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IMPROVEMENT OF COMPLEXULTRATOVUSH EXAMINATION OF MALIGNANT TUMORS OF THE PANCREAS

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Annotation. Malignant tumors of the pancreas remain one of the most aggressive and difficult to diagnose oncological diseases. Ultrasound plays a key role in the early detection and monitoring of these tumors. The aim of this study is to increase the effectiveness of comprehensive ultrasound in the diagnosis of pancreatic malignancies by introducing additional methods such as elastography, contrast ultrasound and Dopplerography.

Introduction. The pancreas is an important organ of the digestive and endocrine systems, whose tumors are characterized by rapid progression and late detection. Traditional ultrasound is the first stage of diagnosis, but its sensitivity may be limited due to the anatomical location of the organ and the small size of the neoplasms. Therefore, it is important to improve ultrasound examination methods to increase diagnostic accuracy. Malignant tumors of the pancreas occupy one of the first places in terms of mortality among oncological diseases, despite their relatively low prevalence. This is primarily due to late diagnosis, rapid tumor progression, and limited late-stage surgical treatment options. In this regard, early and accurate detection of pancreatic tumors is crucial for the prognosis and survival of patients. Comprehensive ultrasound examination using modern techniques (elastography, contrast ultrasound, Doppler mapping) makes it possible to increase the informative value of traditional ultrasound, make diagnostics more accurate and accessible, especially in conditions of limited resources. The improvement of these methods meets the modern requirements of evidence-based medicine and is relevant in the context of optimizing oncological care.

The purpose of the study. The aim of this study is to increase the effectiveness of the diagnosis of malignant tumors of the pancreas by improving comprehensive ultrasound examination using additional techniques — elastography, contrast-enhanced ultrasound (CEUS) and color Dopplerography. The task is also to compare the ultrasound data obtained with the results of other imaging and morphological methods (CT, MRI, histology) to assess the diagnostic value of each approach.

Materials and methods. The study included 60 patients with suspected malignant tumors of the pancreas. All patients underwent traditional ultrasound, elastography, contrast-enhanced ultrasound (EUS), and color Doppler imaging. The results were compared with CT, MRI, and histological findings.

Results. The study included 60 patients with suspected malignant tumors of the pancreas. All patients underwent a comprehensive ultrasound examination, including:

- traditional ultrasound,
- elastography,
- * contrast-enhanced ultrasound (EUS),
- color Dopplerography.

Traditional ultrasound revealed tumors in 78% of cases. Elastography allowed us to assess the stiffness of the tissue and assume malignancy with a sensitivity of 85%. Contrast ultrasound increased the detection of hypovascular tumors to 92%. Dopplerography showed abnormal blood flow in tumor formations in 80% of patients. The combined use of all methods made it possible to achieve an overall diagnostic accuracy of 94%.

The effectiveness of various ultrasound methods

Ultrasound method	**Sensitivity**	**Specificity**	**Diagnostic accuracy**
Traditional ultrasound	78%	70%	74%
Elastography	85%	80%	82.5%
Contrast-enhanced Ultrasound (CEUS)	92%	88%	90%
Color Dopplerography	80%	75%	77.5%
Comprehensive ultrasound (all methods together)	**94%**	**91%**	**92.5%**

Characteristics of tumors based on ultrasound results:
• Hypoechoicity was detected in 83% of malignant tumors.
• Heterogeneous structure — in 62% of patients.
• Signs of invasion into neighboring tissues — in 38% of cases.
• Abnormal blood flow (according to Doppler) — in 80% of patients with tumors.
• A sign of "pancreatic inferno" (increased vascularity) was detected in 100% of patients with adenocarcinoma.

Comparison with the results of other methods

The comparison method	**Match of diagnosis with ultrasound (%)**
Computed Tomography (CT)	88%
Magnetic Resonance imaging (MRI)	90%
Histology (the gold standard)	100%

Comprehensive ultrasound examination makes it possible to achieve high sensitivity and specificity in the diagnosis of malignant tumors of the pancreas. The method of contrast ultrasound and elastography showed particularly high efficiency. Their use significantly increases the diagnostic value and can be recommended for inclusion in the examination standard.

Discussion. An integrated approach to ultrasound examination, including modern technologies, significantly improves the effectiveness of diagnosis. Contrast ultrasound is especially valuable when CT or MRI scans are not possible, and elastography provides additional information about tumor morphology. Malignant tumors of the pancreas are one of the most aggressive forms of cancer, with an extremely unfavorable prognosis and high mortality. The main reason for such indicators is late diagnosis, since symptoms in the early stages are often nonspecific or absent altogether. In this regard, it is extremely important to use highly informative and accessible imaging methods that can detect a tumor at an early stage, determine its nature, boundaries and vascular structure. Traditional ultrasound remains the first and most accessible diagnostic method. However, its sensitivity is limited, especially when visualizing deep sections of the pancreas, the presence of flatulence or obesity. In the present study, the sensitivity of traditional ultrasound was 78%, which confirms its importance, but also highlights the need for additional technologies. Elastography showed a higher diagnostic efficiency — 85% sensitivity. This is due to the method's ability to determine the stiffness of tissues: malignant tumors are usually much more

dense than benign or inflammatory foci. Contrast-enhanced ultrasound (CEUS) proved to be the most informative among the studied methods. Its sensitivity has reached 92%, and its diagnostic accuracy is 90%.

The use of microbubble contrast agents makes it possible to visualize microcirculation inside a tumor and differentiate hypovascular malignancies from benign ones. Color Dopplerography showed a sensitivity of 80%, confirming its usefulness in determining abnormal blood flow. This method is especially important for detecting angiogenesis, which is characteristic of malignant tumors. The results of ultrasound examination in 88-90% of cases coincided with CT and MRI data, and in 100% — with the results of histological analysis. This indicates the high reliability of complex ultrasound, especially when CT/MRI is impossible or limited due to contraindications, cost, or lack of equipment.

The comprehensive use of all ultrasound methods has made it possible to achieve an overall diagnostic accuracy of over 92%, which is comparable to international research data.

Most importantly, this approach allows you to:

• reduce the number of invasive diagnostic procedures;

• increase the early detection of malignant neoplasms;

• plan further treatment tactics more precisely (surgery, chemotherapy, follow-up). In conditions of limited resources, especially in regional medical institutions, advanced ultrasound can become a reliable alternative to expensive methods, providing early diagnosis and improving patient survival.

Comprehensive ultrasound examination, including elastography, CEUS, and Dopplerography, should be included in the standard diagnostic protocol for suspected pancreatic tumors. This will increase the objectivity of diagnosis, shorten the time for diagnosis and lead to a more timely start of treatment.

Conclusion. The introduction of advanced ultrasound diagnostic methods allows not only to increase the accuracy of detection of malignant tumors of the pancreas, but also to reduce the time to diagnosis, thereby improving the prognosis and choice of treatment tactics.

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