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CASE STUDY

MULTIPLE INSULINOMAS AND ITS PREOPERATIVE EVALUATION BY MULTIDETECTOR CT- CASE REPORT WITH REVIEW OF LITERATURE

***Saket Nigam, Namrata Nigam and Hira Lal**

Rama Medical College, India

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ABSTRACT

We report a case of multiple insulinomas in a 32 year-old male and their appearances on dual phase multidetector computed tomography with a review of literature regarding imaging characteristics of insulinomas.

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INTRODUCTION

Insulinoma is a rare and elusive, but the most common, curable endocrine tumor of the pancreas having an incidence of 0.4 per 100,000 person years (Yao and Reynertson, 2005), with female preponderance (Lack, 2003; Graves *et al*., 2004). The average age of presentation being fifth decade of life. They are typically sporadic, solitary, and less than 2 cm in diameter. Though functional and almost exclusively localized to the pancreas, they are often difficult to diagnose and to localize. Symptomatic hypoglycemic episodes are often non-specific, go unrecognized and are occasionally mistaken for seizures or psychiatric disorders for several years. (Graves *et al*., 2004; Beauchet *et al*., 2005). We are describing a case with multiple insulinomas which was evaluated with biphasic CT for number, location and characteristics of the lesions along with their vascular supply.

Case report

32 year-old male presented with recurrent episodes of altered behavior on fasting for last six years. Sweating, palpitation and disorientation was present during these episodes which improved with oral feeds. His weight was stable and was a diagnosed hypertensive for last 3 years. Family history was negative for diabetes, thyroid, parathyroid, or pituitary disease. Blood sugar level during fasting was 34 mg% (1.9 mmol/I; normal, 3.6-6.0 mmol/I) and serum insulin was still detectable. This led to a diagnosis of insulinoma, and we were consulted to locate it.

**Corresponding author: Saket Nigam,*
Rama Medical College, India.

MATERIALS AND METHODS

CT scan was performed in MDCT Philips scanner. Fifteen minutes prior to the examination, patient was given 500 mL of water for demarcation of the stomach and duodenum and delineation of the pancreatic head region. Unenhanced scanning of the pancreas was initially performed to define the craniocaudal extent of the pancreas using the following parameters: 64 x 0.625 mm detector configuration, 3-mm reconstruction interval, pitch of 0.9, 120 kVp, 250 mAs, and 35-cm field of view. Our standard multidetector biphasic pancreatic protocol is performed with a slice thickness of 1 mm, pitch of 0.9 and reconstruction parameters of 3mm section width and increment of 1.5 through the pancreas at 20 sec after the initiation of contrast injection (arterial phase) followed by slices at 60 sec (portal venous phase). The phase is considered to be arterial if there is opacification of the arteries without opacification of the superior mesenteric vein. The phase with opacification of the portal and hepatic veins is considered portal venous phase 6). 100ml of non ionic contrast (300 mg I/mL) is given at a rate of 30ml/sec followed with a saline flush of 30ml with same flow rate.

RESULTS

A total of six insulinomas were identified on biphasic CT which ranged in size from 6 mm to 32 mm and were located in the uncinate process (1), neck (1), body (2) and tail (2). All six tumors were detected in both the arterial and venous phase but the morphology of 3 of them was better demonstrated in the portovenous phase. The lesion in the uncinate process showed predominant peripheral enhancement in both phases of the study. One of the lesion in the tail of the pancreas showed calcification within it which was visualized in the noncontrast scan. Arterial reconstruction on MIP images showed one of the insulinoma being fed by gastroduodenal artery and the others by superior mesenteric artery.

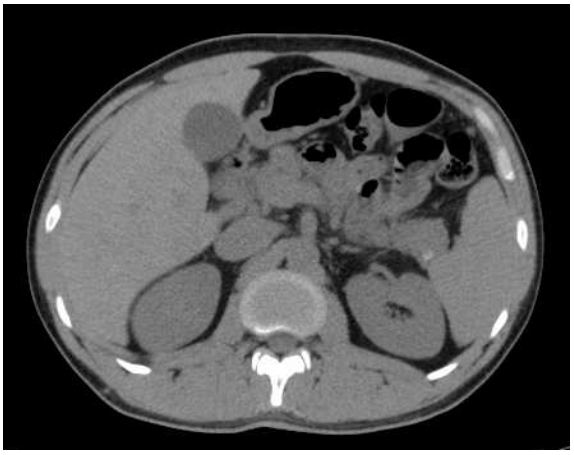
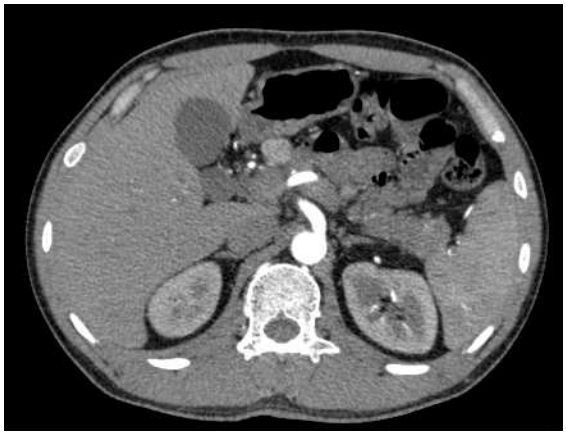


