DOI: https://doi.org/10.17816/psaic1769

Adnexal torsion in girls: Predictors and methods for surgical treatment. Case reports and review

Dmitry V. Donskoy[1,2], Sergey A. Korovin[1], Alexey V. Vilesov[2], Roman A. Akhmatov [1,2], Kadidiatou D. Sangare[1], Olga A. Alimova[2]

[1] Russian Medical Academy of Continuous Professional Education, Moscow, Russia;
[2] Children's State Hospital of St. Vladimir, Moscow, Russia

ABSTRACT

Modern diagnostic and treatment methods make it possible to establish a preoperative diagnosis of adnexal torsion and provide surgical assistance. Thus, the causes of this disease and the scope of surgical treatment must be investigated. This study reports the cases of 20 patients aged 3–17 years with adnexal torsion who were treated at the St. Vladimir Children's City Clinical Hospital between 2017 and 2023. Ultrasonography is a mandatory preoperative screening diagnostic method. All patients underwent laparoscopic surgery. During the postoperative period, magnetic resonance imaging was performed to confirm the diagnosis. Increased ovarian size due to cysts (7), paramesonephric cysts (4), and fixed lateroflexion (6) were identified as predictors of torsion. In 3 (15%) patients, the cause of torsion was unknown. Paramesonephric cysts were resected, and two adnexectomies were performed. After detorsion, 12 (60%) patients underwent fixation of the appendages. A literature search was conducted using PubMed, Scopus, eLibrary, and RSCI. A total of 47 articles were analyzed, 58 articles were reviewed, and 39 on the problems of determining predictors of adnexal torsion in children and methods of surgical correction were selected. Based on the data obtained, the main disease predictors were clarified. A change in the angle of the uterus (lateroflexion) was found to cause the atypical location of the ovaries, which in turn can lead to torsion of the changed or unchanged appendage. Suggestions have been made regarding the connection between connective tissue dysplasia and uterine lateroflexion in the development of adnexal torsion in childhood. The results confirmed the complexity of the radiological diagnosis of lateroflexion. The scope of the surgical intervention for acute torsion of the uterine appendages was dependent on the etiology of the torsion and the degree of ischemia of the appendage. Various options for detorsion with unilateral and bilateral oophoropexy and without fixation of the injured appendage have been proposed. Removal of uncomplicated paramesonephric formations of the uterine appendages identified during diagnostic laparoscopy is a simple procedure and helps prevent torsion. Thus, puncture of accidentally detected ovarian cysts in patients who have not been examined for tumor markers is deemed inappropriate.

Keywords: adnexal torsion; predictors; detorsion; lateroflexion; surgery; children; series of case reports.

To cite this article
Donskoy DV, Korovin SA, Vilesov AV, Akhmatov RA, Sangare KD, Alimova OA. Adnexal torsion in girls: Predictors and methods for surgical treatment. Case reports and review. *Russian Journal of Pediatric Surgery, Anesthesia and Intensive Care*. 2024;14(1):131–142. DOI: https://doi.org/10.17816/psaic1769

Received: 10.01.2024 **Accepted:** 03.03.2024 **Published:** 28.03.2024

DOI: https://doi.org/10.17816/psaic1769

Перекрут придатков матки у девочек: предикторы и способы оперативного лечения. Серия клинических наблюдений и обзор литературы

Д.В. Донской[1,2], С.А. Коровин[1], А.В. Вилесов[2], Р.А. Ахматов[1,2], К.Д. Сангаре[1], О.А. Алимова[2]

[1] Российская медицинская академия непрерывного профессионального образования, Москва, Россия;
[2] Детская городская клиническая больница святого Владимира, Москва, Россия

АННОТАЦИЯ

Современные методы диагностики и лечения позволяют устанавливать предоперационный диагноз перекрута придатков матки и оказывать хирургическую помощь. В то же время причины возникновения данного заболевания и определение объема оперативного лечения требуют детального изучения. В работе представлены наблюдения 20 пациенток в возрасте от 3 до 17 лет с перекрутом придатков матки, находившихся на лечении в Детской городской клинической больнице святого Владимира с 2017–2023 гг. Обязательным предоперационным скрининг-методом диагностики служила ультрасонография. Всем девочкам выполняли лапароскопические операции. В послеоперационном периоде для уточнения диагноза применяли магнитно-резонансную томографию. В качестве предикторов перекрута были выявлены увеличенные размеры яичников за счет кист (7), парамезонефральные кисты (4) и фиксированная латерофлексия (6). В 3 наблюдениях (15 %) причина перекрута не была установлена. Парамезонефральные кисты резецировали, проведены 2 аднексэктомии. После деторсии фиксация придатков выполнена 12 (60 %) пациентам. Проведен поиск литературы в базах данных PubMed, Scopus, eLibrary, РИНЦ. Анализу подвергнуты 47 ссылок, просмотрено 58 статей, отобрано 39 публикаций, посвященных проблемам определения предикторов перекрута придатков матки у детей и способам хирургической коррекции рассматриваемого заболевания. На основании полученных данных уточнены основные предикторы заболевания. Выявлено, что изменение угла наклона матки (латерофлексия) является причиной атипичного расположения яичников, которая в свою очередь может приводить к перекруту измененного или неизмененного придатка. Высказаны предположения о связи дисплазии соединительной ткани и латерофлексии матки на развитие аднексиального перекрута в детском возрасте. Показана сложность лучевой диагностики латерофлексии. В зависимости от этиологических причин, вызвавших торсию, и степени ишемии придатка рассмотрен объем хирургического вмешательства при остром перекруте придатков матки. Предложены различные варианты деторсии с односторонней, двухсторонней оофоропексией и без фиксации травмированного придатка. Показано, что удаление неосложненных парамезонефральных образований придатков матки, выявленных при диагностической лапароскопии, является легко выполнимой операцией и способствует предотвращению торсии. Высказано мнение о нецелесообразности выполнения пункции случайно выявленных кист яичников, у необследованных на онкомаркеры пациенток.

Ключевые слова: перекрут придатков матки; предикторы; деторсия; латерофлексия; хирургическое лечение; дети; серия клинических наблюдений.

Как цитировать

Донской Д.В., Коровин С.А., Вилесов А.В., Ахматов Р.А., Сангаре К.Д., Алимова О.А. Перекрут придатков матки у девочек: предикторы и способы оперативного лечения. Серия клинических наблюдений и обзор литературы // Российский вестник детской хирургии, анестезиологии и реаниматологии. 2024. Т. 14, № 1. С. 132–142. DOI: https://doi.org/10.17816/psaic1769

Рукопись получена: 10.01.2024 **Рукопись одобрена:** 03.03.2024 **Опубликована:** 28.03.2024

DOI: https://doi.org/10.17816/psaic1769

女孩子宫附件扭转：预测因素和手术治疗。临床病例系列和文献综述

Dmitry V. Donskoy[1,2], Sergey A. Korovin[1], Alexey V. Vilesov[2], Roman A. Akhmatov [1,2], Kadidiatou D. Sangare[1], Olga A. Alimova[2]

[1] Russian Medical Academy of Continuous Professional Education, Moscow, Russia;
[2] Children's State Hospital of St. Vladimir, Moscow, Russia

