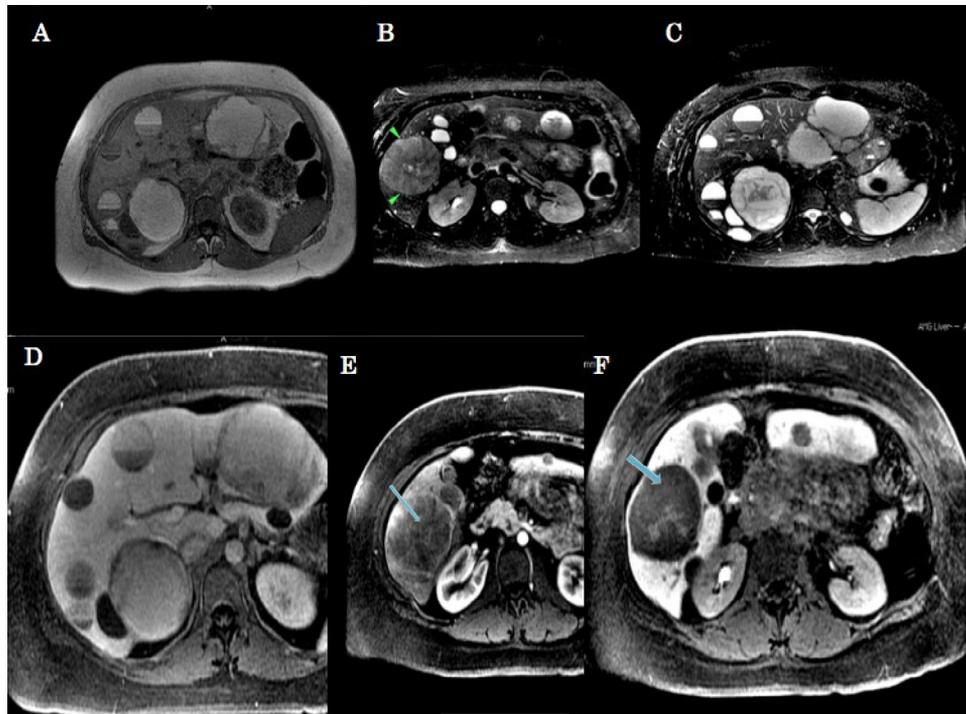


Fig. 3 – MRI sequences. (A) T1 shows numerous lesions with T1 shortening. (B) T2 STIR showing a large solid, T2 hypointense lesion in segment 5/6 (green arrows). (C) Additional numerous well-circumscribed T2 hyperintense lesions, some of which show fluid-fluid levels. (D, E, F) LAVA post contrast, most of the cystic lesions are nonenhancing. The large solid lesion in segment V/VI shows subtle delayed enhancement. LAVA, liver acquisition with volume acceleration; MRI, magnetic resonance imaging; STIR, short tau inversion recovery.

functional tumor markers including chromogranin A, and 5-hydroxyindoleacetic acid, which were all within normal limits.

Because of her persistent abdominal pain, the patient underwent yttrium 90 (Y-90) chemoembolization therapy for each lobe of the liver. The patient is now recovering and

continues to be followed up with oncology annually for tumor assessment.

Discussion

The relatively low incidence of NETs and the cystic nature of the vast majority of the lesions in our case were misleading.

Classically, on MRI, hydatid cysts are T1 hypointense and T2 hyperintense [1,2]. The capsule should only be thin with T1 and T2 hypointensity and nonenhancing because it is a pseudo-capsule [3–5].

The delayed hepato-specific phase of the gadolinium-ethoxybenzyl-diethylenetriamine penta-acetic acid excluded not only hepatocellular tumor origin of the solid component but also bile leak.

The whole-body Octreotide SPECT was very useful in highlighting the focal primary lesion within the rectosigmoid junction in this case, as the tumor markers were otherwise negative.

NETs can have variable radiologic features ranging from solid to frank cystic lesions, hyperenhancing or rarely hypoenhancing [1–3].

