

## Our experience in diagnosis and treatment of children with adnexal torsion

Chaykivska E.<sup>1,2,3</sup>, Gyzha L.<sup>1,2</sup>, Pereyaslov A.<sup>1</sup>, Nykyforuk O.<sup>1,2</sup>

### Abstract

**Background:** The diagnosis of adnexal torsion is challenging due to the absence of specific symptoms that can determine the postponing of surgery, and as the consequence, the development of necrotic changes of adnexa. Nowadays, the surgical treatment of patients with this pathology shifting to the ovary-sparing surgery (detorsion) despite to the presence of necrotic changes during surgery. By that, the question of the choice of the method of treatment in case of adnexal torsion still under debate between pediatric surgeons and gynecologists

**Aim of the study was** to summarize the own experience in treatment of patients with adnexal torsion

**Methods:** This study was based on the results of retrospective and prospective analysis of treatment of 73 patients with adnexal torsion, who were operated at Lviv Regional Children's Clinical Hospital «OHMATDYT» during 2010-2022 years.

Diagnosis was established on results of clinical investigation and ultrasonography (US). It was performed 74 surgical procedures (one patient was operated twice), among them 57 (77%) by laparoscopic and 17 (23%) by open approach (laparotomy). It was 49 (66,2%) ovary-sparing surgeries (detorsion with or without cystectomy) and 25 (33,8%) – adnexectomy.

Results of the study were evaluated by the statistical program StatPlus: mac, AnalystSoft Inc. (version v8).

**Results:** The average age of patients was  $11,5 \pm 0,5$  years. Abdominal pain (in 100%) and vomiting (in 49,3%) were the main clinical appearances. Unilateral ovarian enlargement and peripherally displaced follicles were the most frequent US findings. The absence of the blood supply was revealed in 39,5% and the whirlpool sign in 11,6% of patients. Among all patients, simple torsion confirmed in 24,3%, while the torsion caused by cyst or dermoid tumor, revealed in 75,7% of patients. Detorsion was performed only in 24,3% of patients and in 42,5% of patients it was supplemented by cystectomy. Adnexectomy was performed in 32,2% of patients.

**Conclusions.** The diagnosis of adnexal torsion should be considered in all females with acute abdominal pain syndrome. Ultrasonography with or without Doppler is the first-line imaging modality. Detorsion was performed regardless of the degree of torsion, and indications for adnexectomy were the presence of a dermoid cyst and clear signs of ovarian necrosis. Laparoscopic detorsion, simple or with cystectomy, is the method of choice for treatment of patients with adnexal torsion. (TCM-GMJ June 2024; 9 (1):P23-P27)

**Keywords:** children, adnexal torsion, ultrasonography, surgery, laparoscopy

### Introduction

**A**dnexal torsion occurs in women of reproductive age, however, it can be observed at any age, since birth to 18 years [1, 6, 12]. This pathology accounts for about 4% among girls with acute abdominal pain [6, 11]. Timely establishment of adnexal torsion is often difficult due to the absence of pathognomonic symptoms, which, in turn, causes

postponement of surgery [6, 11, 29]. Delayed surgery leads to increase the risk of development of necrotic changes of adnexa, as well as the occurrence of other complications, including peritonitis, bleeding, sepsis [15, 26], and subsequently to decrease fertility [28]. Until recently, the standard surgical treatment for children and adults with adnexal torsion was ovariectomy due to concerns that the ovarian tissue is not viable, and detorsion without ovariectomy may cause thromboembolism and the development of a malignant process in the remaining ovary [15, 21, 26]. Nowadays, the surgical treatment of girls with this pathology involves detorsion, despite to the presence of necrotic changes during surgery [2, 4, 14]. It should be noted that the method of choice (ovariectomy or detorsion) in patients

From the <sup>1</sup>Danylo Halytsky Lviv National Medical University, Ukraine,

<sup>2</sup> Lviv Regional Children's Clinical Hospital «OHMATDYT», Ukraine

<sup>3</sup> Multidisciplinary Clinical Hospital of Emergency and Intensive Care «Hospital Saint Anna», Ukraine

Received January 23, 2024; accepted March 27, 2024.