摘要

现代诊断和治疗方法使子宫附件扭转的术前诊断和手术治疗成为可能。同时，本病的发病原因和手术治疗范围的确定也需要详细研究。本文介绍了2017–2023年期间在圣弗拉基米尔儿童市临床医院接受治疗的20名3至17岁子宫附件扭转女性患者的观察结果。超声波检查是术前筛查的必要诊断方法。所有女孩都接受了腹腔镜手术。术后通过磁共振成像明确诊断。囊肿导致的卵巢体积增大（7 例）、副肾盂囊肿（4 例）和固定性后屈（6 例）被确定为扭转的预测因素。3例（15%）患者的扭转原因尚未确定。对副肾盂囊肿进行了切除，并进行了 2 例附件切除术。12例（60%）患者在扭转后进行了阑尾固定术。在PubMed、Scopus、eLibrary和RSCI数据库中进行了文献检索。我们分析了47篇参考文献，审阅了58篇文章，选取了39篇出版物，专门研究如何确定儿童子宫附件扭转的预测因素以及手术矫正该疾病的方法。根据获得的数据，明确了该疾病的主要预测因素。研究发现，子宫倾角（后倾）的变化是卵巢不典型排列的原因，进而可能导致改变或未改变的附件扭转。有人认为结缔组织发育不良和子宫后倾与儿童期附件扭转的发生有关。这显示了子宫后位放射诊断的复杂性。根据扭转的病因和附件缺血的程度，考虑了急性子宫附件扭转的手术干预范围。提出了单侧、双侧或不固定受创附件的各种不同的剥离术。研究表明，通过诊断性腹腔镜检查发现的无并发症的子宫附件旁肿块进行切除是一种简便易行的手术，有助于预防子宫扭转。有观点认为，对未进行肿瘤标记物检查的患者意外检测到的卵巢囊肿进行穿刺是不可取的。

关键词：子宫附件扭转；预测因素；脱出；后屈；手术治疗；儿童；系列临床观察。

引用本文

Donskoy DV, Korovin SA, Vilesov AV, Akhmatov RA, Sangare KD, Alimova OA. 女孩子宫附件扭转：预测因素和手术治疗。临床病例系列和文献综述. *Russian Journal of Pediatric Surgery, Anesthesia and Intensive Care*. 2024;14(1):131–142. DOI: https://doi.org/10.17816/psaic1769

收到：10.01.2024 **接受：**03.03.2024 **发布日期：**28.03.2024

BACKGROUND

Adnexal torsion (AT) in girls occurs in 2.7%–4.9% of all patients with abdominal pain in a surgical hospital [1–3]. Modern methods of diagnosis and treatment allow for preoperative diagnosis and surgical care. However, the causes and definition of the scope of surgical treatment remain controversial.

This study aimed to analyze Russian and foreign publications on predictors of AT and surgical correction of torsion in children, based on our observations.

DESCRIPTION OF CLINICAL CASES

Video recordings of 20 laparoscopic surgeries performed for AT in girls aged 3–17 years at St. Vladimir's Children's City Clinical Hospital between 2017 and 2023 were analyzed retrospectively. Ultrasonography was used as the mandatory preoperative screening method of diagnosis performed according to the standard technique on the Voluson E8 device (Austria) using convex and linear transducers of 2–15 MHz. To optimize the image, the B-color mode with color Doppler mapping was used in most cases. Surgeries were performed using an endovideosupport system by Karl Storz (Germany), with a three-chip SLII high-resolution video camera with a block and standard set of instruments, including 5 and 10 mm trocars, mono and bipolar electrocoagulation instruments, scissors, forceps for grasping and dissection, and needle holder. Magnetic resonance imaging (MRI) was performed for postoperative diagnosis. A Toshiba device (Excelart Vantage Atlas-X, USA) with an actively protected magnet of 1.5 Tesla and a reconstructed image thickness of ⩾1 mm was used. The study protocol involved using conventional MRI to image the abdominal and pelvic organs, and T1- and T2-weighted images were acquired in axial, sagittal, and frontal projections.

The table summarizes the causes of torsion and the number and types of surgical interventions.

Detorsion without fixation was performed when ovarian cysts >5 cm were detected. Children were then transferred to gynecologic departments for interval surgery. If the structure of the black appendage was disturbed during detorsion and fragmented when untwisted, adnexectomy was performed. In four observations of paramesonephral cysts, an isolated torsion of the fallopian tube was detected without any disturbance of ovarian blood flow. After detorsion, no blood flow restoration was detected in the fallopian tubes. In one case, the patient underwent cyst enucleation in the hope of restoring blood supply; however, this was not successful. All children underwent salpingectomy without ovarian fixation. Lateroflexion was detected in seven cases; however, the change in uterine angle was considered transient in only one case (Fig. 1).

After detorsion, in six observations, the uterus maintained a fixed lateroflexion position, deviating from the conventional central axis to the left or right side. In addition to the increased ovarian mass and size, two main factors contribute to the development of torsion in uterine lateroflexion:

1. The lateral deviation of the uterus reduces the space of the ovarian fossa and prevents the ipsilateral gonad from descending into the pelvis (Fig. 2).

This positioning can result in the torsion of the altered or unaltered ovary because of physical strain, active peristalsis, or excessive gas.

2. The lateral deviation of the uterus increases the space in the ovarian fossa on the opposite side, which could potentially lead to torsion (Fig. 3).

In the above observations, the ligamentous apparatus of the uterus and ovaries was used to unilaterally fix the appendages through plication.

Two observations of AT are of interest, in which the contralateral gonad was located over the uterus (Fig. 4). For this appendage location, bilateral fixation was performed after detorsion.

The change in the angle of inclination may be associated with dysplasia of the ligamentous apparatus of the uterus or ovaries. This is indirectly confirmed by the detection of three inguinal hernias on the ipsilateral side in patients with lateroflexion and pelvic floor muscle development and/or pelvic adhesions (Fig. 5).

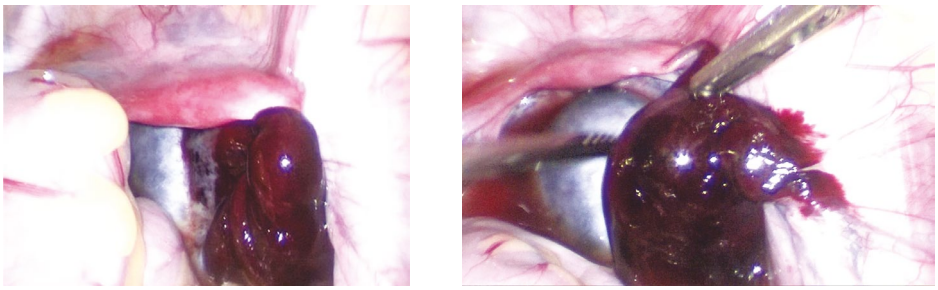
In the analysis of the case histories of the patients, preoperative transabdominal ultrasonography showed the

Table. Etiology and types of operations for uterine torsion

Таблица. Этиология и виды операций при перекруте придатков матки

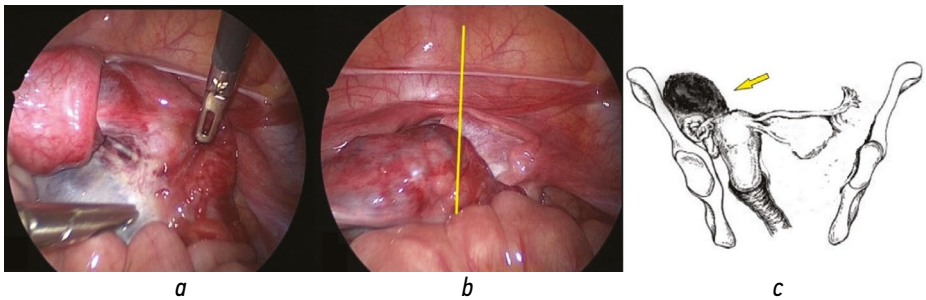
Surgery	Ovarian cysts	Paramesonephric cysts	Fixed lateroflexion	Unspecified	Number of patients	
					n	%
Detorsion	2	–	–	–	2	10
Detorsion with fixation	5	–	5	2	12	60
Detorsion with resection	–	4	–	–	4	20
Detorsion with adnexectomy	–	–	1	–	1	5
Adnexectomy without detorsion	–	–	–	1	1	5
Total	7 (35%)	4 (20%)	6 (30%)	3 (15%)	20	100

