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Ultrasound diagnosis of pancreatic tumors

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Abstract: In patients with solid pancreatic lesions, the differential diagnosis must be evaluated to determine whether radical surgery, pancreatic parenchyma-saving strategies, or follow-up is indicated. Contrast-enhanced (endoscopic) ultrasonography and elastography facilitate the further characterization of SPLs. The majority of cases of pancreatic ductal adenocarcinoma exhibit hypoenhancement with contrast-enhanced ultrasonography. Elastographically soft SPLs are benign with very few exceptions, whereas stiffer SPLs can be malignant or benign. This article reviews the current use of modern ultrasound imaging techniques, including contrast-enhanced ultrasonography and elastography, for the detection and characterization of SPLs. In particular, the unexcelled diagnostic potential of multiparametric endoscopic ultrasonography to detect and characterize small SPLs is highlighted.

Keywords: Ultrasonography, pancreas, tumors, endocrine carcinomas, Ultrasound elastograph , urinary tract infection, dopplerоghraphy, kidney abscess

Introduction

Pancreatic cancer (PCa) is a cancer with the worst prognosis and poor patient survival. When analyzing the incidence in the United States for the period 2000-2009. the proportion of newly diagnosed stage IV PCa was 53% of cases, the stage was not established in 11% of cases. The 5-year survival rate varied from 24% in stage I cases to 2% in tumors with distant metastases.

The pancreas is located in the retroperitoneal space, which makes it difficult to diagnose tumors early. Being a gland of mixed secretion, it has a developed network of blood vessels and intraorganic nerve plexuses, adjacent to the celiac and superior mesenteric nerve plexuses. The main vessels (superior mesenteric, splenic arteries and veins) pass along the posterior surface of the organ. From the pancreas begins the root of the mesentery of the small intestine. Such a complex anatomical location, active blood supply and innervation of the organ, together with the aggressive growth of malignant neoplasms located in the pancreas, are the reason for the predominance of a locally advanced or generalized process. Metastasis of prostate cancer is lymphogenous and hematogenous. With lymphogenous metastasis, regional and distant lymph nodes (LNs) are affected. With hematogenous metastasis, foci are detected in the liver, lungs, kidneys, adrenal glands, and bones. Peritoneal dissemination occurs with a tumor lesion of the peritoneum with frequent development of specific ascites. Perineural changes are associated with the involvement of the celiac and superior mesenteric nerve plexuses in the tumor process, which is the cause of the pain syndrome. Exocrine tumors are divided into benign, malignant, and those with uncertain malignant potential. Benign tumors include: adenoma, serous cystadenoma, mucinous cystadenoma, intraductal papillary mucinous neoplasia (IPMN), mature teratoma.

Malignant tumors include: ductal adenocarcinoma, serous adenocarcinoma, mucinous adenocarcinoma, acinar cell carcinoma, intraductal papillary mucinous carcinoma, pancreatoblastoma, solid pseudopapillary carcinoma. Moderately dysplastic mucinous cystadenoma, moderately dysplastic intraductal papillary mucinous neoplasia, and solid pseudopapillary tumor (SPN) are all benign but have a high potential for malignancy. This forces them to be isolated into a separate group of tumors with an uncertain malignant potential (similar to borderline ovarian tumors). Endocrine tumors include insulinoma, gastrinoma, glucagonoma, vipoma, and somatostatinoma. According to the WHO classification (2000), there are benign endocrine tumors, tumors with an uncertain potential for malignancy, well-differentiated endocrine carcinomas with a low degree of malignancy, and poorly differentiated endocrine carcinomas with a high degree of malignancy.

Tumor changes in the pancreas may be a manifestation of multiple endocrine neoplasia syndrome (MEN) type I (Wermer's syndrome). The development of the MEN-1 syndrome is associated with mutations in the MEN-1 gene located in the pericentric region of chromosome 11 (llql3). The symptom complex includes

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hyperplastic or tumor processes in the parathyroid glands, anterior pituitary gland, pancreas, changes can occur in the adrenal glands, thymus, gonads, lungs.