Address requests to: Chaykivska Elina

E-mail: elinachaykivska@gmail.com

Copyright © 2024 Translational and Clinical Medicine-Georgian Medical Journal

with adnexal torsion remains a subject of debate between pediatric surgeons and gynecologists.

**Aim of the study was** to summarize our own experience of treatment for patients with adnexal torsion

## Methods

This study based on the results of retrospective and prospective analysis of treatment for 73 patients with adnexal torsion, who were operated at Lviv Regional Children's Clinical Hospital «OHMATDYT» during 2010-2022 years.

Diagnosis was established on results of clinical investigation and ultrasonography (US). US was done in 43 (58,9%) patients (on Voluson 730 Pro (General Electric, Austria), since 2018 - on LOGIQ P7 (General Electric, USA with 7-12 MGc linear probes).

It was performed 74 surgical procedures (one patient was operated twice), among them 57 (77%) by laparoscopic and 17 (23%) by open approach (laparotomy). It was 49 (66,2%) ovary-sparing surgeries (detorsion with or without cystectomy) and 25 (33,8%) – adnexectomy.

Results of the study were evaluated by the statistical program StatPlus: mac, AnalystSoft Inc. (version v8).

## Results and discussion

Adnexal torsion, causes stasis in the lymphatic and venous vessels with the subsequent development of ischemia, necrosis and, as a result, the loss of ovarian function. And, although literary sources provide information about isolated torsion of the ovary or fallopian tube [1, 4, 10], there were no cases of such torsion in our study.

The average age of the patients was was  $11.5 \pm 0.5$  years (from one to 18 years). It should be noted that 26 (35,6%) were premenarchal patients, and 47 (64,4%) -

postmenarchal. Such results coincide with the data of most literary sources [1, 3, 4, 22], although other sources indicate the average age of patients within 15 years [25], and according to some data, the average age was within 9 years [11].

The average duration of the disease (from the moment of pain syndrome to hospitalization) was  $48,6 \pm 5,8$  hours (range from 2 to 164 hours). In two patients, in whom self-amputation of the appendages was detected during the surgery, it was not possible to clearly establish the duration of the disease. Later hospitalization was more often noted in patients who had not yet menstrual period, compared to those who already had it -  $50,6 \pm 9,3$  hours and  $48,3 \pm 7,7$  hours, but this difference was not statistically significant ( $p=0.854$ ), the same was noted by other researchers [20, 25]. The duration of the disease showed an inverse correlation with the possibility of organ-preserving surgery (Pearson's  $R = -0.5901$ ,  $p=4.89746E-8$ ; Spearman's  $t = -6.0895$ ,  $p=5.44109E-8$ ).

The presence of pain in the lower part of the abdomen was noted in all patients, 42 (57,3%) of them indicated the right- or left-sided localization of the pain, and 12 (16,4%) girls noted the pain radiating to the thigh. According to the literature, the frequency of pain syndrome in patients with adnexal torsion varies from 65% to 100% [11, 22, 28, 30]. At the same time, according to E.Scheier (2022), only 41% of patients had abdominal pain [25].

Vomiting was noted in 36 (49,3%) patients, in most of them it was twice or three times. The results of physical examination are shown in more detail in Table 1.

None of the patients, primarily premenarchal girls, did not need a gynecological examination, which coincides with the recommendations of other researchers [6, 16], while according to E. Ashwal and co-authors (2015) gynecological examination is necessary for postmenarchal girls [3].

Table 1. Results of objective examination in patients with adnexal torsion (n=73)

Sign	Amount (%)
Pain	73 (100)
Vomitting	36 (49,3)
Nausea	19 (26)
Body temperature	36 (49,3)
Subfebrile	34 (46,6)
General weakness	26 (35,6)
Pallor of the skin	12 (16,4)
The presence of a mass in the lower part of abdomen	7 (9,6)

Laboratory examination included general analysis of blood and urine, but no special changes were noted, which is consistent with the results of other studies [6, 13, 24, 25].