DOI: https://doi.org/10.17816/psaic1769



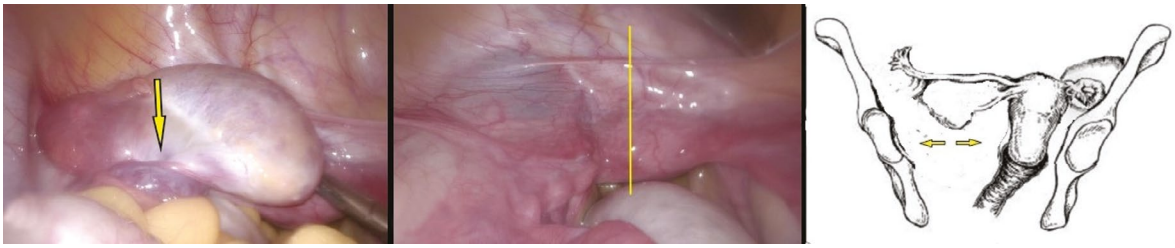
a *b*

Fig. 1. Adnexal torsion with transient lateroflexion of the uterus: *a* — adnexal torsion on the right; classical transient right-sided uterine lateroflexia caused by the mass effect; and *b* — condition after detorsion. The uterus is in a central position
Рис. 1. Перекрут придатков с транзиторной латерофлексией матки: *a* — перекрут придатков справа. «Классическая» транзиторная правосторонняя латерофлексия матки, вызванная масс эффектом (mass effect); *b* — состояние после деторсии. Матка в центральном положении



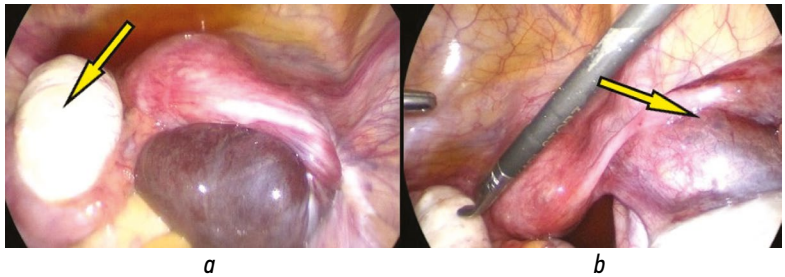
a *b* *c*

Fig. 2. Adnexal torsion with left-sided lateroflexion of the uterus: *a* — adnexal torsion on the left; *b* — the condition after detorsion; and the yellow line means conditional; *c* — the layout of the torsioned adnexal (arrow)
Рис. 2. Перекрут придатков при левосторонней латерофлексии матки: *a* — перекрут придатков слева; *b* — состояние после деторсии. Желтая линия — условная центральная ось; *c* — схема расположения торсированного придатка (указан стрелкой)



a *b* *c*

Fig. 3. Adnexal torsion on the left: *a* — torsion of the "healthy" adnexa on the left. The arrow indicates the torsioned left ovary; *b* — right-sided uterine lateroflexia; the yellow line indicates the conditional central axis; and *c* — scheme of the formation of a free space in the pelvis (arrow)
Рис. 3. Перекрут придатков слева: *a* — перекрут «здоровых» придатков слева. Стрелкой указан торсированный левый яичник; *b* — правосторонняя латерофлексия матки. Желтая линия — условная центральная ось; *c* — схема образования свободного пространства в малом тазу (указано стрелками)



a *b*

Fig. 4. Adnexal torsion on the right: *a* — the left ovary above the uterus (arrow); *b* — state after detorsion. The left ovary maintains its position. The right adnexa in the free abdominal cavity (arrow)
Рис. 4. Перекрут придатков справа: *a* — левый яичник над маткой (указан стрелкой); *b* — состояние после деторсии. Левый яичник сохраняет свое положение. Правый придаток в свободной брюшной полости (указан стрелкой)

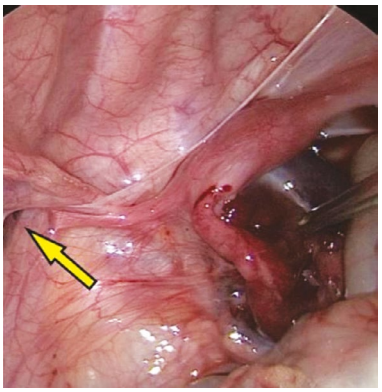


Fig. 5. Adnexal torsion on the left. Condition after detorsion. Left-sided lateroflexion of the uterus. The arrow indicates a left-sided inguinal hernia
Рис. 5. Перекрут левых придатков. Состояние после деторсии. Левосторонняя латерофлексия матки. Стрелкой указана левосторонняя паховая грыжа

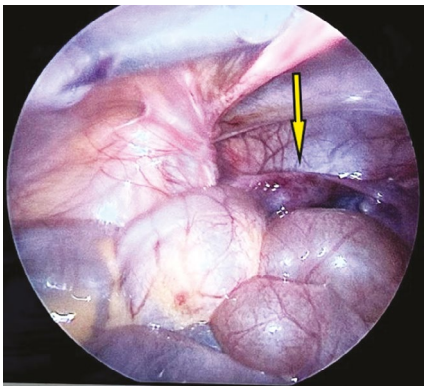


Fig. 6. Endoscopic view during revision of the pelvic organs. The arrow points to the left-sided lateroflexion of the uterus
Рис. 6. Эндоскопическая картина при ревизии органов малого таза. Стрелка указывает на левостороннюю латерофлексию матки

uterus deviating toward ovary torsion in one patient. Based on this data, we determined the position of the uterus in girls who underwent laparoscopic surgery for nongynecologic abdominal pathology. Consequently, left-sided lateroflexion of the uterus was detected in a 10-year-old girl who underwent surgery for destructive appendicitis (Fig. 6).

Postoperatively, transabdominal ultrasonography and MRI were performed to examine the pelvic organs. However, echography data did not provide any useful information. Conversely, MRI confirmed the presence of uterine lateroflexion (Fig. 7).

This study has the limitations of a retrospective study. The small number of patients currently complicates the identification of uterine lateroflexion as a potential predictor of AT. Further study of this problem is necessary.