Hydatid disease results from infection by the *Echinococcus* parasite, which results in cystic lesions that primarily are found in the liver [2,4]. According to the World Health Organization classifications of hydatid disease, five different stages for hepatic cysts exist, ranging from a simple hepatic

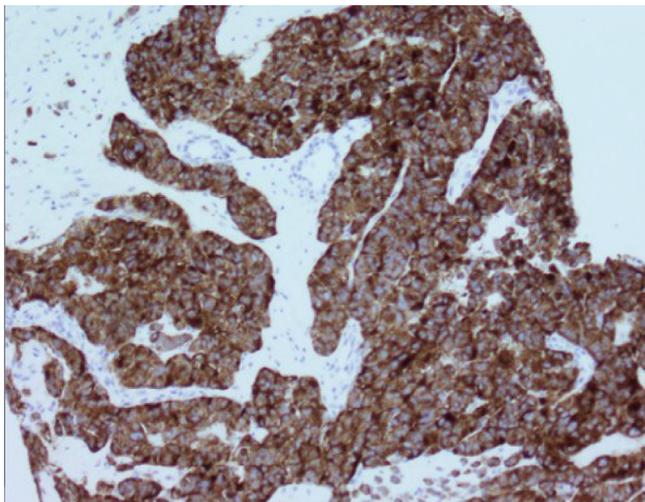


Fig. 4 – IHS photomicrograph shows reactivity with antibodies to synaptophysin. IHS, immune histochemical stain. IHS, immune histochemical stain.

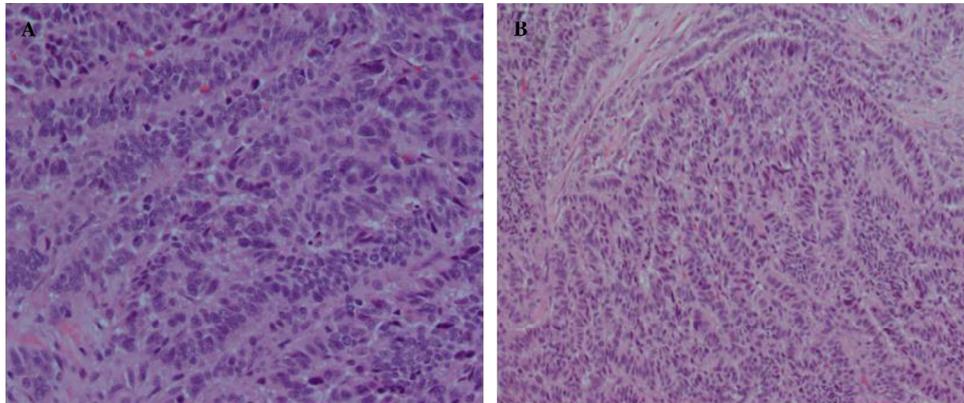


Fig. 5 – Histology of the neuroendocrine carcinoma in the liver (H&E) demonstrates abnormal granular cytoplasm consistent with neuroendocrine disease. H&E, hematoxylin and eosin.

cyst to an arch-like thick partially or completely calcified wall cyst [3,5].

The designation of NETs depends on well-defined histologic features, size, lymphovascular invasion, mitotic counts, Ki-67 labeling index, invasion of adjacent organs, presence of metastases, and whether they produce hormones [6–8]. Gastropancreatic neuroendocrine tumor (GEP-NET) represents 2% of all gastrointestinal tumors [2,7,9].

Almost all NETs are potentially malignant, but the poorly differentiated type show more aggressive behavior.

Distant metastases have been reported in 20%-40% of cases [1,10]. Nonfunctioning tumors of the pancreas and gastrointestinal tract are more likely to metastasize [1].

Liver and lymph nodes are the most common metastatic sites, followed usually by lungs, bones, peritoneum and mesentery, brain, and breast [3,11].

The histologic diagnosis of GEP-NETs is through the demonstration of neuroendocrine markers in the tissue, such as chromogranins, synaptophysin, protein gene product 9.5, and neuron-specific enolase [12,13].

