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DIAGNOSIS AND TREATMENT OF GLOMERULAR TORSION IN CHILDREN AND OPPORTUNITIES FOR LAPAROSCOPIC APPROACH

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ABSTRACT
This article analyzes the clinical presentation, diagnostic features, differential diagnosis, and surgical management of omental torsion in children. The aim of the study was to investigate the clinical characteristics of omental torsion as a cause of acute abdomen and to evaluate the potential of laparoscopic diagnosis and treatment. A retrospective analysis was performed on the clinical data of 11 patients treated at the Republican Scientific and Practical Center for Pediatric Minimally Invasive and Endoscopic Surgery between 2017 and 2025. The patients ranged in age from 5 to 13 years. Acute appendicitis was initially suspected in all cases. Clinical findings, laboratory results, and ultrasonographic data were assessed during the diagnostic process. Diagnostic laparoscopy enabled direct visualization of the abdominal organs, identification of omental torsion, and assessment of concomitant pathology. Laparoscopic resection of the affected portion of the greater omentum was performed in ten patients, whereas one patient underwent open surgery because of trauma-related findings. No postoperative complications were reported. The findings highlight the importance of considering omental torsion in the differential diagnosis of acute abdominal pain in children, using diagnostic laparoscopy when clinically indicated, and promptly treating the identified pathological changes.

Keywords: Children, omental torsion, acute abdomen, differential diagnosis, diagnostic laparoscopy, laparoscopic resection, surgical treatment, necrosis.

АННОТАЦИЯ
В статье проанализированы особенности клинического течения, диагностики, дифференциальной диагностики и хирургического лечения перекрута большого сальника у детей. Цель исследования — изучить клинические особенности перекрута большого сальника как причины синдрома острого живота и оценить возможности

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лапароскопической диагностики и лечения. Проведен ретроспективный анализ клинических данных 11 пациентов, проходивших лечение в Республиканском научно-практическом центре детской малоинвазивной и эндоскопической хирургии в период с 2017 по 2025 год. Возраст пациентов составлял от 5 до 13 лет. Во всех случаях при госпитализации первоначально подозревался острый аппендицит. При диагностике оценивались клинические, лабораторные данные и результаты ультразвукового исследования. Диагностическая лапароскопия позволила непосредственно осмотреть органы брюшной полости, выявить перекрут большого сальника и оценить сопутствующую патологию. У десяти пациентов выполнена лапароскопическая резекция пораженного участка большого сальника, у одного пациента в связи с изменениями, обусловленными травмой, проведено открытое хирургическое вмешательство. Послеоперационный период протекал без зарегистрированных осложнений. Полученные результаты свидетельствуют о важности учета перекрута большого сальника при дифференциальной диагностике острого живота у детей, применения диагностической лапароскопии по клиническим показаниям и своевременного устранения выявленных патологических изменений.
Ключевые слова: дети, перекрут большого сальника, синдром острого живота, дифференциальная диагностика, диагностическая лапароскопия, лапароскопическая резекция, хирургическое лечение, некроз.

The relevance of the problem: Great omental torsion is one of the rare causes of acute abdominal syndrome and has a polyetiological nature. It is noted in the literature that this condition is observed in 0.01-0.32% of patients who underwent emergency abdominal surgery. Primary and secondary forms of the disease are distinguished. This pathology was first described by Oberst in 1882.

Primary torsion occurs for no apparent reason. In such cases, clinical and intraoperative examinations do not reveal changes in the omentum or surrounding organs and tissues that cause torsion.

Secondary torsion can be associated with an increase in the volume of the greater omentum, its attachment to the hernial sac, the presence of a tumor, hematoma, or hemorrhagic infarction, as well as inflammatory infiltrates and adhesions in the abdominal cavity. Possible factors include appendicitis, cholecystitis, inflammatory diseases of the genital organs, peritonitis, changes after previous surgeries, and fixation around the ventriculoperitoneal shunt. The source indicates that this condition occurs with a frequency of 0.024% among children who underwent diagnostic laparoscopy.