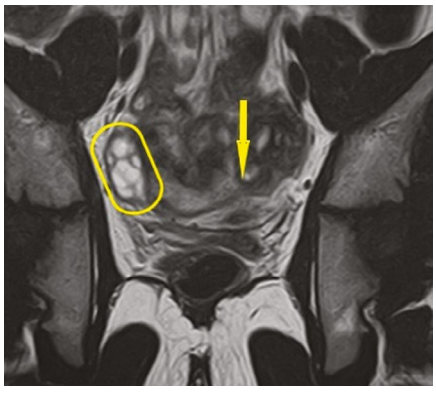


Fig. 7. Magnetic resonance tomography of the lower abdominal cavity. The uterus is in the *anteflexio* and *retroversio* position, with clear boundaries. The body is tilted to the left (arrow). The right ovary at the entrance to the pelvis (oval)
Рис. 7. Магнитно-резонансная томография нижнего одела брюшной полости. Матка в положении *anteflexio*, *retroversio*, с четкими границами, тело отклонено влево (стрелка). Правый яичник у входа в малый таз (овал)

LITERATURE REVIEW

A systematic search was conducted in the PubMed, Scopus, eLibrary, and RSCI databases. In total, 47 references were analyzed, 58 articles were reviewed, and 39 publications that focused on the identification of predictors of AT in children and its methods of surgical treatment were selected.

Etiology

The etiology of AT is not fully understood; however, cystic formations (functional, retention, and paramesonephric) and tumors (benign and rarely malignant) of the uterine appendages are considered the main disease predictors [1–7]. According to R.M. Rocha and I.D.E.S. Barcelos [7], the main causes of AT from a large series of observations (360 patients) were dermoid cysts (36%), follicular cysts (16.1%), and corpus luteum cysts (9.9%). C. Spinelli et al. [6] reported the results of a histologic study involving 97 patients, and they identified functional cysts as one of the causes of AT, including the following: follicular (34.7%), simple (30.6%), corpus luteum (14.3%), serous (8.2%), and pseudocysts (6.2%). Dermoid cysts were detected in 25 (25.8%) patients. In addition, torsion of unchanged appendages was observed in 11 (11.3%) cases. In the systematic review of the literature on AT in the pediatric population with an average age of 11.6 years, O. Adeyemi-Fowode et al. [8] revealed that girls in the premenarchal period accounted for 43.4% of observations, whereas girls in the postmenarchal period accounted for 56.6%. The authors attribute the increased morbidity in adolescence to hormonal influences and the growth of the gonads, which leads to an increased frequency of physiologic and pathologic masses. Most studies have reported an association between AT and increased ovarian mass and size >5 cm. Paramesonephric cysts are considered a rare cause of AT, occurring in approximately 10% of cases. According to most experts, isolated fallopian tube torsion is almost

always associated with a paratubal cyst or hydrosalpinx [8–11]. Ovarian malignancies are an even less frequent cause of ovarian torsion. In a pooled series of studies including 707 patients with AT, S.C. Oltmann et al. [12] found malignancy in only 1.8% of cases. According to various authors, the cause of AT was unidentified in 21%–46% of pediatric patients [8, 12]. The etiology of AT in the absence of cysts or neoplasms is unclear and may be due to the increased mobility of the appendages caused by elongated ovarian ligaments or a hyperelastic type of mesosalpinx or mesovarium. The relatively small size of the uterus in premenarchal girls may provide a suitable space for AT. Increased blood pressure in the veins of the neoplasm's pedicle or the ovary is believed to play a role in AT development [8, 12, 13]. Dysplastic changes in the ligamentous apparatus of children, as pointed out by L.V. Adamyan et al. [3], may be an internal manifestation of AT.

Pathogenesis

Girls with AT experience changes in body position, physical exertion, increased intestinal peristalsis, and bladder overflow [2, 8, 12, 14]. Several authors have reported that right-sided AT is 1.5 times more common [4, 15, 16]. According to L. Darrell, the increased risk of right-sided torsion can be attributed to the larger space on the right side of the pelvis, which is filled with sigmoid colon, and the hypermobility of the cecum and ileum [17]. In addition, the author cited the work of S.J. Boley et al. [18] and highlighted the significant role of irreparable inguinal hernias in AT occurrence in girls. This was detected during hernioplasty in 27% of the cases [17].

Clinical presentation and diagnosis

The clinical presentation of AT is not dependent on the causative factors and is quite characteristic but not disease-specific [2, 5]. Symptoms resulting from AT can imitate destructive appendicitis, urinary tract infections, renal colic, gastroenteritis, or other causes of acute abdominal and pelvic pain. Transabdominal ultrasonography with Doppler imaging is the primary screening procedure for visualizing AT in children [2, 19]. Ultrasonography reveals an enlarged ovary with increased echogenicity, often accompanied by small peripheral cysts. In some cases, the ovary and uterus may be displaced to the same side. Doppler ultrasonography can detect blood flow disorders in the affected ovary, which is characterized by a whirlpool sign consisting of numerous concentric hypoechogenic rings resembling the shape of a target [21, 22]. However, the presence of blood supply on Doppler examination does not necessarily exclude AT because of the dual blood supply from the ovarian and uterine arteries and venous hemorrhage occurs before the arterial channel is damaged [3, 23]. Ultrasonography is also used postoperatively to monitor the recovery of the injured ovary [19]. Based on the literature, folliculogenesis is restored within 3 months to 3 years, as determined by echography [21, 24–27]. In addition to ultrasonography, recent publications have discussed the use of radiologic diagnostic methods such as multispiral computed tomography (MSCT) and MRI. For instance, S. Gounder et al. reported that in approximately half of the cases, MSCT and MRI detected uterine deviations to the side of the lesion, which, along with ovarian displacement (medialization), indicates AT [28, 29]. CT can detect ovarian teratomas with calcifications, which may cause AT. In addition, MSCT is useful in identifying other causes of abdominal pain, such as appendicitis or urinary system concretions, which can mimic ovarian torsion. However, A.V. Ngo et al. [23] do not recommend using MSCT for suspected ovarian torsion because of high doses of ionizing radiation and low cost-effectiveness compared with ultrasonography. MRI is not commonly used in cases of suspected acute ovarian torsion because of issues with availability, cost, and most importantly, the timing of the procedure, which is a crucial factor in preserving appendiceal viability [30]. However, as several studies have indicated, MRI is the preferred method for visualizing uterine appendiceal neoplasms that have resulted in torsion and can be performed after detorsion [21, 31].

These findings, along with the clinical presentation, necessitate the use of an invasive visualization method, which is confirmed by laparoscopy [2, 14, 32].

Treatment

Laparoscopic visualization of AT and detorsion does not pose a challenge [2]. However, the operating surgeon faces several challenging tasks. First, they must determine the viability of the organs involved because this determines the extent of the surgical intervention. Second, they must identify and eliminate the cause of torsion if possible. Finally, they must address appendage fixation. The available literature presents conflicting opinions.

Only a completely changed appendage should be removed. Organ viability is determined visually by its color. Viability is determined by blood flow restoration after untwisting. S.V. Parelkar et al. [33] distinguished four degrees of ischemia, ranging from a slightly discolored ovary to red, brown, and black. They described 10 observations of detorsions in which the ovaries were severely ischemic or necrotically altered at the time of surgery. However, subsequent sonograms revealed gonad preservation with follicle development in nine patients [33]. Dasgupta et al. (34) conducted a 20-year retrospective analysis of necrotic appendage preparations, defining a viability index based on the percentage of intact tissue identified (one for 0%, two for 1%–25%, three for 26%–75%, and four for >75%). At the time of surgery, ovaries described as "black" contained viable glandular tissue in 38%, and 21% of observations had an index of four. The American Association of Pediatric Surgeons and the Outcomes and Evidence-Based Practice Committee conducted a study to provide recommendations

for optimizing the treatment of ovarian torsion. The authors concluded that appendiceal detorsion in pediatric patients without ovariectomy is strongly supported by compelling evidence because most of the rescued ovaries remain viable [34].