The diagnosis of adnexal torsion is established on the basis of clinical data, which are supplemented by ultrasound results. Today, USG is considered the main imaging method for diagnosing adnexal torsion with a high level of specificity and sensitivity [1, 25, 27].

USG signs that indicated the presence of torsion were unilateral ovarian enlargement, peripheral displacement of the follicles, which was caused by edema, medial ovarian displacement with its increased echogenicity (Fig. 1), and presence of fluid in the pelvis, which combined with adnexal changes

Unilateral ovarian enlargement is the most common sign of adnexal torsion, which was detected in all our patients, however, for children there are no specifically defined criteria of normal ovarian sizes [15]. Although, in the studies of S.C. Oltmann and co-authors (2009) it was shown that the presence of a pelvic mass larger than 5 cm in a child older than one year indicates the presence of torsion [18].

According to the literature, USG symptoms of torsion can also be an increase in the echogenicity of a twisted ovary compared to an intact ovary, the presence of a "double bladder" symptom, characterized by the presence of a large ovarian cyst that can simulate a bladder [15, 25, 28].

In addition, the signs of torsion were blood supply disorders or the presence of a "whirlpool" sign, which were detected by dopplerography (Fig. 2).

It should be noted that the presence of the "whirlpool" sign indicates the presence of torsion of the vascular pedicle, which reliably indicates the presence of adnexal torsion, however, it is quite difficult to detect this sign, as other researchers also point out [1]. Absence of blood supply in the enlarged ovary was found in 17 (39,5%) patients, and the "whirlpool" sign - in only 5 (11,6%) girls, which coincides with the data of other researchers [15, 20].

Unfortunately, the absence or presence of blood supply in an enlarged ovary cannot absolutely confirm/disprove the presence of torsion, but the detection of blood supply on Dopplerography can be used to determine the viability of the ovary after detorsion. In our study, according to dopplerography, detorsion was effective in 26 (60,5%) girls with preserved blood supply of adnexa, and only in 4 (23,5%) patients with its absence. The results of the objective examination and the results of the ultrasound made it possible to suspect the presence of adnexal torsion, which was an indication for surgical intervention.

Seventy four patients with adnexal torsion were treated by surgery, while one child was operated twice for repeated torsion of a single ovary. All surgeries were performed with the participation of a pediatric gynecologist. During surgeries, 42 (56,8%) right-sided and 32 (43,2%) left-sided appendages were found, which is

consistent with literature data [16, 22]. There were no cases of bilateral torsion in our study. In 13 (17,8%) patients, due to the absence of a clear diagnosis, diagnostic laparoscopy was performed, during which adnexal torsion was confirmed and detorsion was performed.

The presence of adnexal torsion is an indication for urgent surgery, the purpose of which is to preserve the adnexa even in those cases when visually they appear necrotized (Fig. 3). Unfortunately, there are no objective methods for assessing the viability of the ovary, and histological examination often reveals viable ovarian tissue that surgeons removed as necrotically changed [1, 9]. The method of surgical procedure - laparotomy or laparoscopy - remains debatable [2, 7]. In our study, 57 (77%) laparoscopies and 17 (23%) - laparotomies were performed.

During surgery, 720° and 360° twisting were most often detected - in 34 (47,2%) and 21 (29,2%) patients, respectively. It was revealed a clear inverse correlation between the degree of rotation and the possibility of organ-preserving surgery (Pearson's  $R = -0.24065$ ,  $p=0.0417$ ; Spearman's  $t = -2.26385$ ,  $p=0.02668$ ).

Among the patients, simple torsion (without cystic or dermoid lesions of the ovary) was confirmed in 18 (24,3%), while torsion due to the presence of a cyst or dermoid tumor was found in 56 (75,7%) patients, which corresponds to the literature [8]. It should be noted that cystic lesions, in particular follicular and paraovarian cysts, were more common in postmenarchal patients - 41 (73,2%) children, while dermoid tumors (16 cases) were found in 11 (68,8%) premenarchal patients, although according to E.Ashwal and co-authors (2015) it was not detected in premenarchal children, instead, dermoid tumor was a factor of torsion in 17% of postmenarchal patients [3].

