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CASE REPORTS

Should oophoropexy be a standard procedure after ovarian torsion in premenarchal patients? A case-based review of fixation indications and techniques

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ABSTRACT

Introduction and aim. Ovarian torsion is a rare but significant cause of acute abdomen in children. Diagnosis is challenging due to nonspecific symptoms. While Doppler ultrasound is essential, it is not definitive. Laparoscopy with detorsion remains the diagnostic and therapeutic standard. For recurrent and high-risk cases, oophoropexy is considered, but there is no consensus on its indications or optimal technique. We analyze the diagnostic process, reasons for recurrence, and outcomes of different oophoropexy techniques.

Description of the case. A premenarchal girl experienced three episodes of ipsilateral ovarian torsion. After the second recurrence, she underwent laparoscopic oophoropexy via fixation posterior to the uterus to the ovarian fossa with absorbable sutures, which failed. Following a third torsion, a laparotomy with a subsequent oophoropexy to the round ligament using non-absorbable sutures achieved a long-term recurrence-free period.

Conclusion. Retorsion remains a significant risk. This case provides a unique intrapatient comparison, demonstrating that the technical approach influences the outcomes. Fixation to the abdominal wall with non-absorbable sutures proved to be superior in this scenario, preventing further recurrence. The patient's age and torsion etiology are critical in selecting a fixation method. This report highlights the potential for oophoropexy failure and offers vital technical insights, underscoring the need for further studies to standardize practices for fertility preservation.

Keywords. abdomen, acute, child, fertility, oophoropexy, ovarian torsion

Introduction

Ovarian torsion (OT) is a rare emergency in the pediatric population, typically managed by pediatric surgeons and gyneacologists.[1–4] It occurs more frequently in adolescents, but approximately 15% of cases are seen in prepubertal patients.[1] Between 41 and 50% of the cases involve an ovarian neoplasm or cyst; however, torsion of normal premenarchal ovaries has also been documented.[2,5] Diagnosing OT can be challenging due to nonspecific symptoms – such as abdominal pain (lasting hours

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to days), nausea, vomiting, and fever – symptoms that overlap with many causes of acute abdomen, with appendicitis being the most common surgical emergency in patients older than one year. This overlap complicates the diagnostic process for OT.[1,2,6,7]

Diagnostic evaluation should encompass a comprehensive history, physical examination, laboratory tests and imaging studies, with ultrasound being the preferred initial choice for gynecological problems. A CT scan or MRI might be more appropriate for identifying gastrointestinal causes but should not delay any urgent surgical intervention.[8] If a surgeon is in charge of the case, a consultation and pelvic examination by a gynecologist might be beneficial. A vaginal or, in patients not sexually active, transrectal bimanual examination can be performed; however, its sensitivity to detect adnexal torsion is low.[9]

Transabdominal ultrasound is the primary imaging tool, effective in excluding other conditions such as appendicitis. Although transvaginal ultrasound offers better visualization, it is rarely appropriate in children; a transrectal approach may be considered in cooperative patients. One of the most comprehensive studies shows that the most common ultrasound characteristics are enlarged adnexa, whirlpool sign, ovarian stromal oedema with or without peripherally displaced antral follicles, and free fluid in the pelvis. In contrast, the follicular ring sign and the absence of Doppler signals in the twisted organ are slightly less common features.[10] Examiners should also note that the normal ovarian volume varies with age.[11,12] A definitive diagnosis can only be made after laparoscopy, during which the ovary is detorsed.

Oophoropexy (OPY) refers to a procedure for fixation of the adnexa, used in ovarian transposition in women before pelvic radiotherapy. It also serves as a preventive measure against recurrence of OT and the occurrence of OT in the remaining ovary following oophorectomy. In these cases, OPY is vital for preserving fertility. While there are several methods of ovarian fixation, specific guidelines regarding the choice of technique and the number of OT procedures warranting intervention in a patient are lacking.

Aim

In this case report, we discuss a premenarchal woman with OT and its recurrence, focusing on the associated risk factors and management strategies. Additionally, we aim to highlight indications for OPY, along with its methods, and technical aspects.