However, no consensus has been established on whether to remove cysts during detorsion. According to N. Smorgick et al. [35], pediatric patients can be divided into two groups: those with torsion of "pathologic" appendages (ovarian cysts or paramesonephric cysts) and those with torsion of "normal" appendages. In the first group, surgical treatment should include detorsion, cystectomy, fenestration, or cyst puncture, which reduces the risk of recurrent appendiceal torsion by 50%–75% [35]. However, performing cystectomy on ischemic, severely edematous, friable appendages may lead to further damage to the gonadal tissue and bleeding and require emergency ovariectomy. In such cases, only detorsion to preserve the ovaries should be considered, and cyst removal should be performed routinely [8, 27, 36].

Fixation of the uterine appendages is challenging. The literature describes several techniques of ovariopexy, including the fixation of the ovary to the lateral pelvic wall, plication of the sacrouterine and round ligaments, shortening the uterine ovarian ligament, and suturing the uterine ovarian ligament to the posterior uterus. However, according to E. Simsek et al. [37], ovarian fixation lacks standardization, and the optimal method of ovariopexy remains undefined. Furthermore, plication does not eliminate the risk of retorsion, which can reach 12% [8, 37, 38]. The article discussed theoretical risks associated with uterine appendage fixation, including potential obstruction of the ovary descending into the fossa during puberty, uterine blood supply impairment, fallopian tube function, or ovary–fallopian tube connection. These risk factors may lead to iatrogenic infertility and require in vitro fertilization [8]. According to L.L. Breech et al. [14], all complex issues must be discussed with the patients and parents, which justifies an interval procedure instead of ovariopexy during primary surgery. In addition, planned interventions after the acute ischemic manifestations have subsided provide better appendage fixation with the restoration of the normal anatomy [14]. The fixation of the contralateral ovary remains controversial. Some authors believe that this procedure should only be performed in recurrent torsion, elongated ovarian ligaments, and bilateral torsion of "normal" appendages when the cause of torsion has not been established [8, 14, 34, 37, 39].

DISCUSSION

Uterine lateroflexion is often overlooked in contemporary Russian and foreign literature. The literature mainly describes the transient deviation of the organ toward torsion, associating it with the "mass effect", which is suppressed after detorsion. The term "mass effect" is widely used and has transitioned from adult to pediatric gynecology. The uterus deviates toward a torsioned ovary, which is often associated with a large mass of a cystically altered or tumor-containing appendage [20, 21]. However, interpreting the condition becomes difficult when the uterus is displaced toward the torsion of the "unchanged" appendage or to the contralateral side. Theoretically, this situation can be explained by reversing the cause-and-effect relationship, i.e., lateroflexion causes torsion.

In summary, three disease phases can be conditionally distinguished: predictor phase, acute phase (torsion), and recovery phase (up to 3 years after detorsion), each of which requires a detailed study. The first two phases will be considered because the recovery phase is exclusive to the gynecology section.

Some surgical aspects that require discussion based on objective evidence are as follows:

1. Predictor phase and simultaneous surgeries: Confirmative laparoscopy is generally recognized as necessary in severe abdominal pain syndrome and when acute surgical pathology cannot be excluded. The presence of ovarian cystic formations on preoperative ultrasound does not affect diagnostic techniques. If surgical pathology is ruled out, the next step is to determine the appropriate course of action for the cyst. Most cases are simple functional cysts that do not require intervention, particularly if the gonad is not larger than 4 cm. If the ovary measures >5 cm, the risk of torsion and malignant cell dissemination in patients without oncomarker testing must be considered. In our experience, we tend to avoid puncture. The situation is different when parovarian and paratubar cysts are detected. Because of their benign nature, growth, and refractoriness to conservative treatment, enucleation is necessary regardless of the mass size. In Morgagni cysts, removal is only recommended for attachments larger than 1 cm in diameter and on a long pedicle. All girls with cystic and tumorous uterine appendage masses detected during diagnostic procedures must be referred to a gynecologist.

2. Acute phase (torsion): The extent of surgical intervention required is dependent on the severity of ischemic disorders in the ovary and fallopian tube. Thus, the aim is to preserve even black appendages, as long as they remain intact. Tissues that disintegrate during detorsion must be removed. In the presence of cystic masses that caused AT, a detorsion is performed, without damaging the capsule. If the mass wall has ruptured, the ovary is resected within the healthy tissue. These procedures are considered necessary because of the high probability of bleeding. The greatest blood loss volume was 1,700 mL. The approach to ovarian fixation is individualized. During the acute phase, ipsilateral medial plication of the broad ligament with suturing to the round ligament of the uterus is preferred because of its anatomical advantages. The fixation of the ovary to the lateral pelvic wall is not recommended because it is considered unnecessary and traumatic during this period. However, in some cases, fixation is completely rejected because of severe ischemic

disorders, the child is <8 years old (if the appendages have not descended into the pelvis, ovariopexy in an interval order is recommended), causes of torsion have been eliminated (such as enucleation of cysts, resection of a cystic ovary, or removal of parovarian masses), or a combination of these factors. Bilateral fixation is performed if intraoperative uterine lateroflexion is established, and both ovaries are located atypically.

CONCLUSIONS

The following AT predictors were identified based on an analysis of literature data and our experience: paramesonephric masses of uterine appendages, ovarian enlargement of >5 cm regardless of etiology, and uterine lateroflexion with atypical location of the ovary and fallopian tube.

With regard to treatment techniques for girls with AT, the following recommendations are followed in the clinic:

- If ovarian cysts are detected without torsion, transfer the patient to the gynecological department or consult a gynecologist.
- Enucleation of the mass is necessary to detect a paramesonephric cyst.
- Surgery on the ovary during the acute phase after uterine appendage detorsion is not recommended because of the risk of bleeding.
- If the appendage is twisted and the mass is disrupted, remove the cyst or resect the ovary while preserving healthy tissue and consult a gynecologist.
- Medial plication is the preferred method of oophoropexy.
- Bilateral oophoropexy is indicated after detorsion when the atypical location of the ovary and fallopian tube is caused by uterine lateroflexion

ADDITIONAL INFORMATION

Authors' contribution. All authors made a substantial contribution to the conception of the work, acquisition analysis, interpretation of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work. Personal contributions of each author: D.V. Donskoy — surgical treatment of patients, literature review, collection and analysis of literary sources, writing; A.V. Vilesov — surgical treatment of patients, patient supervision, collection and analysis of literary sources, article editing; R.A. Akhmatov, S.A. Korovin — surgical treatment of patients, collection and analysis of literary sources, article editing; K.D. Sangare — patient supervision, collection and analysis of literary sources, article editing; O.A. Alimova — patient supervision, collection and analysis of literary sources.

Funding source. This study was not supported by any external sources of funding.

Competing interests. Authors declare that they have no competing interests.

Consent for publication. Written consent was obtained from the patients for publication of relevant medical information and all of accompanying images within the manuscript.

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией. Вклад каждого автора: Д.В. Донской — хирургическое лечение пациентов, обзор литературы, сбор и анализ литературных источников, написание текста; А.В. Вилесов — хирургическое лечение пациентов, курация пациентов, сбор и анализ литературных источников, редактирование статьи; Р.А. Ахматов, С.А. Коровин — хирургическое лечение пациентов, сбор и анализ литературных источников, редактирование статьи; К.Д. Сангаре — курация пациентов, сбор и анализ литературных источников; О.А. Алимова — хирургическое лечение пациентов, сбор и анализ литературных источников.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования и подготовке публикации.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи

Информированное согласие на публикацию. Авторы получили письменное согласие законных представителей пациентов на публикацию медицинских данных и фотографий.