At the current stage, detorsion is considered the main method of surgical procedure in girls with adnexal torsion [2, 4, 28], however, the frequency of ovariectomy remains quite high (50%-78%) [15, 19, 26, 30]. In our study, detorsion accounted for 66,2% (in 48 patients) of all surgeries for adnexal torsion. At the same time, simple detorsion was performed in 18 (24,3%) patients, and in 31 (42,5%) children, it was supplemented by removal of ovarian cyst membranes, removal of a paraovarian cyst, or resection of the ovary, which corresponds to the data of other researchers [2, 16, 28].

It should be noted that the detection of dark blue color of adnexa during surgery does not correlate with the presence of necrosis, since the ovary has a double blood supply - from the utero-ovarian vessels and vessels of the small pelvis, which provide sufficient blood supply to prevent complete ischemia of the ovarian tissue, which other researchers also emphasize [1, 2].

The purpose of detorsion is to preserve adnexa, primarily the ovary, and, subsequently, fertility [12, 13, 15]. Most literature sources testify that ovarian function is preserved in 80-100% of patients after detorsion [5, 17,



23, 31], and only P. Galinier et al. (2009) reported the presence of functional ovarian activity in 21% of patients [9].

Adnexectomy was performed in 25 (32,2%) patients, in particular, in 10 children with dermoid tumors, in 9 - with adnexal necrosis, in 4 - with cystic transformation of the ovary, and in two - with adnexal auto-amputation. The decision to do adnexectomy on the basis of necrotic changes was made in cases when after detorsion the ovary and fallopian tube were still dark blue, in 4 patients after repeated laparoscopy, which was performed after 18-24 hours, the results of preoperative dopplerography (absence of blood supply in the ovary), as well as the duration of the disease (more than 72 hours). Similar criteria for adnexectomy are

used by other researchers [4, 12, 19]. In our practice, we do not use only ovariectomy and live fallopian tube because, in our opinion, this does not improve future fertility.

**Conclusion**

The diagnosis of adnexal torsion should be considered in all females with acute abdominal pain syndrome. Ultrasonography with or without Doppler is the first-line imaging modality. Detorsion was performed regardless of the degree of torsion, and indications for adnexectomy were the presence of a dermoid cyst and clear signs of ovarian necrosis. Laparoscopic detorsion, simple or with cystectomy, is the method of choice for treatment of patients with adnexal torsion

