

## Ultrasonic Characteristic Characteristics Pancreas in Covid-19 Infection

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### Abstract

An ultrasound examination of the pancreas was carried out in 1958 patients with confirmed covid infection with interstitial pneumonia. At the same time, a lesion of the pancreas was revealed in 78% of patients with a peculiar and typical echo pattern in the form of a hyperechoic gland, without changing its contours and size.

**Introduction.** Early and timely diagnosis of the most common diseases of the pancreas and prevention of possible complications is one of the urgent problems of modern medicine.

Currently, ultrasound diagnostics is one of the leading diagnostic methods for inflammatory processes of the abdominal organs. Many researchers believe that it has already become a routine diagnostic method in everyday practice and decisive in the choice of treatment tactics.

In recent months, humanity has faced an infection caused by a new strain of human coronavirus (SARS-CoV-2), characterized by a variety of clinical manifestations of the disease, the absence of etiotropic therapy, a significant deterioration in the course of concomitant pathology, a rather high mortality rate, which, according to various studies, varies widely (from 0.5% to 15%) [3, 7, 8, 11, 14, 15].

The initial stage of infection is the penetration of SARS-CoV-2 into the target cells of the upper respiratory tract epithelium, which have type II angiotensin converting enzyme receptors (ACE2). However, the main and rapidly achievable target is the alveolar cells of type II (AT2) of the lungs, which determines the development of pneumonia [1, 2, 5, 17]. The role of CD147 in the penetration of SARS-CoV-2 into cells is also discussed [4, 6, 9, 10]. With COVID-19, catarrhal gastroenterocolitis may develop, since the virus infects epithelial cells of the stomach, small and large intestine that have ACE2 receptors [2, 11, 13]. There is evidence of the possibility of damage to the kidneys, central nervous system, endothelial vessels [1, 5].

The available literature on the diagnosis and treatment of the new coronavirus infection COVID-19 describes in detail the methods of laboratory and instrumental diagnostics of COVID-19, modern approaches to the differentiated treatment of various groups of patients. for lung damage, which in most cases determines the prognosis of the disease. Meanwhile, with COVID 19, other organs and systems of the body, including the digestive organs, can be affected. The gastrointestinal tract (GIT), along with the respiratory tract, can serve as the initial "gateway to infection" [4,8,9,12].

Specialists at the Royal University of Liverpool Hospital in England concluded that coronavirus infection can occur in the form of acute pancreatitis with specific and unusual symptoms of pancreatitis, including those with high sugar and fat in the blood. They reported this in an article published in the journal *Gastroenterology* [4, 5 8, 10]. Timely detection of such symptoms will allow you to immediately diagnose and begin treatment at an early stage.

**Keywords:** Coronavirus, diabetes mellitus, pancreas

**Purpose of inspection:** Is to study the nature of pathological changes in the pancreas in COVID-19 at various stages of the disease and their impact on the course of the pathological process.

**Material and methods:** The data of the ultrasound examination of 1958 patients treated at the Uzexpomarkaz medical center for COVID-19 infection with interstitial pneumonia from August to November 2020 were used as the research material. Of these, 995 are men, 963 are women. The average age of the patients was 59 + -0.5 years. Ultrasound examination was performed on the "Toshiba" apparatus. Patients are divided into 2 groups: group 1 (main) - patients

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who did not suffer from diabetes mellitus before infection with COVID-19 (1742 patients - 89%) and group 2 (control) patients with a previously established diagnosis of diabetes mellitus (216 patients -11%). In 93% of patients (1821 people), the disease manifested itself in respiratory disorders in the form of cough, shortness of breath, chest pains. In 7% of patients (137 people), the disease began with abdominal pain and dyspeptic disorders.

An ultrasound examination of the chest and abdominal organs of these patients with COVID-19 and interstitial pneumonia revealed various lesions of the internal organs, namely:

- in 78% - thickening of the pancreas, in the form of a hyperechoic pancreas, such as "slaked lime";
- in 70% - hepatomegaly;
- 4% have minor hydropericardium;
- hydrothorax - in isolated cases.

