JOP - Journal of the Pancreas 2000; 1(3 Suppl.) : 95-99

Pancreatic Head Mass: What Can Be Done ? Diagnosis: Computed Tomography Scan

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Abstract

The diagnosis of different pancreatic diseases has recently become a recurrent problem. In cases with pancreatic head mass the main question is the differentiation between malignant and benign lesions. When a neoplasm is suspected, the main task is to judge operability. The usefulness of computed tomography imaging in the evaluation of pancreatic carcinoma has been well established. In this article the authors discuss the possibilities of computed tomography (CT) in diagnostic work-up.

Introduction

Patients presenting inflammatory and malignant pancreatic diseases are common in daily practice. For the most part, anamnestic data, clinical examination and laboratory findings are used to evidence the presence and type of pancreatic disease. The imaging modalities must identify and characterize pancreatic lesions. Patients suspected of having cancer of the pancreas frequently undergo extensive testing to confirm malignancy and determine tumor resectability. Accurate preoperative assessment of resectability and staging of pancreatic carcinoma is essential.
Transabdominal ultrasonography of the pancreas is limited by different patient dependent restrictions (obesity, meteorism, etc.). Endoscopic retrograde cholangio-pancreatography (ERCP) is highly accurate, but relatively more dangerous than CT. Nowadays, CT is the most important, and sometimes, the initial imaging modality of the pancreas.

Technique

Incremental bolus dynamic CT is the optimal technique for evaluation of the pancreas. The first phase (general examination of the pancreas) is performed using automatic table incrementation, 8-10 mm collimated scans, and a scan speed of fewer than 2 seconds. A second phase (fine imaging of the pancreas) is performed 30 seconds after contrast injection (iv. bolus of 80-150 mL of 60% iodinated contrast agent) with thirty-five 3 mm continuous slices. A third acquisition (study of veins) is performed 50-80 seconds after the injection with 8-10 mm continuous slices. This results in an excellent contrast enhancement of the major peripancreatic blood vessels and the normal pancreatic and hepatic parenchyma [1, 2].
We can elevate the tumor detection rate and reliable assessment of resectability with the use special examination techniques such as spiral hydro-CT. The latter is a combination of pharmacological intestinal paralysis and water distension of the stomach and duodenum with specific reference to the tumor detection rate, differentiation of malignant versus benign tumors and assessment of tumor resectability [3].

Pancreatic tumours

The main question in cases with pancreatic head mass is the verification or the exclusion of malignancy which is often difficult. It is only of little help that some types of pathologies, e.g. acute pancreatitis and functioning endocrine tumors, can be ruled out with anamnestic data and laboratory findings. The question of the operability is somewhat easier, but nonetheless exasperating. Unfortunately, the majority of pancreatic neoplasms are unresectable at the time of the initial clinical presentation due to the extension of the tumor beyond the pancreas with invasion of adjacent structures. Thus, accurate nonoperative staging of pancreatic carcinoma is desirable to avoid the morbidity and mortality of unnecessary major surgery.

A circumscribed mass is the primary, but not necessarily an early sign of *ductal pancreatic adenocarcinoma*. An increase in diameter and roughness of the contour of the pancreas are unreliable signs of malignancy. The masses contained a central zone of diminished attenuation in about 80% of the cases [4]. On unenhanced CT most tumors have the same density as normal pancreatic tissue and can easily be missed if the tumor is small and the contour of the gland is not deformed. With spiral CT and bolus contrast administration, the tumor-pancreas contrast is best seen during the early phase of pancreatic perfusion. The tumor as a hypodense lesion can be distinguished from the opacified pancreatic parenchyma. A cystic central portion can demonstrate necrosis or the hemorrhage in the tumor. The border between the pancreas and the retroperitoneal space and the surrounding organs is often indistinct [5].

The pancreatic duct and/or common bile dilatation is critically indicative of malignancy. After intravenous contrast enhancement, dilatation of the biliary tract becomes clearly visible and the contour of the pancreatic duct can be better evaluated [6, 7].