REFERENCES

1. Adeyemi-Fowode O, McCracken KA, Todd NJ. Adnexal torsion. *J Pediatr Adolesc Gynecol*. 2018;31(4):333–338. doi: 10.1016/j.jpag.2018.03.010

2. Donskoy DV. *Surgical tactics in urgent pelvic organ diseases in girls* [dissertation abstract]. Moscow, 2000. (In Russ.)

3. Adamian LV, Poddubnyĭ IV, Glybina TM, et al. Ovarian torsion and fibrous dysplasia in children (case report). *Russian journal of human reproduction*. 2014;20(5):57-59. EDN: TJAVGT

4. Korovin SA, Dzyadchik AV, Galkina YaA, Sokolov YuYu. Laparoscopic treatment in girls with adnexal torsion. *Russian Journal of Pediatric Surgery, Anesthesia and Intensive Care*. 2016;6(2):73–79. EDN: WFEYZJ doi: 10.17816/psaic252

5. Kulakov VI, Selezneva ND, Krasnopolsky VI. *Operative gynaecology*. Moscow: Meditsina, 1990. 464 p. (In Russ.)

6. Spinelli C, Tröbs R-B, Nissen M, et al. Ovarian torsion in the pediatric population: predictive factors for ovarian-sparing surgery-an international retrospective multicenter study and a systematic review. *Arch Gynecol Obstet*. 2022;308:1–12. doi: 10.1007/s00404-022-06522-3

7. Rocha RM, Santos Barcelos IDE. Practical recommendations for the management of benign adnexal masses. *Rev Bras Ginecol Obstet*. 2020;42(9):569–576. doi: 10.1055/s-0040-1714049

8. Adeyemi-Fowode O, Lin EG, Syed F, et al. Adnexal torsion in children and adolescents: a retrospective review of 245 cases at

a single institution. *J Pediatr Adolesc Gynecol*. 2019;32(1):64–69. doi: 10.1016/j.jpag.2018.07.003
9. Baracy MG Jr, Hu J, Ouillette H, Aslam MF. Diagnostic dilemma of isolated fallopian tube torsion. *BMJ Case Rep*. 2021;14(7):e242682. doi: 10.1136/bcr-2021-242682
10. Harmon JC, Binkovitz LA, Binkovitz LE. Isolated fallopian tube torsion: sonographic and CT features. *Pediatr Radiol*. 2008;38(2):175–179. doi: 10.1007/s00247-007-0683-y
11. Mentessidou A, Mirilas P. Surgical disorders in pediatric and adolescent gynecology: Adnexal abnormalities. *Int J Gynaecol Obstet*. 2023;161(3):702–710. doi: 10.1002/ijgo.14574
12. Oltmann SC, Fischer A, Barber R, et al. Cannot exclude torsion — a 15-year review. *J Pediatr Surg*. 2009;44(6):1212–1216. doi: 10.1016/j.jpedsurg.2009.02.028
13. Webster KW, Scott SM, Huguelet PS. Clinical predictors of isolated tubal torsion: a case series. *J Pediatr Adolesc Gynecol*. 2017;30(5):578–581. doi: 10.1016/j.jpag.2017.05.006
14. Breech LL, Hillard PJA. Adnexal torsion in pediatric and adolescent girls. *Curr Opin Obstet Gynecol*. 2005;17(5):483–489. doi: 10.1097/01.gco.0000179666.39548.78
15. Poonai N, Poonai C, Lim R, Lynch T. Pediatric ovarian torsion: case series and review of the literature. *Can J Surg*. 2013;56(20);103–108. doi: 10.1503/cjs.013311
16. Ryan MF, Desai BK. Ovarian torsion in a 5-year old: a case report and review. *Case Rep Emerg Med*. 2012;2012:679121. doi: 10.1155/2012/679121
17. Darrell L. Cass, ovarian torsion. *Semin Pediatr Surg*. 2005;14(2):86–92. doi: 10.1053/j.sempedsurg.2005.01.003
18. Boley SJ, Cahn D, Lauer T, et al. The irreducible ovary: A true emergency. *J Pediatr Surg*. 1991;26(9):1035–1038. doi: 10.1016/0022-3468(91)90668-J
19. Bykovsky VA, Donskoy DV. Echography in uterine appendage torsion in children: variant of therapeutic and diagnostic tactics and clinical examples. *Echography*. 2002;3(2):123–129. (In Russ.)
20. Tielli A, Scala A, Alison M, et al. Ovarian torsion: diagnosis, surgery, and fertility preservation in the pediatric population. *Eur J Pediatr*. 2022;181(4):1405–1411. doi: 10.1007/s00431-021-04352-0
21. Scheier E. Diagnosis and management of pediatric ovarian torsion in the emergency department: Current insights. *Open Access Emerg Med*. 2022;14:283–291. doi: 10.2147/OAEM.S342725
22. Riccabona M, Lobo M-L, Ording-Muller L-S, et al. European Society of Paediatric Radiology abdominal imaging task force recommendations in paediatric uroradiology, part IX: Imaging in anorectal and cloacal malformation, imaging in childhood ovarian torsion, and efforts in standardising paediatric uroradiology terminology. *Pediatr Radiol*. 2017;47(10):1369–1380. doi: 10.1007/s00247-017-3837-6
23. Ngo A-V, Otjen JP, Parisi MT, et al. Pediatric ovarian torsion: a pictorial review. *Pediatr Radiol*. 2015;45(12):1845–1855. doi: 10.1007/s00247-015-3385-x
24. Huang C, Hong M-K, Ding D-C. A review of ovary torsion. *Tzu Chi Med J*. 2017;29(3):143–147. doi: 10.4103/tcmj.tcmj_55_17
25. Celik A, Ergün O, Aldemir H, et al. Long-term results of conservative management of adnexal torsion in children. *J Pediatr Surg*. 2005;40(4):704–708. doi: 10.1016/j.jpedsurg.2005.01.008
26. Kives S, Gascon S, Dubuc É, Eyk NV. No. 341 — Diagnosis and management of adnexal torsion in children, adolescents, and adults. *J Obstet Gynaecol Can*. 2017;39(2):82–90. doi: 10.1016/j.jogc.2016.10.001
27. Sriram R, Zameer MM, Vinay C, Giridhar BS. Black ovary: Our experience with oophoropexy in all cases of pediatric ovarian torsion and review of relevant literature. *J Indian Assoc Pediatr Surg*. 2022;27(5):558–560. doi: 10.4103/jiaps.jiaps_207_21
28. Gounder S, Strudwick M. Multimodality imaging review for suspected ovarian torsion cases in children. *Radiography*. 2021;27(1):236–242. doi: 10.1016/j.radi.2020.07.006
29. Piper HG, Oltmann SC, Xu L, et al. Ovarian torsion: diagnosis of inclusion mandates earlier intervention. *J Pediatr Surg*. 2012;47(11):2071–2076. doi: 10.1016/j.jpedsurg.2012.06.011
30. Chang-Patel EJ, Palacios-Helgeson LK, Gould CH. Adnexal torsion: a review of diagnosis and management strategies. *Curr Opin Obstet Gynecol*. 2022;34(4):196–203. doi: 10.1097/GCO.0000000000000787
31. Lourenco AP, Swenson D, Tubbs RJ, Lazarus E. Ovarian and tubal torsion: imaging findings on US, CT, and MRI. *Emerg Radiol*. 2014;21(2):179–187. doi: 10.1007/s10140-013-1163-3
32. Petlakh VI, Konovalov AK, Konstantinova IN, et al. Diagnosis and treatment of gynecological diseases in a pediatric surgeon's practice. *The Doctor*. 2012;(1):3–7. EDN: OVWAJN
33. Parelkar SV, Mundada D, Sanghvi BV, et al. Should the ovary always be conserved in torsion? A tertiary care institute experience. *J Pediatr Surg*. 2014;49(3):465–468. doi: 10.1016/j.jpedsurg.2013.11.055
34. Dasgupta R, Renaud E, Goldin AB, et al. Ovarian torsion in pediatric and adolescent patients: A systematic review. *J Pediatr Surg*. 2018;53(7):1387–1391. doi: 10.1016/j.jpedsurg.2017.10.053
35. Smorgick N, Mor M, Eisenberg N, et al. Recurrent torsion of otherwise normal adnexa: oophoropexy does not prevent recurrence. *Arch Gynecol Obstet*. 2023;307(3):821–825. doi: 10.1007/s00404-022-06831-7
36. Tsafrir Z, Hasson J, Levin I, et al. Adnexal torsion: cystectomy and ovarian fixation are equally important in preventing recurrence. *Eur J Obstet Gynecol Reprod Biol*. 2012;162(2):203–205. doi: 10.1016/j.ejogrb.2012.02.027
37. Simsek E, Kilicdag E, Kalayci H, et al. Repeated ovariopexy failure in recurrent adnexal torsion: combined approach and review of the literature. *Eur J Obstet Gynecol Reprod Biol*. 2013;170(2):305–308. doi: 10.1016/j.ejogrb.2013.06.044
38. Saberi RA, Gilna GP, Rodriguez C, et al. Ovarian preservation and recurrent torsion in children: both less common than we thought. *J Surg Res*. 2022;271:67–72. doi: 10.1016/j.jss.2021.10.004
39. Raźnikiewicz A, Korlacki W, Grabowski A. The role of laparoscopy in paediatric and adolescent gynaecology. *Videosurgery and Other Miniinvasive Techniques*. 2020;15(3):424–436. doi: 10.5114/wiitm.2020.9781