### **Technology and technique for scanning the pancreas.**

The inaccessibility of the pancreas determines the distinctive features of its imaging technique. To obtain a full-fledged and informative image of the pancreas, several prerequisites must be met - preliminary *preparation of the patient, the use of technological methods for imaging the pancreas, high-quality adjustment of the diagnostic device, dynamic observation.*

Preparing a patient for ultrasound examination of the pancreas is of great importance, especially if there are any abnormalities in the structure, location, size of the organ or in the presence of pathology. The study itself *should be carried out on an empty stomach - with abstinence from food for 6-10 hours.*

**The echographic picture of the pancreas is normal.** The biometric indicators of the pancreas in healthy individuals are as follows: the thickness of the pancreas in the head region is 20-22 mm, in the body region - 14-15 mm and in the tail section - 18-20 mm. In all cases, the main pancreatic (Wirsung) duct with smooth inner contours is visualized. The diameter of the duct in the body area does not exceed 1.4-1.5 mm. The contours of the pancreas are smooth and clear, the structure is homogeneous, fine-grained, of average echogenicity, which is comparable to the echogenicity of normal liver tissue. Respiratory mobility of the unchanged pancreas is preserved.

**Echographic picture of acute pancreatitis.** Form gland: usually preserved, except local (segmental) or focal pancreatitis, when affected parts (segments) or portions of the pancreas and the increase in size occurs and measurable - of the shape of this part of the gland, often producing an impression volumetric lesion.

The contours of the organ can change: with mild or moderate edema, the outline of the gland is emphasized. With an increase in edema, the emphasis of the contours increases, and when it spreads to the surrounding tissues (omentum, peritoneum, mesenteric roots, retroperitoneal tissue), on the contrary, it decreases, which leads to blurred borders of the pancreas. In these cases, the contours of the gland are usually not clearly differentiated.

The echogenicity of the pancreas in the edema phase decreases, unevenly in different areas. A pronounced edema of the pancreatic parenchyma can lead to such a significant decrease in echogenicity that in such a situation the gland is hardly distinguishable from a large venous vessel.

Internal structure : With diffuse lesions, the heterogeneity of the structure of the gland is revealed in all departments. In the case of a segmental or focal edema, these changes are concentrated mainly at the site of the lesion.

Ductal system: Dilation of the pancreatic duct often occurs with significant swelling of the head, leading to compression of its excretory part. In parallel, compression of the common bile duct can occur with the development of characteristic echographic signs of biliary hypertension (expansion of the extrahepatic and intrahepatic bile ducts, enlargement of the gallbladder).

**Ultrasound diagnostics of chronic pancreatitis.** Form: in general, it usually remains, although a previously transferred variant of local (segmental) or focal pancreatitis can lead to its change due to an increase or decrease in these departments.

Contours: jaggedness or tuberosity of the outer contour, especially the anterior one. The unevenness of the contour of the gland is due to the uneven replacement of the glandular tissue by fibrous areas, especially in the superficial parts.

Dimensions: with frequent relapses, there is an increase in the gland in volume, and with the sclerosing variant of chronic pancreatitis, on the contrary, shrinkage and decrease in size.

Echogenicity: with diffuse lesions in the remission phase, it is increased, and unevenly in different areas. With local variants of the lesion, a more significant and uneven increase in the echogenicity of the corresponding area is usually observed.

Internal structure: pronounced diffuse heterogeneity of the structure in the form of chaotically alternating areas of medium and high echogenicity.

Ductal system: local expansion of the main pancreatic duct for the most part occurs with appropriate changes in the head, leading to compression of its excretory part. The internal contour of a dilated pancreatic duct usually becomes uneven and jagged. In the lumen of the main pancreatic duct and its branches, calculi of various sizes can be detected. Additional signs of chronic pancreatitis with echography may be the identification of retention cysts and pseudocysts.

**Research results: Ultrasound picture of the pancreas in patients with covid infection without diabetes mellitus (main group)** . In 164 (9.4%) patients, the pancreas was unchanged. A picture of acute pancreatitis was revealed in 3 (0.2%) patients. The picture of chronic pancreatitis was observed in 36 (2.1%) patients. In 1539 (88.3%) patients, the ultrasound picture of the pancreas had its own characteristics ("atypical pancreatitis") and they were typical for all examined patients.