Neuroendocrine tumors are considered potentially malignant, their metastasis occurs by lymphogenous and hematogenous routes. With the appearance of metastases, the manifestation of carcinoid syndrome increases, which is characterized by the release of hormones secreted by the tumor (more often serotonin, bradykinin, histamine and chromogranin A). The manifestation of the syndrome consists of a vascular crisis (“hot flush”), intestinal dysfunction (hypermotor-type diarrhea, flatulence, intestinal colic, intestinal obstruction due to tumor growth, mesenteric thrombosis), changes in the respiratory system (bronchospasm) and the cardiovascular system (increased blood pressure during "hot flashes", cardiomyopathy, insufficiency and damage to the heart valves). "Flashes" are characterized by redness of the skin, the appearance of purple spots on the face, neck, upper body, hands. These symptoms are often provoked by emotional overload, drugs containing catecholamines, food and alcohol intake.

Material & Methods

Ultrasound is widely used in the diagnosis of neoplasms of the hepatobiliary system. Quite often, it is sonography that is the first method for examining patients with obstructive jaundice and abdominal pain. Ultrasound is highly informative, safe for the patient and generally has no contraindications. According to recent studies, the diagnostic accuracy of sonography in detecting pancreatic tumors is comparable to CT and reaches 87-90%, and when using color Doppler mapping - 94%.

Sonography allows you to identify the prevalence of the process in the pancreas, metastatic changes in the lymph nodes (regional and distant), liver, and in some cases to determine dissemination in the peritoneum.

An important feature of ultrasound is the ability to obtain a real-time image, which helps to biopsy neoplasms with a minimal risk of damage to the main vessels and intestinal walls, as well as to obtain adequate material for histological and/or cytological studies.

Positron emission tomography (PET), endosonography (endosonography) and laparoscopy in ambiguous situations provide additional information. Based on the intensity of accumulation of the radiopharmaceutical, PET provides information about the nature of changes in the pancreatic parenchyma (tumor, inflammatory changes), endosonography helps to clarify the degree of local spread of the tumor. Laparoscopic examination can detect dissemination in the peritoneum in patients with cancer of the body and tail of the pancreas with a high level of CA19.9 (more than 100 U / ml).

The assessment of the degree of prevalence of the tumor is carried out according to the TNM classification of the 7th revision. According to the classification, stage T1 includes tumors within the pancreas up to 2 cm in size. Stage T2 includes tumors ranging in size from 2 to 4 cm without signs of going beyond the organ capsule. Stage T3 is characterized by the involvement of surrounding organs and structures in the tumor process without spreading to the superior mesenteric artery and celiac trunk. In the presence of tumor infiltration of the superior mesenteric artery and celiac trunk, the stage is defined as T4.
Ultrasound procedure. Study in B-Mode

Results

In grayscale mode (B-mode), pancreatic adenocarcinoma is visualized as a hypoechoic formation of a heterogeneous structure with a fuzzy, uneven contour. The structure of the tumor is often solid, rarely solid with cystic inclusions. The tumor can be localized intraparenchymatously, go beyond the capsule of the gland, spread to the parapancreatic tissue, the tissue of the root of the mesentery of the small intestine, the mesentery of the colon, involve the duodenum, choledochus, the wall of the stomach, and large blood vessels. When the tumor is localized in the head of the pancreas, the expansion of the choledochus is often visualized; when the tumor is localized in the head and body, the expansion of the main pancreatic duct is visualized