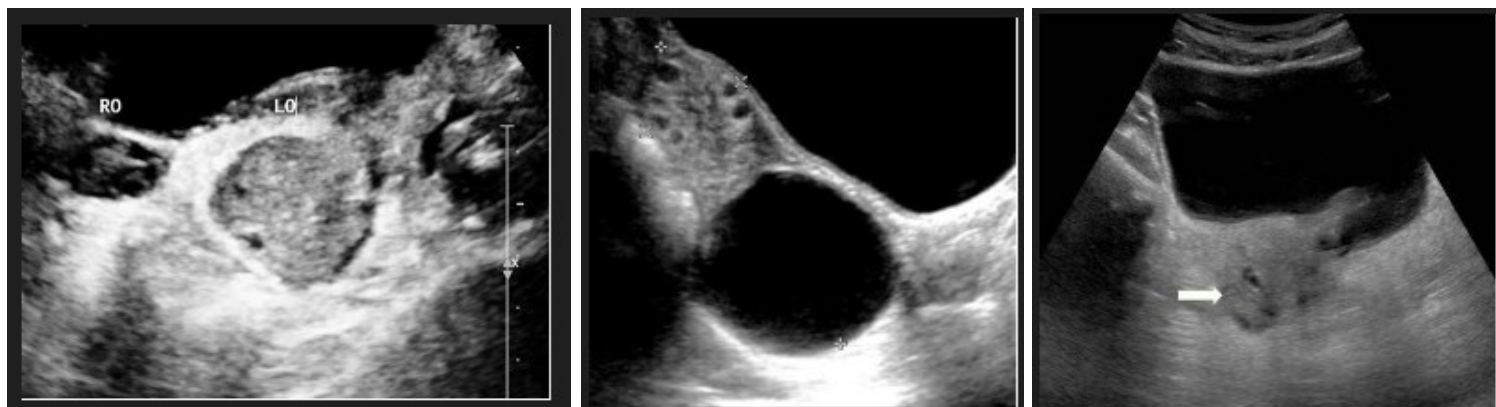


Figure 1. USG signs of adnexal torsion. (A) unilateral ovarian enlargement (RO – right ovary, LO – left ovary); (B) Enlarged left ovary with peripheral displacement of the follicles and paraovarial cyst; (C) A hyperechoic twisted right ovary (arrow) is identified close to the midline under a full bladder

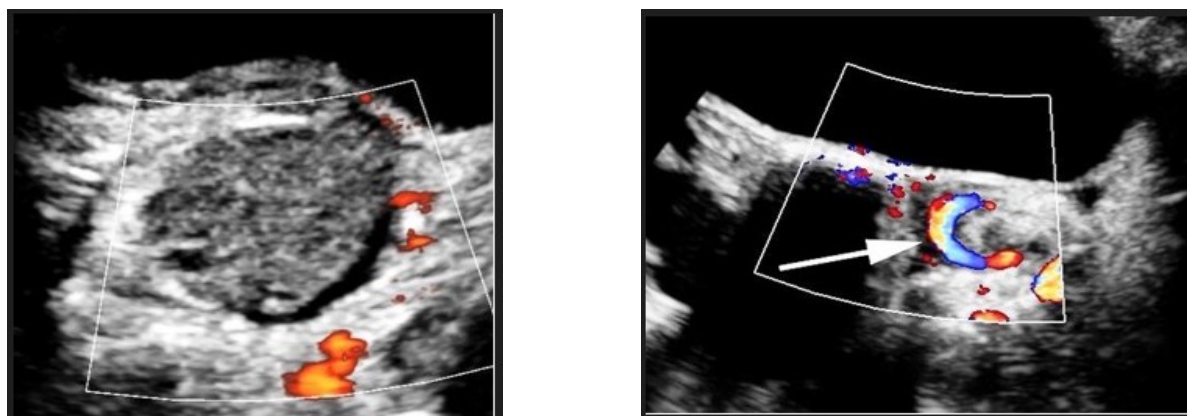


Figure 2. Dopplerography in case of adnexal torsion. (A) Absence of blood supply in the ovary; (B) "whirlpool" sign (arrow)

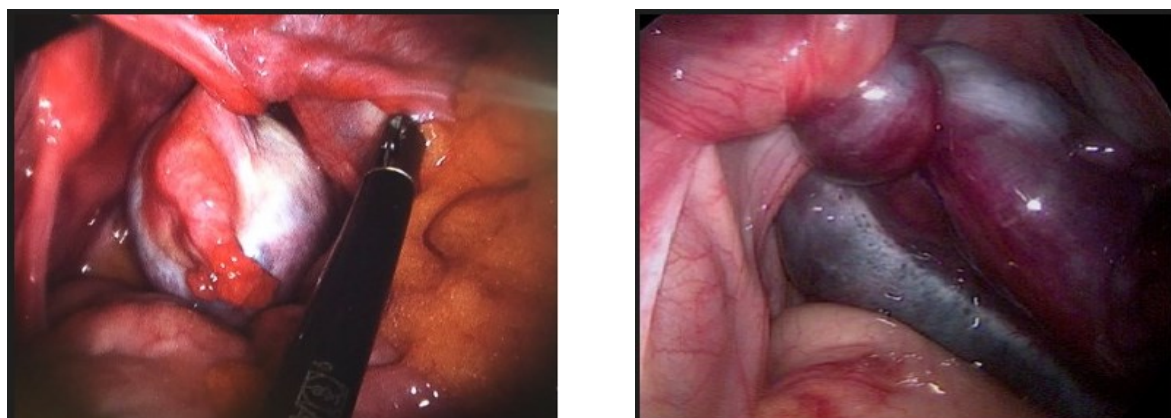


Figure 3. Laparoscopic picture of adnexal torsion. (A) Adnexal torsion without signs of necrosis; (B) Torsion with signs of ischemia and necrosis

