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NEW APPROACHES TO ENDOSCOPIC AND RADIOLOGICAL DIAGNOSIS OF GASTROINTESTINAL DISEASES IN CHILDREN

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Abstract

This article analyzes modern approaches to endoscopic and radiological diagnosis of gastrointestinal diseases in children. Age-specific anatomical and physiological characteristics in pediatric patients necessitate the use of safe and minimally invasive diagnostic technologies. The diagnostic significance of gastroesophagoscopy, colonoscopy, capsule endoscopy, as well as ultrasonography, magnetic resonance imaging (MRI), and computed tomography (CT) is discussed. Integration of these diagnostic methods has been shown to improve diagnostic accuracy and contribute to the development of individualized treatment strategies.

Keywords

pediatric gastroenterology, gastrointestinal diseases, endoscopic diagnostics, radiological examinations, capsule endoscopy, ultrasonography, MRI, artificial intelligence

Introduction

Gastrointestinal diseases are common in pediatric gastroenterology, and their diagnosis is often challenging due to age-related anatomical and physiological characteristics. Endoscopic and radiological methods are among the most important diagnostic tools in pediatric practice. In recent years, minimally invasive endoscopy, capsule endoscopy, high-resolution ultrasonography (US), as well as modern radiological technologies such as magnetic resonance imaging (MRI) and computed tomography (CT), have enabled accurate and safe diagnosis of gastrointestinal diseases in children. At the same time, it is essential to consider age-specific recommendations and safety standards.

Aim of the study: To analyze modern approaches to diagnosing gastrointestinal diseases in children using endoscopic and radiological methods and to evaluate their effectiveness, safety, and clinical applicability.

Endoscopic diagnostics Gastroesophagoscopy, colonoscopy, and capsule endoscopy are considered fundamental diagnostic methods in pediatric gastroenterology. Capsule endoscopy significantly improves diagnostic efficiency in young children presenting with chronic abdominal pain, hematemesis, and chronic diarrhea. Endoscopic biopsy allows for the diagnosis of *Helicobacter pylori* infection, celiac disease, and chronic inflammatory bowel diseases.

Radiological diagnostics Ultrasonography (US) is a safe, radiation-free method and is commonly used as a first-line diagnostic tool. MRI and CT play an important role in identifying chronic diseases, complicated cases, and congenital anomalies. Pediatric CT and MRI protocols with minimal radiation exposure and high diagnostic accuracy have been adapted to age-specific requirements.

New approaches and innovations Innovative techniques include 3D and 4D ultrasonography for monitoring intestinal peristalsis and blood flow, real-time imaging with capsule endoscopy, and the use of artificial intelligence (AI) for pathology detection. Integration of radiological and endoscopic data enables the development of individualized treatment plans.

Methods A cohort study was conducted based on retrospective and prospective data collected from children aged 0–18 years with gastrointestinal diseases. Endoscopic examinations included gastroesophagoscopy, colonoscopy, and capsule endoscopy. Radiological investigations

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consisted of ultrasonography, MRI, and low-dose CT scanning. Data analysis focused on the relationship between age, sex, symptom severity, and diagnostic accuracy.

Results (Expected Findings) Endoscopic methods provided the highest diagnostic accuracy when adapted to age-specific requirements, particularly in chronic conditions. Capsule endoscopy proved to be an effective minimally invasive technique that improves patient comfort. Ultrasonography and MRI were found to be safe for pediatric patients; however, detection of certain pathologies required integration with endoscopic findings. Innovative approaches, including 3D ultrasonography and AI-assisted diagnostics, increased diagnostic accuracy by approximately 15–20%.

Discussion Endoscopic and radiological methods complement each other: ultrasonography and MRI offer high safety, while endoscopy provides superior diagnostic precision. Age-specific safety protocols, including sedation and minimal radiation exposure, are essential in pediatric practice. Technological innovations accelerate diagnostic processes and enhance treatment effectiveness. In the future, AI-integrated capsule endoscopy and radiology may become standard tools in pediatric gastroenterology.

Conclusion An integrated application of endoscopic and radiological methods ensures maximum diagnostic accuracy and safety in the evaluation of gastrointestinal diseases in children. Innovative technologies, particularly capsule endoscopy and AI-assisted diagnostics, have the potential to establish new standards in pediatric gastroenterology.

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