СПИСОК ЛИТЕРАТУРЫ

1. Adeyemi-Fowode O., McCracken K.A., Todd N.J. Adnexal torsion // J Pediatr Adolesc Gynecol. 2018. Vol. 31, N. 4. P. 333–338. doi: 10.1016/j.jpag.2018.03.010
2. Донской Д.В. Хирургическая тактика при ургентных заболеваниях органов малого таза у девочек: автореф. дис. ... канд. мед. наук. Москва, 2000.
3. Адамян Л.В., Поддубный И.В., Глыбина Т.М., и др. Перекрут придатков матки у детей и подростков с дисплазией соединительной ткани (клинический случай) // Проблемы репродукции. 2014. Т. 20, № 5. С. 57–59. EDN: TJAVGT
4. Коровин С.А., Дзядчик А.В., Галкина Я.А., Соколов Ю.Ю. Лапароскопические вмешательства у девочек с перекрутами придат-

ков матки // Российский вестник детской хирургии, анестезиологии и реаниматологии. 2016. Т. 6, № 2. С. 73–79. EDN: WFEYZJ doi: 10.17816/psaic252

5. Кулаков В.И., Селезнева Н.Д., Краснопольский В.И. Оперативная гинекология. Москва: Медицина, 1990. 464 с.

6. Spinelli C., Tröbs R.-B., Nissen M., et al. Ovarian torsion in the pediatric population: predictive factors for ovarian-sparing surgery — an international retrospective multicenter study and a systematic review // Arch Gynecol Obstet. 2022. Vol. 308. P. 1–12. doi: 10.1007/s00404-022-06522-3

7. Rocha R.M., Santos Barcelos I.D.E. Practical recommendations for the management of benign adnexal masses // Rev Bras Ginecol Obstet. 2020. Vol. 42, N. 9. P. 569–576. doi: 10.1055/s-0040-1714049

8. Adeyemi-Fowode O., Lin E.G., Syed F., et al. Adnexal torsion in children and adolescents: a retrospective review of 245 cases at a single institution // J Pediatr Adolesc Gynecol. 2019. Vol. 32, N. 1. P. 64–69. doi: 10.1016/j.jpag.2018.07.003

9. Baracy M.G. Jr., Hu J., Ouillette H., Aslam M.F. Diagnostic dilemma of isolated fallopian tube torsion // BMJ Case Rep. 2021. Vol. 14, N. 7. ID e242682. doi: 10.1136/bcr-2021-242682

10. Harmon J.C., Binkovitz L.A., Binkovitz L.E. Isolated fallopian tube torsion: sonographic and CT features // Pediatr Radiol. 2008. Vol. 38, N. 2. P. 175–179. doi: 10.1007/s00247-007-0683-y

11. Mentessidou A., Mirilas P. Surgical disorders in pediatric and adolescent gynecology: Adnexal abnormalities // Int J Gynaecol Obstet. 2023. Vol. 161, N. 3. P. 702–710. doi: 10.1002/ijgo.14574

12. Oltmann S.C., Fischer A., Barber R., et al. Cannot exclude torsion — a 15-year review // J Pediatr Surg. 2009. Vol. 44, N. 6. P. 1212–1216. doi: 10.1016/j.jpedsurg.2009.02.028

13. Webster K.W., Scott S.M., Huguelet P.S. Clinical predictors of isolated tubal torsion: a case series // J Pediatr Adolesc Gynecol. 2017. Vol. 30, N. 5. P. 578–581. doi: 10.1016/j.jpag.2017.05.006

14. Breech L.L., Hillard P.J.A. Adnexal torsion in pediatric and adolescent girls // Curr Opin Obstet Gynecol. 2005. Vol. 17, N. 5. P. 483–489. doi: 10.1097/01.gco.0000179666.39548.78

15. Poonai N., Poonai C., Lim R., Lynch T. Pediatric ovarian torsion: case series and review of the literature // Can J Surg. 2013. Vol. 56, N. 2. P. 103–108. doi: 10.1503/cjs.013311

16. Ryan M.F., Desai B.K. Ovarian torsion in a 5-year old: a case report and review // Case Rep Emerg Med. 2012. Vol. 2012. ID 679121. doi: 10.1155/2012/679121

17. Darrell L. Cass, ovarian torsion // Semin Pediatr Surg. 2005. Vol. 14, N. 2. P. 86–92. doi: 10.1053/j.sempedsurg.2005.01.003

18. Boley S.J., Cahn D., Lauer T., et al. The irreducible ovary: A true emergency // J Pediatr Surg. 1991. Vol. 26, N. 9. P. 1035–1038. doi: 10.1016/0022-3468(91)90668-J

19. Быковский В.А., Донской Д.В. Эхография при перекруте придатков матки у детей: вариант лечебно-диагностической тактики и клинические примеры // Эхография. 2002. Т. 3, № 2. С. 123–129.

