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Pancreatic Head Mass: What Can Be Done ? Diagnosis: Ultrasonography

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Transabdominal ultrasonography (US) was introduced in pancreatic diagnostics in the early 1970s and it was the first method which allowed for a direct visualization of the gland. Despite the recent introduction of a number of more modern imaging modalities or of technical improvements in their application, no significant reduction in the use of US has been observed. In any case, for both clinicians and radiologists in Europe, it still remains the most important diagnostic tool in patients suspected of having a pancreatic head mass. Neither the new computerized tomography (CT) scanners nor the latest magnetic resonance imaging technology have caused a decrease in US requests. There are many reasons for its long-standing success: US is available even in small hospitals and first aid stations; it is inexpensive, non-invasive, well accepted by the patients, easily repeated, and can be performed at bedside. Furthermore, US technology has greatly improved in recent years. However, US is not perfect, mainly because it is highly operator-dependent. The results of the best groups are very different from the "routine" results and this occurs mostly in pancreatic diseases. Also a long training period is required [1].

Intestinal gas and particularly air in the duodenum can prevent a complete visualization of the pancreatic head, but usually some maneuvers such as scanning the patient in the left lateral decubitus, in the upright position or after filling the stomach with fluid can improve the visualization [2]. The basic problem is the ability of the imaging tools, and particularly of US, to differentiate between inflammatory and neoplastic masses. The problem is complicated by the possible relationship between the two conditions [3], but usually the patients have different clinical histories and features. Nevertheless, in a few patients affected by a particular form of acute pancreatitis with a hypoechoic focal mass localized only in the head, and in so-called "groove pancreatitis" [4], the sonographic distinction between pancreatitis and pancreatic carcinoma is often difficult if not impossible. These patients can demonstrate dilatation of the common bile duct and jaundice, and, less frequently, dilatation of the main pancreatic duct (MPD). Patients with chronic pancreatitis suffering from an inflammatory mass in the head of the pancreas are considered a subgroup: approximately 30% of all surgical patients with chronic pancreatitis [5]. In this subset of patients, during an acute relapse and for some period of time after its resolution, the pancreatic head is enlarged and hypoechoic, with possible calcifications which can help the differential diagnosis of pancreatic cancer. The echo-texture is usually uneven, with both strongly echogenic foci and anechoic areas; the echostructural alterations are present in 57.1% of cases [6]. Generally, the MPD is irregularly dilated ("zipper-like") and this is an important aspect of differentiation from pancreatic cancer. A dilated MPD has been found in 54.3% of patients with chronic pancreatitis [6]. In so-called early chronic pancreatitis, the MPD may be of normal caliber both at US, and CT, and even at endoscopic retrograde cholangiopancreatography. In normal subjects, after pancreatic

stimulation with secretin, the MPD usually dilates by 100% or more and returns to basal diameter within 15 minutes, while in "early chronic pancreatitis", the dilatation is absent or decreased and it lasts longer. By means of the use of this provocative test, the sensitivity in discriminating normal from early chronic pancreatitis has been 86.6% [7]. In chronic pancreatitis, a focal mass in the pancreatic head, usually seen during an acute exacerbation of pancreatitis, or fibrosis can cause extrahepatic biliary obstruction and, more frequently, biochemical cholestasis in about one-third of the patients. It could be very hard to differentiate this condition from pancreatic carcinoma, especially if the pancreatic head is uncalcified [8] and also since the latter disease is more frequently involved in biliary obstruction. In some cases the differential diagnosis is really difficult, but there are useful criteria. In chronic pancreatitis, the gland is usually diffusely enlarged with increased and uneven echogenicity and irregular dilatation of the MPD. On the contrary, in pancreatic cancer, the lesion is focal, with a mass-effect; it is almost always hypoechoic and the MPD is regularly dilated. The rare condition of pancreatic cancer complicating chronic pancreatitis is difficult, if not impossible, to recognize when only US is used. Endoscopic ultrasonography (EUS) associated with EUS-guided biopsy seem the best methods in detecting pancreatic cancer on chronic pancreatitis, but EUS appears not to be very accurate in assessing locoregional spread of pancreatic cancer complicating chronic pancreatitis [9]. US is able to visualize pancreatic cancer with a high sensitivity (95%), specificity (83%), negative predictive value (100%), and overall accuracy (83%) [10], and this modality has been recommended as the primary examination for clinical suspicion of pancreatic cancer. The large majority of small pancreatic cancers present a poorly reflecting, rather homogeneous, well-demarcated mass at US, while cancers larger than 3-4 cm are echo-poor, non-homogeneous masses with irregular, lobulated margins and frequent cystic (necrotic) areas. Sometimes, mostly in small tumors (less than 2 cm), the neoplastic lesion is not detectable, while the "indirect signs", such as the dilatation of MPD and/or of the common bile duct are well visualized. In a 1999 statement of the American Gastroenterological Association, it was reported that: "…Currently, conventional or single-phase spiral CT is the initial test to diagnose pancreatic tumors…" [11]. At the same time, a Swedish Group [12] published a large prospective, cohort analysis to determine the accuracy of US in the diagnosis of pancreatic tumors. In all patients referred for pancreatic US during 1988-1990, the data on malignant disease and survival were analyzed using the Swedish Death and Cancer Registries. Nine hundred and nineteen patients (489 women, 430 men; median age, 58 years) were enrolled in the analysis. In 140 of them, a clinical diagnosis of tumor in the pancreatic area was confirmed within 1 year after US. These tumors were primary pancreatic tumors (n=102), common bile duct and duodenal cancers (n=17), and metastases in the pancreatic area (n=21). The sensitivity of US in the detection of all tumors in the pancreatic area was 88.6% (124 out of 140 patients), which was similar to the 90% for the detection of exocrine pancreatic cancer (79 out of 88 patients); in this last subset of patients, jaundice was present in 57% of cases at the time of US, and the tumor was located in the head (64 patients), in the body (16 patients), in the tail (5 patients), and in 2 patients the entire pancreas was involved. The mean size of the tumors was 4 cm. There were nine false-positive US examinations, for a specificity of 98.8% (770 out of 779 patients). The positive predictive value and negative predictive value of US for the detection of all tumors in the pancreatic area were 93.2% and 98.0%, respectively. Systematic sampling of 94 investigations confirmed an association between US accuracy and the presence of clinical symptoms of pancreatic cancer. Significant differences in the sensitivity ($P<0.05$) and accuracy ($P<0.01$) of diagnosis were observed between three experienced investigators. The results of this study support the general recommendation to use US for primary