Fig. 1. Calcification in the tail of the pancreas which on contrast images was seen within the enhancing lesion



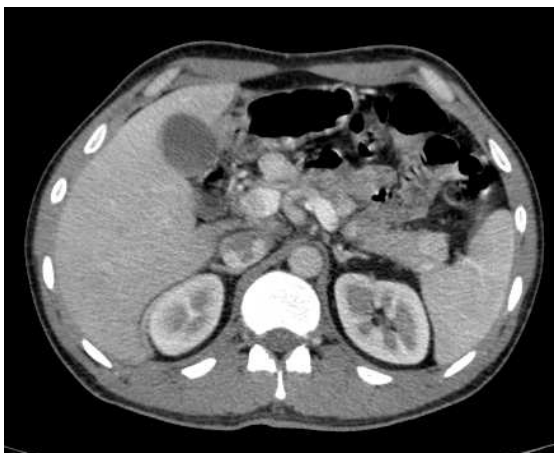
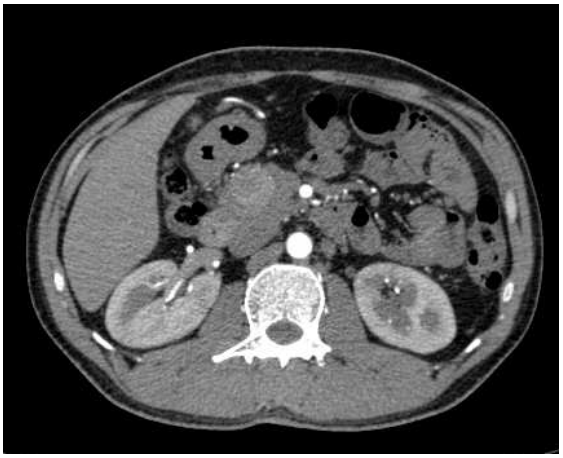


Fig. 2 and 3. Insulinoma in the region of head of pancreas showing enhancement in arterial phase and persistence of contrast in the venous phase. The lesions in the tail of the pancreas are also more prominently visualized in the venous phase



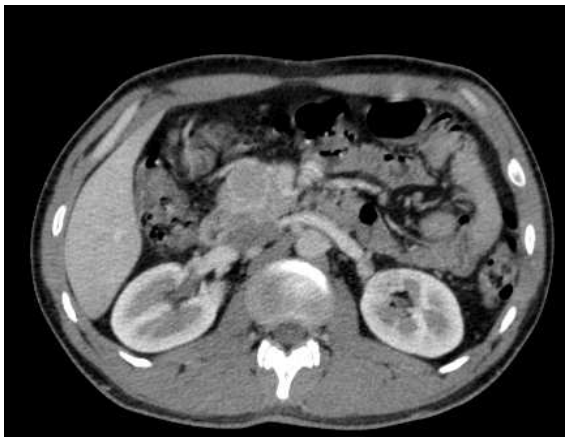


Fig. 4 and 5. Atypical appearance of pancreatic insulinoma. Multiphase helical CT scan obtained during arterial and pancreatic phase shows peripheral enhancement in the lesion both in the arterial and the venous phase

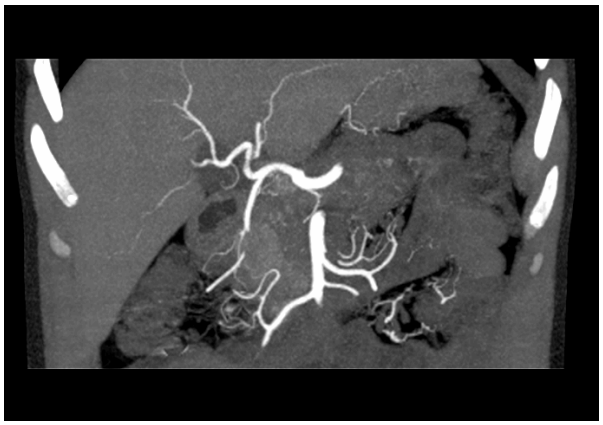


Fig. 6. Coronal MIP scan of arterial phase shows feeding arteries to the insulinoma arising from the gastroduodenal artery