Reaction surrounding the tumor occasionally creates a fuzzy appearance of the tumor region mimicking pancreatitis. The high contrast of peripancreatic vessels on contrast-enhanced CT allows assessment of vascular encasement. Staging of pancreatic carcinoma with conventional CT involves only the major peripancreatic arteries and veins. Helical CT can sufficiently show enough small arteries (gastroduodenal artery, anterior and posterior superior pancreaticoduodenal arteries and the right gastroepiploic artery) to allow evaluation in the preoperative staging of pancreatic tumors [8]. CT findings of dilatation or obstruction of the superior peripancreatic veins (pancreaticoduodenal veins and gastrocolic trunk) suggest tumor extension to the peripancreatic tissues. The small veins are difficult to detect on conventional CT, but helical CT enables a more precise identification of the inferior peripancreatic veins [9-11].

The secondary signs, such as enlarged lymph nodes, regional metastases, hepatic metastases, ascites confirm the diagnosis of malignancy.

Ancillary CT findings of pancreatic carcinoma include vascular involvement in addition to local tumor extension, contiguous organ invasion, distant metastasis, ascites, and obstructive pseudocysts. The presence of one or more of these findings is used as a criteria for indicating the unresectability of the tumor [12].

According to different authors, correct diagnosis of pancreatic carcinoma was made in 69 to 94% of patients using spiral CT. The overall accuracy of spiral CT for assessing resectability varied from 70 to 95% in the literature [7, 13, 14].

In contrast to adenocarcinoma, the mass of *anaplastic carcinoma* show marked enhancement after contrast administration.

Acinar cell carcinomas usually present as well demarcated tumors of low attenuation and minor or no enhancement after contrast administration.

Noncystic mucinous neoplasms have a central cystic mass, which is sometimes can be the only finding at CT examination.

Papillary-cystic tumors on CT appear as large non-homogeneous masses with a well-differentiated thick contour. This thick solid wall is enhanced after contrast administration. In the inner margin of the capsule, papillary

nodules may be present. Calcification at the periphery of the lesion can be seen [15, 16].
Endocrine tumors are generally small, hypervascularized lesions on dynamic contrast-enhanced CT.
Microcystic adenomas may display, according to the tissue composition, a conglomerate of small cysts. *Macrocystic adenomas* appear on plain scans as large multilocular cysts or conglomerates of cysts. The cysts are larger than 2 cm. After the administration of contrast material to both types of cystic adenomas, hypervascularized septas can be seen.

Inflammatory diseases

Pancreatic swelling of the entire gland with calcification is the typical picture of *chronic pancreatitis*. Occasionally, an isolated mass of the pancreatic head can be found. The dilatation of the pancreatic duct is a typical finding and can be better demonstrated after administration of contrast material. The contours of the pancreatic duct are more irregular than in tumor related obstructions. Contrast enhancement of the parenchyma is non-homogeneous due to fibrosis.
The typical CT appearance of *pancreatic pseudocysts* are a hypodense lesion with a well demarcated, sometimes thick, wall [17].

Summary

It has been well-established that dynamic CT is useful and is probably the single best modality for the diagnosis and staging of pancreatic adenocarcinoma, although it is not fully sufficient in many cases, especially in those involving small tumors. On the other hand, a patient with pancreatic head mass without unambiguous sign of carcinoma (metastases, local expansion or spreading of tumor) requires further evaluation.

