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INNOVATIVE METHODS OF RADIATION DIAGNOSTICS OF ACUTE ABDOMINAL DISEASES IN CHILDREN

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Introduction

Acute surgical diseases of the abdominal organs in young children occupy a leading place in the structure of emergency conditions in pediatric practice. Diagnosis of this pathology presents significant difficulties due to age-related anatomical and physiological characteristics, nonspecific symptoms, and limited clinical examination capabilities in infants. In these conditions, radiological examination methods play a decisive role, allowing for rapid and accurate determination of the nature of the lesion, the location of the pathological process, and the extent of its spread [1].

Modern radiology relies on a combination of methods, among which ultrasound occupies a key place. Ultrasound is a safe, non-invasive, accessible, and highly informative method that enables the early detection of pathological changes in abdominal organs [3]. It allows for the visualization of intussusception as a "target" sign, the diagnosis of acute appendicitis by thickening of the appendix wall and the absence of peristalsis, the detection of free fluid and gas during perforation, and the signs of necrotizing enterocolitis—wall thickening, pneumatosis, and gas in the portal vein. Modern ultrasound machines allow the use of Doppler ultrasonography



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to assess blood flow and ischemic changes, significantly increasing diagnostic accuracy.

Abdominal radiography remains an important primary imaging modality, particularly in cases of suspected intestinal obstruction, hollow viscus perforation, and the presence of free gas. However, its use in children is limited due to radiation exposure and low information yield in cases of soft tissue changes.[2] In complex diagnostic situations, computed tomography (CT) is used, providing high spatial resolution and the ability to perform multiplanar reconstruction. Modern multislice CT scanners allow examinations to be completed in seconds, which is especially important in young patients. Low-dose protocols are used to reduce radiation exposure , and the use of contrast enhancement helps to clarify the degree of inflammation and assess vascular complications.

Magnetic resonance imaging is used less frequently in pediatric practice, primarily for differential diagnosis, detection of congenital anomalies, and inflammatory changes without radiation exposure. The advantages of MRI include high contrast resolution and the ability to evaluate soft tissue structures, which is particularly valuable for liver pathology, biliary tract pathology, and vascular disorders [5].

The radiological diagnostic algorithm is developed based on the suspected disease. Ultrasound is recommended as the initial diagnostic method for most acute conditions, radiography is recommended for suspected obstruction or perforation, CT is used to clarify complex cases, and MRI is used when a more detailed assessment without radiation is needed. This stepwise approach improves diagnostic accuracy and reduces the risk of unnecessary radiation exposure[2].

Current trends in the development of radiology are aimed at improving technology and enhancing safety. Contrast-enhanced ultrasound (CEUS), 3D reconstruction, teleradiology consultations, and artificial intelligence systems capable of automatically recognizing pathological changes in images are being introduced. All this helps optimize diagnosis time and improve the quality of emergency care for children.



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Conclusion

Thus, radiodiagnostics plays a key role in recognizing acute surgical diseases of the abdominal organs in young children. Ultrasound remains the method of choice, providing high information yield while remaining completely safe for the patient. Computed tomography and magnetic resonance imaging are used as clarifying methods in complex cases and during surgical planning. Adherence to radiation safety principles, the use of low-dose technologies, and the rational selection of imaging techniques are the foundation of modern pediatric radiology.

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