DISCUSSION

About 10% of all insulinomas are multiple, with 50% of them being associated with the multiple endocrine neoplasia syndrome-1 (MEN-1) (Waickus *et al*., 1999) and the rest being sporadic in nature or associated with insulinomatosis. Insulinomatosis, a rare disease is characterized by synchronous and metachronous occurrence of insulinomas, multiple insulinoma precursor lesions, and rare development of metastases, but common recurrent hypoglycemia. This disease differs from sporadic and MEN1-associated insulinomas (Anlauf *et al*., 2009). Insulinoma can be diagnosed medically on the basis of the presence of periodic hypoglycemic episodes,

which are relieved by intravenous glucose administration, and in conjunction with fasting blood sugar levels below 50 mg% (termed "Whipples triad"). Historically, the preoperative evaluation for patients with suspected insulinomas has been controversial. Some believe that after an insulinoma has been confirmed biochemically, preoperative imaging is not necessary because nearly all insulinomas are located in the pancreas and can be detected with intraoperative inspection, palpation, and sonography. In addition, noninvasive imaging techniques are perceived as having relatively poor sensitivity (Boukhman *et al*., 1999; Hashimoto and Wash, 1999; Huai *et al*., 1998; Norton *et al*., 1988). However many surgeons emphasize the importance of preoperative localization of insulinomas because these lesions cannot be identified during surgical exploration in 10–20% of the cases (Angelini *et al*., 1987). Accurate preoperative localization and determination of the number of tumors may provide valuable information regarding the type of surgery required. If tumors are located deep in the pancreas, partial pancreatectomy may be required, whereas tumors located near the surface of the pancreas can be treated by enucleation. Moreover, identification of a focal mass can help exclude nesidioblastosis as a cause of the hypoglycemia, which might require an extensive resection. Nesidioblastosis, or islet cell hyperplasia, is characterized by a proliferation of abnormal B cells throughout the pancreas. The development of multidetector CT technology now allows high-resolution images to be obtained during multiple phases of enhancement. Most biphasic studies assessing insulinomas have been performed using arterial and portal venous phase imaging to exploit the hypervascular nature of these tumors. Some investigators have shown improved conspicuity of islet cell tumors on the arterial phase of enhancement, whereas others have shown the portal venous phase to be more beneficial (Van Hoe *et al*., 1995; King *et al*., 1998; Ichikawa *et al*., 2000; Keogan *et al*., 1997). However both phases appear to be complementary as was seen in the enhancement pattern of insulinomas in our patient. The classic and most common enhancement pattern of islet cell tumors is that of a hyperattenuating lesion in the arterial and venous phases (Van Hoe *et al*., 1995; King *et al*., 1998; Ichikawa *et al*., 2000). Many small lesions enhance more prominently and thus are easier to detect in the arterial phase or become inconspicuous in the venous phase. In a series of 11 cases of functioning islet cell tumors reported by Van Hoe *et al*. (1995), most lesions were hyperattenuating and two were more conspicuous on arterial phase imaging. However none of the lesions in our patient showed wash out of contrast in the venous phase and all were well seen in the venous phase. Calcification was visualized in one of the insulinoma which is an unusual finding (Ellen *et al*.). Other unusual findings include cystic tumors and low-density tumors. Unlike small islet cell tumors, which appear homogeneous, larger lesions often show heterogeneous enhancement in a ring like pattern or with central areas of necrosis or cystic degeneration (Buetow *et al*., 1995) as was seen in the lesion situated in the uncinate process of this patient which measured 3.2 cm in diameter and showed more intense peripheral enhancement and mild central enhancement. A few non enhancing tumors have been reported in the literature (Theodore, 1990) and they can be identified as hypodense lesions on the background of enhancing pancreatic parenchyma on venous phase. Three-dimensional images obtained by MDCT offer additional information for more accurate localization of the lesions. The 3D images obtained by MDCT clearly demonstrate the 3D structure of the tumors, peripancreatic vasculature, and feeding arteries on the same display. If tumors lie adjacent to enhancing vessels or are pedunculated, they can potentially be missed on axial imaging. The 3D images provide a multiangle display of an oblique slab containing the specific vessel of interest, and this technique improves the tumor detection in problematic cases.

Conclusion

In conclusion, accurate localization of islet cell tumors is critical for successful surgical resection especially in patients with multiple insulinomas thus reducing the intraoperative palpation of the pancreatic parenchyma and also excluding nesidioblastosis as a cause of hypoglycemia. We would also like to emphasize that water should be given instead of radio-opaque oral contrast, as islet cell tumors may also be found in the bowel wall.

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