20. Tielli A., Scala A., Alison M., et al. Ovarian torsion: diagnosis, surgery, and fertility preservation in the pediatric population // Eur J Pediatr. 2022. Vol. 181, N. 4. P. 1405–1411. doi: 10.1007/s00431-021-04352-0

21. Scheier E. Diagnosis and management of pediatric ovarian torsion in the emergency department: Current insights // Open Access Emerg Med. 2022. Vol. 14. P. 283–291. doi: 10.2147/OAEM.S342725

22. Riccabona M., Lobo M.-L., Ording-Muller L.-S., et al. European Society of Paediatric Radiology abdominal imaging task force recommendations in paediatric uroradiology, part IX: Imaging in anorectal and cloacal malformation, imaging in childhood ovarian torsion, and efforts in standardising paediatric uroradiology terminology // Pediatr Radiol. 2017. Vol. 47, N. 10. P. 1369–1380. doi: 10.1007/s00247-017-3837-6

23. Ngo A.-V., Otjen J.P., Parisi M.T., et al. Pediatric ovarian torsion: a pictorial review // Pediatr Radiol. 2015. Vol. 45, N. 12. P. 1845–1855. doi: 10.1007/s00247-015-3385-x

24. Huang C., Hong M.-K., Ding D.-C. A review of ovary torsion // Tzu Chi Med J. 2017. Vol. 29, N. 3. P. 143–147. doi: 10.4103/tcmj.tcmj_55_17

25. Celik A., Ergün O., Aldemir H., et al. Long-term results of conservative management of adnexal torsion in children // J Pediatr Surg. 2005. Vol. 40, N. 4. P. 704–708. doi: 10.1016/j.jpedsurg.2005.01.008

26. Kives S., Gascon S., Dubuc É., Eyk N.V. No. 341 — Diagnosis and management of adnexal torsion in children, adolescents, and adults // J Obstet Gynaecol Can. 2017. Vol. 39, N. 2. P. 82–90. doi: 10.1016/j.jogc.2016.10.001

27. Sriram R., Zameer M.M., Vinay C., Giridhar B.S. Black ovary: Our experience with oophoropexy in all cases of pediatric ovarian torsion and review of relevant literature // J Indian Assoc Pediatr Surg. 2022. Vol. 27, N. 5. P. 558–560. doi: 10.4103/jiaps.jiaps_207_21

28. Gounder S., Strudwick M. Multimodality imaging review for suspected ovarian torsion cases in children // Radiography. 2021. Vol. 27, N. 1. P. 236–242. doi: 10.1016/j.radi.2020.07.006

29. Piper H.G., Oltmann S.C., Xu L., et al. Ovarian torsion: diagnosis of inclusion mandates earlier intervention // J Pediatr Surg. 2012. Vol. 47, N. 11. P. 2071–2076. doi: 10.1016/j.jpedsurg.2012.06.011

30. Chang-Patel E.J., Palacios-Helgeson L.K., Gould C.H. Adnexal torsion: a review of diagnosis and management strategies // Curr Opin Obstet Gynecol. 2022. Vol. 34, N. 4. P. 196–203. doi: 10.1097/GCO.0000000000000787

31. Lourenco A.P., Swenson D., Tubbs R.J., Lazarus E. Ovarian and tubal torsion: imaging findings on US, CT, and MRI // Emerg Radiol. 2014. Vol. 21, N. 2. P. 179–187. doi: 10.1007/s10140-013-1163-3

32. Петлах В.И., Коновалов А.К., Константинова И.Н., и др. Диагностика и лечение гинекологических заболеваний в практике детского хирурга // Врач. 2012. № 1. С. 3–7. EDN: OVWAJN

33. Parelkar S.V., Mundada D., Sanghvi B.V., et al. Should the ovary always be conserved in torsion? A tertiary care institute experience // J Pediatr Surg. 2014. Vol. 49, N. 3. P. 465–468. doi: 10.1016/j.jpedsurg.2013.11.055

34. Dasgupta R., Renaud E., Goldin A.B., et al. Ovarian torsion in pediatric and adolescent patients: A systematic review // J Pediatr Surg. 2018. Vol. 53, N. 7. P. 1387–1391. doi: 10.1016/j.jpedsurg.2017.10.053

35. Smorgick N., Mor M., Eisenberg N., et al. Recurrent torsion of otherwise normal adnexa: oophoropexy does not prevent recurrence // Arch Gynecol Obstet. 2023. Vol. 307, N. 3. P. 821–825. doi: 10.1007/s00404-022-06831-7

36. Tsafrir Z., Hasson J., Levin I., et al. Adnexal torsion: cystectomy and ovarian fixation are equally important in preventing recurrence // Eur J Obstet Gynecol Reprod Biol. 2012. Vol. 162, N. 2. P. 203–205. doi: 10.1016/j.ejogrb.2012.02.027

37. Simsek E., Kilicdag E., Kalayci H., et al. Repeated ovariopexy failure in recurrent adnexal torsion: combined approach and review of the literature // Eur J Obstet Gynecol Reprod Biol. 2013. Vol. 170, N. 2. P. 305–308. doi: 10.1016/j.ejogrb.2013.06.044

38. Saberi R.A., Gilna G.P., Rodriguez C., et al. Ovarian preservation and recurrent torsion in children: both less common than we thought // J Surg Res. 2022. Vol. 271. P. 67–72. doi: 10.1016/j.jss.2021.10.004

39. Raźnikiewicz A., Korlacki W., Grabowski A. The role of laparoscopy in paediatric and adolescent gynaecology // Videosurgery and Other Miniinvasive Techniques. 2020. Vol. 15, N. 3. P. 424–436. doi: 10.5114/wiitm.2020.97817

AUTHORS INFO

***Dmitry V. Donskoy,** MD, Cand. Sci. (Medicine);
ORCID: 0000-0001-5076-2378; eLibrary SPIN: 8584-8933;
e-mail: dvdonskoy@gmail.com

Sergey A. Korovin, MD, Dr. Sci. (Medicine);
ORCID: 0000-0002-8030-9926; eLibrary SPIN: 2091-6381;
e-mail: korovinsa@mail.ru

Alexey V. Vilesov;
ORCID: 0009-0001-4545-9590; eLibrary SPIN: 2081-3871;
e-mail: vilesov.alexej@yandex.ru

Roman A. Akhmatov, MD, Cand. Sci. (Medicine);
ORCID: 0000-0002-5415-0499; eLibrary SPIN: 9024-8324;
e-mail: romaahmatov@yandex.ru

Kadidiatou D. Sangare;
ORCID: 0000-0003-2395-5777;
e-mail: tanti_sangare@yahoo.fr

Olga A. Alimova;
ORCID: 0009-0007-0679-885X;
e-mail: dr.olga_andreevna@mail.ru

* Corresponding author / Автор, ответственный за переписку

ОБ АВТОРАХ

***Дмитрий Владимирович Донской,** канд. мед. наук;
ORCID: 0000-0001-5076-2378; eLibrary SPIN: 8584-8933;
e-mail: dvdonskoy@gmail.com

Сергей Афанасьевич Коровин, д-р мед. наук;
ORCID: 0000-0002-8030-9926; eLibrary SPIN: 2091-6381;
e-mail: korovinsa@mail.ru

Алексей Владимирович Вилесов;
ORCID: 0009-0001-4545-9590; eLibrary SPIN: 2081-3871;
e-mail: vilesov.alexej@yandex.ru

Роман Анатольевич Ахматов;
ORCID: 0000-0002-5415-0499; eLibrary SPIN: 9024-8324;
e-mail: romaahmatov@yandex.ru

Кадидиату Джингеди Сангаре;
ORCID: 0000-0003-2395-5777;
e-mail: tanti_sangare@yahoo.fr

Ольга Андреевна Алимова;
ORCID: 0009-0007-0679-885X;
e-mail: dr.olga_andreevna@mail.ru