**Fig. 1. Ultrasound picture of the pancreas in a COVID-19 infected patient without diabetes mellitus on the 3rd day from the onset of the disease**

Gland shape: preserved.

Contours: smooth, clear

Dimensions: not increased.

Echogenicity: in the early period, **moderately hyperechoic**, on the 5-7th day there is a **pronounced hyperechoicity**, without an echo shadow.

Internal structure: the early period is not homogeneous, in the form of single hyperechoic foci . On the 5th day, it was homogeneous, without manifestations of fibrosis. Duct system: not expanded.



**Fig. 2.** Ultrasound picture of the pancreas in a COVID-19 infected patient without diabetes mellitus on the 7th day from the onset of the disease



**Fig. 3.** Ultrasound picture of the pancreas in a COVID-19 infected patient without diabetes mellitus on the 20th day from the onset of the disease



**Fig. 4. Ultrasound picture of the pancreas in a COVID-19 infected patient without diabetes mellitus 3 months after the disease: areas with linear fibrosis can be traced**

**Ultrasound picture of the pancreas in patients with covid infection with diabetes mellitus (control group).** In 12 (5.5%) patients, the pancreas was unchanged. There were no patients with signs of acute pancreatitis. 201 (93.1%) patients had a picture of chronic pancreatitis. The picture of "atypical pancreatitis" was revealed in 3 (1.4%) patients.



**Fig. 5. Ultrasound picture of chronic pancreatitis in a COVID-19 infected patient with diabetes mellitus**

**Distribution of patients in groups by echo changes in the pancreas**

**Table 1.**

Groups Sick	RV without Changes		Spicy pancreatitis		Chronic sky Pancreatitis		"Atypical pancreatitis "		Total bygroup	
	abs	%	abs	%	Ab	%	abs	%	abs	%
<b>The main (without sugar diabetes)</b>	164	9.4	3	0, 2	36	2.1	1539	88.3	1742	100
<b>Control with sugar diabetes)</b>	12	5.5	-	-	201	93.1	3	1.4	216	100
<b>General number sick</b>	176	9.0	3	0.2	237	12.1	1542	78.7	1958	100

**Discussion.** The results of our study showed that the pancreas is vulnerable to covid infection. The pancreas contains high concentrations of angiotensin-converting enzyme-2, especially in the islets of Langerhans, which are the target of SARS-CoV-2, which leads to damage to the pancreas and the appearance of the above-described changes in the gland.

The nature of the changes in the pancreas was unusual - thickening of the gland tissue without edema and areas of necrosis.

Several characteristic points (features) of ultrasound examination of the pancreas in COVID-19 can be noted:

- with an ultrasound examination of the pancreas with COVID-19, special training is not required. Regardless of food intake and severity of intestinal pneumatosis, the pancreas is visualized against the background of surrounding tissues and organs as a hyperechoic organ.
- changes begin to appear 3-4 days from the onset of the disease in the form of single hyperechoic foci;
- on days 5-15, changes in the gland are more pronounced, visualized as a hyperechoic pancreas;
- changes in the pancreas do not depend on the sex and age of patients, but are more pronounced in young people;
- these changes are manifested in patients with chronic pancreatitis (diabetics).
- on the 15th - 25th day of the disease, restoration of the normal echo picture of the pancreas is observed.

#### Conclusions:

1. In 78-88% of patients with covid infection, the pancreas is affected;
2. Changes in the pancreas during covid infection in patients without diabetes mellitus have a typical echo pattern - a hyperechoic gland without changes in contours and sizes.
3. Changes in the pancreas during covid infection in patients with diabetes mellitus has an echo pattern of chronic pancreatitis.
4. The maximum severity of changes in the pancreas is observed on the 5-15th day of the disease.
5. A hyperechoic pancreas on ultrasound, as well as with a "ground glass" symptom on CT of the lungs, is a characteristic sign of pancreatic lesions in covid infection in patients without diabetes mellitus.

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