imaging in patients suspected of having pancreatic tumor, because of its efficiency, availability, and non-invasiveness. US-guided biopsy can be used, with minimal risk of complications, in patients who are not candidates for radical surgery and to identify endocrine pancreatic neoplasms that are amenable to treatment even at more advanced stages. The dependency of US on investigator experience as compared with other methods, however, mandates local evaluation of the performance of US both before and after it is introduced as the primary imaging strategy in the clinical management of pancreatic tumors [12].

In conclusion, US has greatly facilitated the diagnosis of pancreatic head masses, the assessment of metastases to the liver or lymph nodes, and, in general, the unresectability of the tumor (which is, unfortunately, the most frequent condition in these patients). However, the staging of the tumor is better achieved by means of modern CT technology and, in selected patients, of EUS. The use of echo-color-Doppler and of power-Doppler has made the definition of vascular involvement easier [13].

After these considerations, the recent AGA statement [11] and the other of the Los Angeles group [14] according to which: "…US has a limited role in the work-up of these patients, and many experienced clinicians proceed directly to CT without a preliminary US examination" seem to us to be excessive and also not completely true.

Key words Pancreatic Neoplasms; Pancreatitis; Ultrasonography

Abbreviations CT: computerized tomography; EUS: endoscopic ultrasonography; MPD: main pancreatic duct; US: ultrasonography

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References

1. Hertzberg BS, Kliewer MA, Bowie JD, Carroll BA, DeLong DH, Gray L, et al. Physician training requirements in sonography: how many cases are needed for competence? AJR Am J Roentgenol 2000; 174:1221-7. [20248628]

2. Costa PL. Pancreas: normal anatomy. In: Buscarini L, Campani R, eds. Abdominal Sonography Atlas. Naples: Idelson-Gnocchi, 2000 (in press).

3. Lowenfels AB, Maisonneuve P, Cavallini G, Amman RW, Lankisch PG, Andersen JR, et al. Pancreatitis and the risk of cancer. N Engl J Med 1993; 328:1433-7.

4. Tio TL, Luiken GJHM, Tytgat GNJ. Endosonography of groove pancreatitis. Endoscopy 1991; 23:291-3. [92076934]

5. Beger HG, Schlosser W, Poch B, Gansauge F. Inflammatory mass in the head of the pancreas. In: Beger HG, Warshaw AL, Büchler MW, Carr-Locke DL, Neoptolemos JP, Russell C, et al., eds. The Pancreas. Oxford: Blackwell Science, 1998: 757-60.

6. Bolondi L, Li Bassi S, Gaiani S, Barbara L. Sonography of chronic pancreatitis. Radiol Clin North Am 1989; 27:815-33. [89265605]

7. Bolondi L, Li Bassi S, Gaiani S, Santi V, Gullo L, Barbara L. Impaired response of main pancreatic duct to secretin stimulation in early chronic pancreatitis. Dig Dis Sci 1989; 34:834-9.

8. Huntington DK, Hill MC, Steinberg W. Biliary tract dilatation in chronic pancreatitis: CT and sonographic findings. Radiology 1989; 172:47-50.

9. Barthet M, Portal I, Boujaoude J, Bernard J-P, Sahel J. Endoscopic ultrasonographic diagnosis of pancreatic cancer complicating chronic pancreatitis. Endoscopy 1996; 28:487491.

10. Nakaizumi A, Tatsuta M, Uehara H, Iishi H, Yamamura H, Okuda S, et al. A prospective trial of early detection of pancreatic cancer by ultrasonographic examination combined with measurement of serum elastase 1. Cancer 1992; 69:936-40. [92136336]

11. American Gastroenterological Association medical position statement: epidemiology, diagnosis, and treatment of pancreatic ductal adenocarcinoma. Gastroenterology 1999; 117:1463-84. [20047882]

12. Karlson B-M, Ekbom A, Lindgren PG, Källskog V, Rastad J. Abdominal US for diagnosis of pancreatic tumor: prospective cohort analysis. Radiology 1999; 213:107-11. [20008163]

13. Angeli E, Venturini M, Vanzulli A, Sironi S, Castrucci M, Salvioni M, et al. Color Doppler imaging in the assessment of vascular involvement by pancreatic carcinoma. AJR Am J Roentgenol 1997; 168:193-7.

14. Gloor B, Todd KE, Reber HA. Diagnostic workup of patients with suspected pancreatic carcinoma. The University of California-Los Angeles approach. Cancer 1997; 79:1780-6.