Description of the case

A four-year-old premenarchal girl was admitted to the department of pediatric surgery with a two-day history of abdominal pain and one episode of vomiting. She had previously been healthy, with no chronic illness or prior surgeries. On examination, her abdomen was soft, without pathological masses or signs of peritoneal irritation, although slight tenderness of the lower abdomen was observed. An ultrasound scan of the right lower abdomen revealed an ovary measuring approximately 4.3×3.1 cm, along with another measuring 2.0×1.0 cm nearby. Free fluid was observed in the Pouch of Douglas. Exploratory laparoscopy revealed a

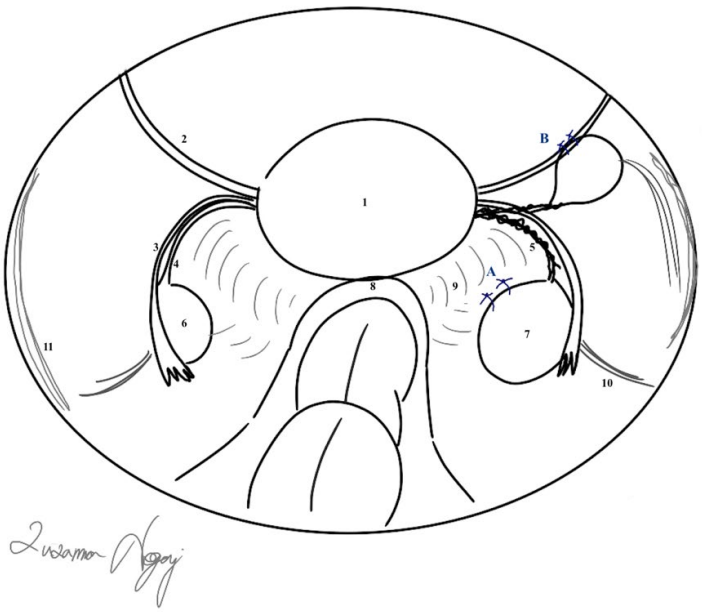

Fig. 1. Schematic laparoscopy view of the pelvis: 1. uterus, 2. round ligament, 3. fallopian tube, 4. utero-ovarian/ovarian ligament (normal), 5. utero-ovarian/ovarian ligament (long), 6. ovary (normal), 7. ovary (enlarged), 8. uterosacral ligament, 9. ovarian fossa and broad ligament, 10. suspensory ligament of the ovary, 11. psoas tendon, A – first fixation of the left ovary to the ovarian fossa, B – second fixation to the round ligament

double twisted black left ovary (LO) in the right iliac fossa. Adnexal detorsion was performed, restoring circulation and the LO was repositioned in the left iliac fossa. The patient was discharged home seven days later in good condition.

Six months later, the patient was readmitted with similar symptoms. An ultrasound confirmed an increase in the size of the LO. A color Doppler revealed peripherally diminished blood flow. An emergency laparoscopy was performed, which revealed a black triple-torsed LO this time. Detorsion of the adnexa was performed that resulted in the return of normal tissue color. The follow-up ultrasound showed a reduction in the size of the LO and Doppler flow indicated normal blood flow.

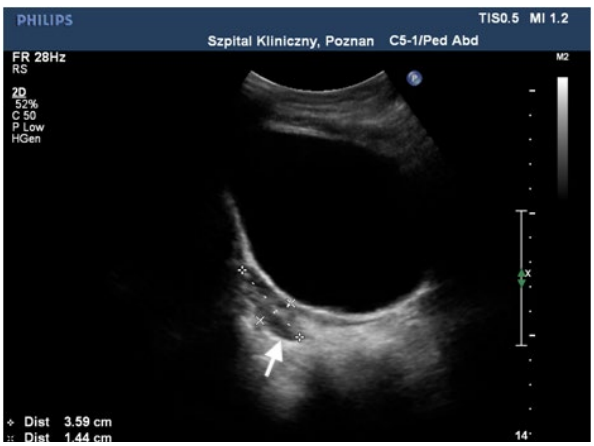

Fig. 2. An ultrasound scan of the twisted, 3.6x1.4 cm left ovary (white arrow) in a premenarchal girl. Visible hypoechogenic mass attached to the upper left side of the left ovary seven months after an oophoropexy

Fig. 3. Laparoscopic view of the recurrent, triple-twisted left ovary in a premenarchal girl before detorsion

Due to the OT recurrence, the patient was scheduled for a laparoscopic OPY. The right and left ovarian ligament (OL) were asymmetric, with the left approximately three times longer than the right. The LO was fixed posterior to the uterus in the ovarian fossa using two single 4-0 absorbable sutures (Fig. 1). Seventeen months post-OPY, the patient returned with similar symptoms and findings as in the previous hospitalizations. An ultrasound revealed a mass attached to the LO (Fig. 2). An exploratory laparoscopy identified a triple twisted black LO (Fig. 3).