## References

- Adeyemi-Fowode O, McCracken KA, Todd NJ. (2018) Adnexal torsion. *J Pediatr Adolesc Gynecol.* 31(4): 333-338. doi: 10.1016/j.jpag.2018.03.010.
- Alberto EC, Tashiro J, Zheng Y, et al. (2021) Variations in the management of adolescent adnexal torsion at a single institution and the creation of a unified care pathway. *Pediatr Surg Int.* 37(1): 129-135. doi: 10.1007/s00383-020-04782-1.
- Ashwal E, Hiersch L, Krissi H, et al. (2015) Characteristics and management of ovarian torsion in premenarchal compared with postmenarchal patients. *Obstet Gynecol.* 126(3): 514-520. doi: 10.1097/AOG.0000000000000995.
- Campbell BT, Austin DM, Kahn O, et al. (2015) Current trends in the surgical treatment of pediatric ovarian torsion: we can do better. *J Pediatr Surg.* 50(8): 1374-1377. doi: 10.1016/j.jpedsurg.2015.04.018.
- Celik A, Ergun O, Aldemir H, et al. (2005) Long-term results of conservative management of adnexal torsion in children. *J Pediatr Surg.* 40(4): 704-708. doi: 10.1016/j.jpedsurg.2005.01.008.
- Childress KJ, Dietrich JE. (2017) Pediatric ovarian torsion. *Surg Clin N Am.* 97(1): 209-221. doi: 10.1016/j.suc.2016.08.008.
- Cohen SB, Wattiez A, Seidman DS, et al. (2003) Laparoscopy versus laparotomy for detorsion and sparing of twisted ischemic adnexa. *JSL.* 7(4): 295-299.
- Fiegel HC, Gfroerer S, Theilen TM, et al. (2021) Ovarian lesions and tumors in infants and older children. *Innov Surg Sci.* 6(4): 173-179. doi: 10.1515/iss-2021-0006.
- Galnier P, Carfagna L, Delsol M, et al. (2009) Ovarian torsion. Management and ovarian prognosis: a report of 45 cases. *J Pediatr Surg.* 44(9): 1759-1765. doi: 10.1016/j.jpedsurg.2008.11.058.
- Guthrie BD, Adler MD, Powell EC. (2010) Incidence and trends of pediatric ovarian torsion hospitalizations in the United States, 2000–2006. *Pediatrics* 125(3): 532–538. doi: 10.1542/peds.2009-1360.
- Hartman SJ, Prieto JM, Naheedy JH, et al. (2021) Ovarian volume ratio is a reliable predictor of ovarian torsion in girls without an adnexal mass. *J Pediatr Surg.* 56(1): 180-182. doi: 10.1016/j.jpedsurg.2020.09.031.
- Karavadara D, Davidson JR, Story L, et al. (2021) Missed opportunities for ovarian salvage in children: an 8-year review of surgically managed ovarian lesions at a tertiary pediatric surgery centre. *Pediatr Surg Int.* 37(9): 1281-1286. doi: 10.1007/s00383-021-04935-w.
- Kives S, Gascon S, Dubuc É, Van Eyk N. (2017) No. 341-Diagnosis and management of adnexal torsion in children, adolescents, and adults. *J Obstet Gynaecol Can.* 39(2): 82-90. doi: 10.1016/j.jogc.2016.10.001.
- Lipsett SC, Haines L, Monuteaux MC, et al. (2021) Variation in oophorectomy rates for children with ovarian torsion across US children's hospitals. *J Pediatr.* 231: 269-272.e1. doi: 10.1016/j.jpeds.2020.12.019.
- Ngo AV, Otjen JP, Parisi MT, et al. (2015) Pediatric ovarian torsion: A pictorial review. *Pediatr Radiol.* 45(12): 1845-1855. doi: 10.1007/s00247-015-3385-x.