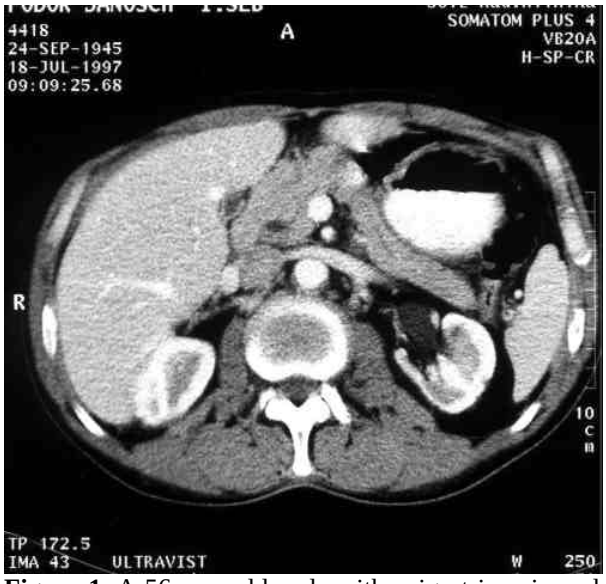

Figure 1. A 56 year old male with epigastric pain and loss of weight. CT after contrast medium administration shows a non-homogeneous hypodense nodule in the dorsal part head of the pancreas. Ductal adenocarcinoma

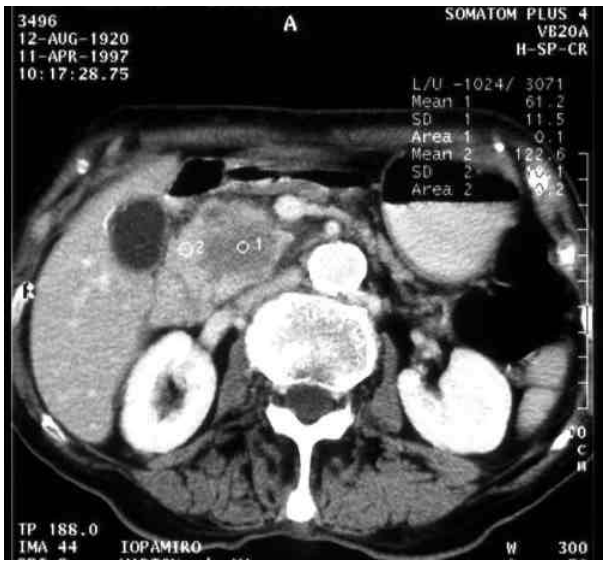

Figure 2. A 52 year old male with icterus. Spiral CT after contrast medium administration shows a hypodense 3 cm diametered lesion in the processus uncinatus. Ductal adenocarcinoma

Figure 3. A 36 year old female with moderate epigastric pain. CT after contrast medium administration shows multiple cystic lesions in the head of the pancreas. Cystadenoma of the pancreas

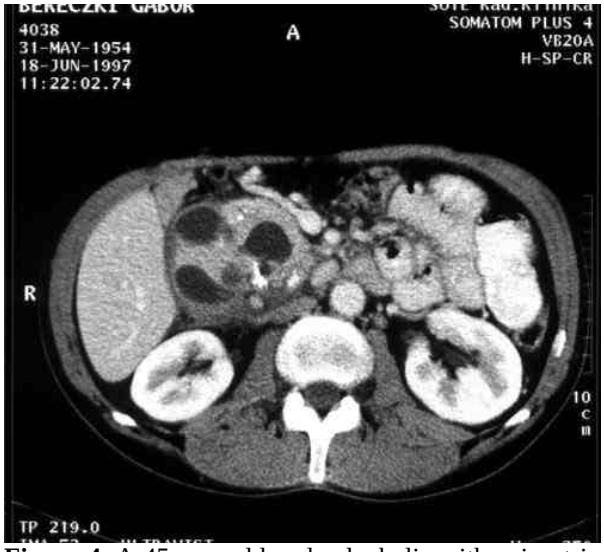

Figure 4. A 45 year old male alcoholic with epigastric pain. CT of the pancreas shows an enlarged pancreatic head, with multiple cystic degeneration and calcification. Chronic pancreatitis

Key words Carcinoma; Diagnosis, Differential; Diagnostic Techniques and Procedures; Neoplasm Staging; Pancreatic Diseases; Pancreatic Neoplasms; Pancreatic Pseudocyst; Tomography, X-Ray Computed

Abbreviations CT: computed tomography

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