Pathogenesis and classification: The pathogenesis of greater omentum torsion is not fully understood. In the literature, torsion around the fixed part of the omentum or along the free edge is described. Fixation of the omentum at two points can facilitate the formation of an axis of torsion. As a result, the fat spirals and blood circulation is disrupted.

Torsion can be partial or complete. In partial torsion, a specific part of the fat may increase due to an increase in adipose tissue, inflammation, or tumor, while the remaining part may take the form of a relatively thin leg. In cases associated with a hernia, chronic inflammation and thickening may occur as a result of the fat remaining in the hernial sac for an extended period.

Predisposing factors in children include anatomical features of the greater omentum, especially in the right part, abundance of adipose tissue, obesity, and accessory venous vessels. In some sources, increased intestinal peristalsis, abrupt body movements, and physical exertion are also

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cited as possible triggering factors. The disease is more common in boys and is noted between the ages of 9 and 16; it is rare in children under the age of four.

Pathological and anatomical changes: Fat torsion can lead to venous congestion, vascular thrombosis, and the development of necrosis in the affected tissue. Hemorrhagic, sometimes serous, fluid is detected in the abdominal cavity. If the process worsens, peritoneal inflammation and other thromboembolic complications may develop.

Clinical presentation and differential diagnosis: Torsion of the greater omentum should be distinguished from conditions such as acute appendicitis, appendicular peritonitis, and ovarian torsion in girls. Patients often complain of pain, nausea, and vomiting in the right half of the abdomen, specifically in the right iliac region. The pain may be persistent or episodic, local or diffuse. In some cases, the pain begins after eating a lot or after an abdominal injury. The severity of clinical symptoms does not always correspond to the patient's general condition. Symptoms of intoxication and dyspepsia may not be present initially; some patients visit the hospital 1–4 days after the onset of symptoms. Palpation may reveal pain in the right iliac region, but abdominal wall muscle tension is not always observed. Body temperature can be normal or subfebrile. In the early stages of the disease, blood analysis may remain unchanged, while leukocytosis may be observed when necrosis or peritonitis develops. Torsion of the omentum attached to the hernial sac can give a clinical picture similar to a compression hernia.

Diagnosis: An accurate diagnosis can be difficult to make before surgery; in most cases, the diagnosis is confirmed during the intraoperative examination. If the symptoms in the clinical examination do not fully explain the cause of abdominal pain, the torsion of the greater omentum should also be considered within the framework of differential diagnosis.

Ultrasound examination can reveal swollen and hyperechoic areas of adipose tissue and free fluid in the abdominal cavity, often in the lower right, with impaired blood flow. If necessary, computed tomography or magnetic resonance imaging is used. However, the sensitivity and specificity of these imaging methods may be limited.

Diagnostic laparoscopy allows for the direct examination of the abdominal cavity and the establishment of a diagnosis. It also allows for the implementation of therapeutic interventions in the same process when appropriate indications exist. The decision regarding laparoscopy should be made based on the patient's clinical condition, possible diagnosis, and surgical risks.

Treatment tactics: Some literature indicates the possibility of conservative treatment in selected patients. However, such an approach must take into account the risk of complications such as abscesses, sepsis, and abdominal adhesions. The source lists surgical treatment as the primary tactic.

Surgical intervention involves the resection of a twisted and non-viable part of the omentum at the boundary of healthy tissue, as well as the elimination of the factor that caused the twist. If possible, a laparoscopic approach is used. If it is impossible to safely perform an intervention using the laparoscopic method or if additional circumstances require it, the transition to the open method is considered. Tactics for eliminating torsion prior to fat resection are carefully evaluated in the source from the perspective of the risk of vascular complications.

Previously, in open surgery, right iliac or mid-laparotomy approaches were used. Detection of an unchanged vermiform tumour and presence of haemorrhagic fluid in the abdominal cavity may require further examination. Laparoscopy allows for the examination of the entire abdominal cavity and, if necessary, the simultaneous treatment of concomitant pathology.