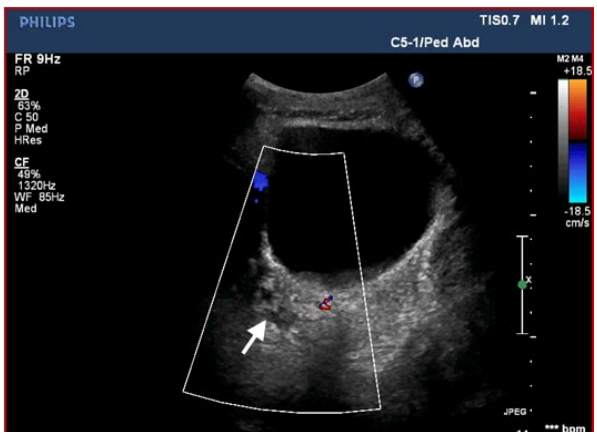

Fig. 4. Postoperative Doppler ultrasound scan of the left ovary (white arrow) in a premenarchal patient with a left ovary with visible blood flow after a third torsion and a second oophoropexy

Detorsion was performed and a gradual, partial restoration of circulation was observed. Given the patient's history, a laparotomy was performed and LO was fixed to the round ligament using two non-absorbable sutures (Fig. 1). Ovarian tissue samples were taken and revealed both necrotic and healthy ovarian tissue. Tumor markers, including β-hCG and AFP, were within the normal ranges. Postoperative ultrasound indicated an enlarged LO with increased blood flow (Fig. 4). During a 5-year follow-up period, the patient did not experience any further recurrences of OT.

Discussion

The unique aspect of our report is the direct intrapatient comparison of two OPY techniques. The failure of the initial fixation with absorbable sutures versus the long-term success of the second procedure with nonabsorbable sutures provides a powerful clinical lesson that is rarely documented in the literature. We believe that fixation of the ovary to the round ligament, specifically with nonabsorbable sutures, was a favorable choice for preventing further recurrences. Had the discrepancy in the lengths of the ovarian ligaments been recognized earlier, this fixation could have been performed sooner, potentially avoiding multiple operating procedures.

In this case, the patient presented common clinical and ultrasound symptoms of OT, without any ovarian mass. While abdominal pain is present in almost all patients, including the present one, it is not possible to

differentiate OT from other pathologies based on symptoms.[13] If OT is suspected, an ultrasound with Doppler flow should be performed.[1,2,14] The presence of an ovarian mass, enlargement of the ovary, or absence of vascular flow is highly suggestive of OT; however, some sources report that Doppler flow in the ovary is present in 40% to 73% of OT cases.[2,5,6,14] Therefore, a lack of Doppler flow in an ovary suggests OT, but its presence does not rule out.[13] Those findings may vary among patients due to causative pathology and the duration of OT.[15] Additionally, a small ovarian mass or ovaries without specific findings may be more closely associated with the risk of retorsion.[16] In our patient, a ovary appeared noticeably larger, likely due to swelling, and the length of the OL allowed it to be positioned near the right ovary. Free fluid in the pouch of Douglas was also visualized.

The literature reports that laparoscopic surgery is the best diagnostic and therapeutic procedure for pediatric patients.[5,6,14,17] Conservative management, such as detorsion and preservation of the adnexa, is considered a safe and effective treatment.[17] Even if the ovary appears necrotic, it generally shows improvement in blood flow and follicular development after 4-6 weeks.[14,17]

Recurrence of OT occurs in 12–19% of the pediatric cases, mainly on the same side, approximately seven times more often in patients with normal ovaries compared to those with ovarian masses, and is not related to the presence of menarche at the first episode of torsion.[3,5] In premenarchal and adolescent girls, smaller adnexa and loose structure can predispose to recurrence of OT.[19] In a prospective cohort study, Tamir Yaniv et al. report that the length of OL length can be a statistically significant factor for OT; however, the answer to whether OPY should be performed in cases of first-episode OT with a long OL is not clear.[18]

In the case presented, after detorsion and confirmation of ovarian viability, the patient was scheduled for elective laparoscopic OPY. This planned approach allows for a deliberate evaluation of pelvic anatomy – including the identification of the elongated ovarian ligament and a controlled fixation procedure, rather than performing it urgently during the initial emergent torsion surgery.