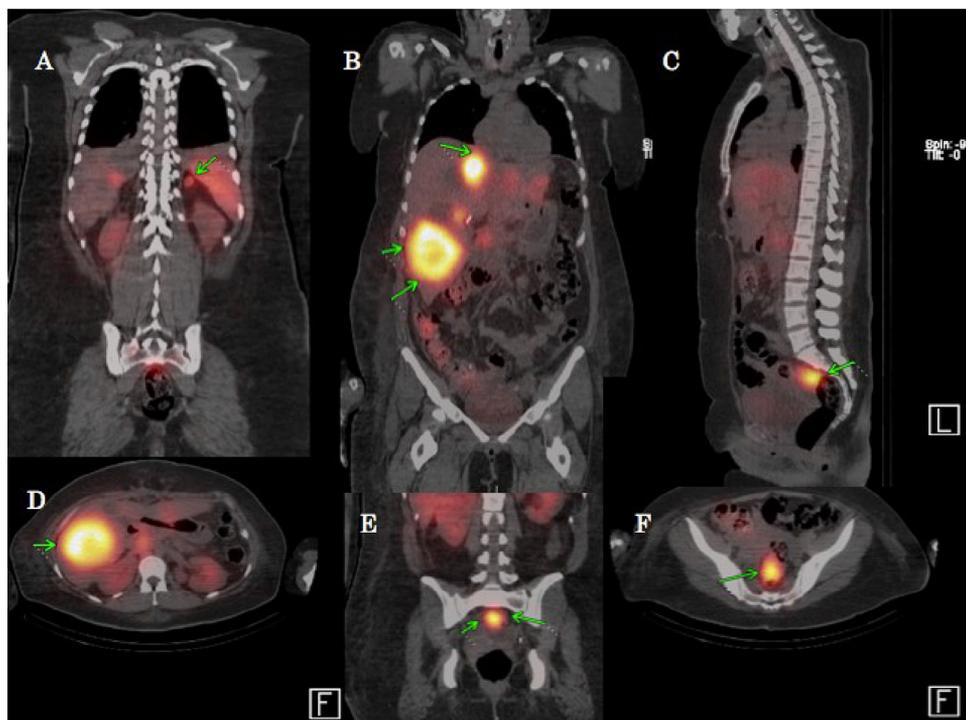


Fig. 6 – Whole-body Octreotide SPECT-CT showed rectosigmoid NET metastasizing to the liver, pancreas, and retroperitoneum. Coronal, sagittal, and axial octreotide scan images fused with corresponding CT images (A, B, and C) metastasize to the liver and retroperitoneum. (D, E, and F) Sagittal fused image shows a lesion at the rectosigmoid junction (green arrow). CT, computed tomography; NET, neuroendocrine tumor; SPECT-CT, single-photon emission computed tomography-computed tomography.

Some NETs express strong hormone receptors, such as somatostatin receptors, and have uptake of certain hormones. This avidity can aid in diagnosis and make some tumors respond to hormone-targeted therapies [14–16].

CT scans, MRIs, ultrasound, and endoscopic ultrasound are common diagnostic tools, but molecular imaging has significantly improved the diagnosis and treatment in patients with NETs [16,17].

Pitfalls in diagnosing hydatid disease

Echinococcus cysts may show a subtle rim of enhancement due to the pseudocapsule, secondary to the inflammatory reactions around the lesion; however, thick enhancing septations or thick capsule argues against hydatid disease. Consider NETs as a differential diagnosis in cystic lesions especially with unusual protein-rich or blood components.

Conclusion

Diagnosis of GEP-NET can be very difficult, and the disease is often widespread by the time of the diagnosis. The mixed cystic metastases and hypovascular solid masses made our presented case very challenging for the proper diagnosis. Whole-body Octreotide SPECT-CT is very helpful in diagnosing functional and nonfunctional NET as long as they express the somatostatin receptors. Fluid-fluid levels may be present with hydatid disease or infectious abscesses, but if no fever, leukocytosis, or parasite load is present, consideration should be given to hemorrhagic metastases.

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