- Nguyen KP, Valentino WL, Bui D, Milestone H. (2022) Ovarian torsion: Presentation and management in a pediatric patient. *Case Rep Obstet Gynecol.* 2022: Article ID 9419963. doi: 10.1155/2022/9419963.
- Oelsner G, Cohen SB, Soriano D, et al. (2003) Minimal surgery for the twisted ischaemic adnexa can preserve ovarian function. *Hum Reprod.* 18(12): 2599-2602. doi: 10.1093/humrep/deg498.
- Oltmann SC, Fischer A, Barber R, et al (2009) Cannot exclude torsion – a 15-year review. *J Pediatr Surg.* 44(6): 1212-1216. doi: 10.1016/j.jpedsurg.2009.02.028.
- Pathak IS, Jurak J, Mulla ZD, Kupesic Plavsic S. (2018) Predictors of oophorectomy in girls hospitalized in Texas with ovarian torsion. *Hosp Pediatr.* 8(5): 274-279. doi: 10.1542/hpeds.2017-0095.
- Prieto JM, Kling KM, Ignacio RC, et al. (2019) Premenarchal patients present differently: a twist on the typical patient presenting with ovarian torsion. *J Pediatr Surg.* 54(12): 2614-2616. doi: 10.1016/j.jpedsurg.2019.08.020.
- Quint EH, Smith YR. (1999) Ovarian surgery in premenarchal girls. *J Pediatr Adolesc Gynecol.* 12(1): 27-29. doi: 10.1016/S1083-3188(00)86617-6.
- Rey-Bellet Gasser C, Gehri M, Joseph JM, Pauchard JY. (2016) Is it ovarian torsion? A systematic literature review and evaluation of prediction signs. *Pediatr Emerg Care.* 2(4): 256-261. doi: 10.1097/PEC.0000000000000621.
- Rousseau V, Massicot R, Darwish AA, et al. (2008) Emergency management and conservative surgery of ovarian torsion in children: a report of 40 cases. *J Pediatr Adolesc Gynecol.* 21(4): 201-206. doi: 10.1016/j.jpag.2007.11.003.
- Sasaki KJ, Miller CE. (2014) Adnexal torsion: review of the literature. *J Minim Invasive Gynecol.* 21(2): 196-202. doi: 10.1016/j.jmig.2013.09.010.
- Scheier E. (2022) Diagnosis and management of pediatric ovarian torsion in the emergency department: Current insights. *Open Access Emerg Med.* 14: 283-291. doi: 10.2147/OAEMS.S342725.
- Sola R, Wormer BA, Walters AL, et al. (2015) National trends in the surgical treatment of ovarian torsion in children: An analysis of 2041 pediatric patients utilizing the nationwide inpatient sample. *Am Surg.* 81(9): 844-848.
- Ssi-Yan-Kai G, Rivain AL, Trichot C, et al. (2018) What every radiologist should know about adnexal torsion. *Emerg Radiol.* 25(1): 51-59. doi: 10.1007/s10140-017-1549-8.
- Tielli A, Scala A, Alison M, et al. (2022) Ovarian torsion: diagnosis, surgery, and fertility preservation in the pediatric population. *Eur J Pediatr.* 181(4): 1405-1411. doi: 10.1007/s00431-021-04352-0.
- Tsai J, Lai JY, Lin YH, et al. (2022) Characteristics and risk factors for ischemic ovary torsion in children. *Children (Basel).* 9(2): 206. doi: 10.3390/children9020206.
- Tzur T, Smorgick N, Sharon N, et al. (2021) Adnexal torsion with paraovarian cysts in pediatric and adolescent populations: A retrospective study. *J Pediatr Surg.* 56(2): 324-327. doi: 10.1016/j.jpedsurg.2020.05.023.
- Wang JH, Wu DH, Jin H, Wu YZ. (2010) Predominant etiology of adnexal torsion and ovarian outcome after detorsion in premenarchal girls. *Eur J Pediatr Surg.* 20(5): 298-301. doi: 10.1055/s-0030-1254110.