Most of the literature on indications for OPY is based on case reports, case series, and small one-center experiences. The overall recurrence of OT after simple laparoscopic detorsion is said to be significant and can vary from 36 up to 64%, especially in the prepuberal population.[3,20] Research indicates that performing OPY reduces this risk, but does not completely exclude it.[3,14]

There are multiple fixation techniques, but comparative evidence is limited (Table 1). Mandarano et al., compared four methods, including fixation of the ovary to the round ligament, ovarian fossa, utero-ovarian ligament, and uterine body, all with non-absorbable sutures.[20] As a result, none of the methods appeared superior, except for the OPY to the round ligament, which, contrary to our case, showed a high rate of recurrence. The authors of the study suspected that this fixation site alters the normal anatomical position of the ovary to the greatest extent. However, it is important to note that fixation to the round ligament in this study involved only five patients and no other publication has confirmed the inadequacy of this fixation site. In terms of alternative methods, a study by Yagur et al. compared ovarian ligament and ovarian round ligament plication in women of reproductive age after adnexal torsion with normal-sized ovaries. Although no statistical significance was found, the ovarian-round ligament plication group experienced recurrence of OT, while the ovarian ligament plication did not.[19]

Table 1. Oophoropexy techniques and alternative ovarian fixation methods performed after episodes of ovarian torsion in female patients of different age groups, OL, ovarian ligament, OT – ovarian torsion

	Method	Note
Oophoropexy	fixation to a uterosacral ligament [21]	relatively easy, and prevents damage to the ureter and blood vessels
	fixation to a utero-ovarian ligament, or to the psoas tendon [22]	proximity of both structures to the anatomical location of the ovary
	fixation to the peritoneum on the posterior abdominal wall (ovarian fossa) [20,23]	helps preserve the tubo-ovarian anatomic relationship
	fixation to an abdominal wall using a trocar site closure needle [24]	suggested as an easier technique, especially for pregnant women with an enlarged uterus
	fixation to the posterior uterine serosa [20,25]	technique reported as effective with the use of either absorbable or non-absorbable sutures
	fixation to the broad ligament [26]	older method, reported in neonatal patients
	fixation to the round ligament [20]	suggested high recurrence rate in one study, however effective in the presented case
Alternative fixation method	plication of the ovarian ligament [27,28]	an effective method for longer or looser OL; it can be performed during early pregnancy
Combined methods	fixation of the ovary to the pelvic side wall with the uteroovarian ligament plication [29]	for recurring OT cases, mainly when laxity of ligaments and enlarged ovaries (due to, e.g., polycystic ovaries) are observed

To secure the ovary, we typically employ two sutures, size 3-0 or 4-0, which penetrate the ovarian cortex, as was demonstrated in our case.[20,30] There is, however, no agreement on whether absorbable or non-absorbable sutures should be used. Some studies, such as those of Fuchs et al., advocate for nonabsorbable sutures, possibly due to shorter observation periods and varying operative techniques.[30] This highlights the need for larger comparative studies on suture types. In our

case, non-absorbable sutures were more effective than absorbable ones.

It is essential to establish different indications and surgical techniques for female patients with OT in various age groups and adnexal characteristics. Research indicates a negative correlation between patient age and recurrence rates. Therefore, for premenarcheal girls, in the absence of ovarian cysts or masses, it might be more profitable to perform OPY during the first detorsion, as it could limit the number of recurrences, reoperations, and their complications. Careful consideration should be given to the presence of ovarian masses and adnexa characteristics, particularly OL and discrepancies in their length. In the case presented, the use of non-absorbable sutures and fixation of the ovary to the abdominal wall was an optimal choice to prevent further recurrences.

Conclusion

This case is noteworthy due to the presentation of two recurrences of the OT despite performing OPY after the first retorsion. OT and its recurrences can lead to organ loss and infertility, which requires increased awareness from the attending physician. It also provides a unique clinical comparison that underscores the influence of surgical technique and suture material choice on long-term results. More studies are required to reach a consensus on optimal indications for OPY and its techniques to prevent recurrence.

Declarations

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Author contributions

Conceptualization, P.S.S., Z.N. and D.J.L. Methodology, P.S.S., A.K., M.J. and Z.N.; Validation, P.S.S., D.J.L. and P.M.; Formal Analysis, Z.N. and D.J.L.; Investigation, Z.N. A.K. and M.J.; Resources, P.S.S. and D.J.L.; Data Curation, Z.N., M.J. and A.K.; Writing – Original Draft Preparation, Z.N., D.J.L., A.K., M.J., P.M. and P.S.S.; Writing – Review & Editing, Z.N. and P.S.S.; Visualization, P.S.S. and Z.N.; Supervision, P.S.S. and P.M.; Project Administration, P.S.S.

Conflicts of interest

The authors declare no competing interests.

Data availability

No datasets were generated or analyzed during the current study.

Ethics approval

Written informed consent was obtained from the patient's parents for their anonymized information to be published in this article.

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