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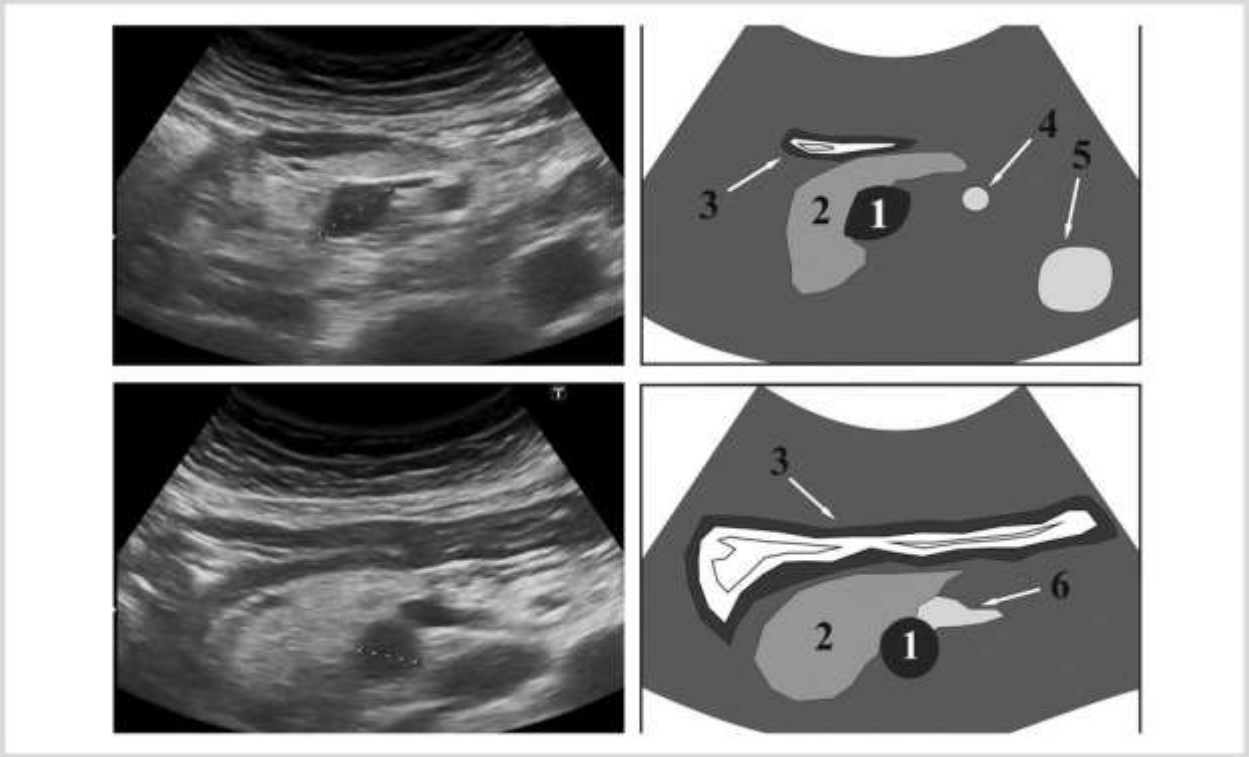

Figure. 1. Sonograms and schemes. Tumor of the uncinate process of the pancreas. Tumor of reduced echogenicity, diffuse-heterogeneous structure with fuzzy, even contours (in conditions of different navigation of the ultrasound sensor): 1 - tumor; 2 - unchanged pancreatic tissue; 3 - stomach; 4 - superior mesenteric artery; 5 - aorta; 6 - superior mesenteric vein.

Metastatic changes in the LN can be found in the parapancreatic tissue, along the hepatoduodenal ligament, in the hilum of the liver, in the region of the celiac trunk, along the superior mesenteric artery, in the hilum of the spleen, paraaortally, paracavally, interaortocavally, in the supraclavicular regions.

The secondary change of the LN is indicated by the shape (usually rounded), structure (absence of cortico-medullary differentiation), size (more than 5 mm in cross section).

Conclusion

In patients with SPLs, etiological differentiation is necessary to facilitate reasonable decisions on further management: radical surgery in patients with resectable PDAC, oncological treatment in patients with non-resectable malignancy, pancreatic parenchyma-saving strategies or surveillance in benign neuroendocrine neoplasia or follow-up in small benign lesions.

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