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Objective: To highlight the clinical features of rare acute surgical pathology in children - torsion of the greater omentum, analyze diagnostic methods, and evaluate the possibilities of laparoscopic diagnosis and treatment.
Materials and methods: In 2017-2025, 11 cases of torsion of the greater omentum in children treated at the Republican Scientific and Practical Center for Pediatric Invasive and Endoscopic Surgery were analyzed. The age of the patients was 5–13 years; the average age was 9±1.8 years. There were 8 (72.7%) boys and 3 (27.3%) girls.
Patients were hospitalized 5–72 hours after the onset of abdominal pain; the average duration was 35±26.3 hours. 4 (36.4%) patients were admitted within the first 6 hours, 2 (18.2%) within 6–24 hours, and 5 (45.5%) patients after 24 hours. Thus, 6 patients (54.5%) were admitted to the hospital on the first day of illness.
All patients were initially hospitalized with a diagnosis of acute appendicitis. The main complaint was pain of varying severity in the right half of the abdomen. Additionally, some patients experienced vomiting, nausea, or diarrhea. In most cases, the pain was persistent; in one patient, it was episodic, while in another, it was diffuse. In two patients, Schetkin–Blumberg's sign was identified in the right iliac region.
When collecting the medical history, the causative factor of pain was not identified in the majority of patients. One 8-year-old boy was reported to have sustained a concussion to the abdominal area during karate training three days prior to hospitalization. Body temperature ranged from 36.1 to 37.2 °C, with an average of 36.6 ± 0.2 °C. ° The number of leukocytes in the blood ranged from 6.9 to 17.3×109/L, with an average of 11.5±2.4×109/L. In one patient, an ultrasound examination revealed an infiltrate with an uneven structure in the right lower quadrant of the abdomen. Infiltrate was not palpated through the abdominal wall or the rectum in any of the patients. Prolonged abdominal pain, the detection of infiltrate in one patient, and the appearance of peritoneal symptoms in two patients during observation served as the basis for emergency laparoscopy. All patients underwent emergency laparoscopy under endotracheal anesthesia. Abdominal cavity examination revealed hemorrhagic fluid in the pelvic region in 5 patients, serous-hemorrhagic fluid in 4 patients, purulent-hemorrhagic fluid in 1 patient, and serous fluid in 1 patient. Partial torsion of the greater omentum was noted in 10 patients. In one patient, a hematoma of the round ligament of the liver was identified, associated with a complete torsion of the greater omentum and abdominal trauma. Additionally, the source noted phlegmonous appendicitis and peritonitis in one patient and acute appendicitis in another.

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Figure 1. Torsion and necrosis of the omentum



Figure 2. Torsion and necrosis of the greater omentum.

In ten patients, laparoscopic resection of the torticollis was performed at the border of healthy tissues. In some patients, laparoscopic appendectomy was performed due to concomitant appendicitis. In one patient with a blunt abdominal injury, a laparotomy and resection of the twisted omentum were performed after identifying a total twist and a round ligament hematoma of the liver.

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It was noted that the postoperative period proceeded without complications and the injuries were primarily healed. The duration of inpatient treatment was 5–19 days, with an average of 7 days.

According to the authors' interpretation, the twist was primary in 7 patients and no specific cause was found; in the remaining cases, factors leading to secondary twisting were identified, including appendicitis or abdominal trauma. The figures relating to this distribution must be double-checked before the final publication.

Clinical advantages of laparoscopy: Possible advantages of the laparoscopic approach include: establishing a diagnosis using a minimally invasive method; conducting a comprehensive examination of abdominal organs; identifying factors that caused the torsion of the omentum; performing resection of the torsioned area at the border of healthy tissues; simultaneously treating comorbid pathology if indicated; and assessing the need for open surgery if safe laparoscopic intervention is impossible.

If the appendix is unchanged during the primary twist, it is possible not to remove it. This approach is consistent with the principle of avoiding unjustified intervention and preserving healthy organs.

Conclusion: Torsion of the greater omentum is a rare cause of acute abdominal syndrome in children and can be clinically similar to acute appendicitis and other urgent abdominal diseases. Although imaging techniques help with diagnosis, in some cases, the final diagnosis is made during laparoscopy. Laparoscopy allows for a complete examination of the abdominal cavity, establishing a diagnosis, and conducting appropriate treatment simultaneously. Treatment tactics should be based on the patient's clinical condition and intraoperative findings.

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