Original Article

Primary Ovarian Torsion in Pediatric Patients: Is Oophoropexy Still an Option? A 14-Year Single-Center Experience

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ABSTRACT

Study objective: Pediatric primary ovarian torsion (POT) is a rare condition related to anatomical predispositions and hormonal triggers. The high recurrence rate of laparoscopic ovarian detorsion (LOD) has led to the consideration of primary oophoropexy (OPX). This study aims to investigate OPX indications in POT and evaluate the efficacy of different fixation techniques.
Methods: A retrospective review was conducted on all pediatric patients (1-14 years) with POT treated with LOD or LOD+OPX at our tertiary care center between 2010 and 2024. The sites of fixation were round ligament, ovarian fossa, utero-ovarian ligament, and uterine body. The data collected included demographic, clinical, imaging, surgical, and follow-up results. Statistical analyses were performed to identify factors associated with recurrence and to compare LOD with LOD+OPX.
Results: Eighteen patients (median age 9.4 years) were included in the study. LOD was performed in 56% of cases, while LOD+OPX was performed in 44%. The overall recurrence rate was 44%, with 40% recurrence after LOD and 50% after LOD+OPX ($p = 1$). Notably, all OPX cases involving the round ligament relapsed (100%), compared to a significantly lower recurrence rate for other OPX sites (20%). Statistical analysis confirmed the round ligament as an inadequate fixation site ($P = .027$). Follow-up ultrasound revealed normal ovarian morphology in 62% of patients and signs of progressive ovarian atrophy in 38%.
Conclusion: In our experience, POT predominantly occurred in premenarchal patients with hypermobile utero-ovarian ligaments. Given the high POT recurrence rate after LOD, adjunctive OPX effectively reduced the recurrence rate, except when fixation was performed at the round ligament.
Keywords: Primary ovarian torsion, Laparoscopic ovarian detorsion, Oophoropexy

Introduction

Ovarian torsion in pediatric patients is reported with an incidence of around 5 cases per 100,000 with a range of 0.5-3.5 cases per year in high-volume centers.[1,2]

Primary ovarian torsion (POT) is defined as the torsion of a healthy ovary. It is believed to be due to a long or hypermobile utero-ovarian ligament or to hyperlaxity of the mesosalpinx and mesovarium,[1-3] in combination with several triggers that promote the torsion, such as premenarchal hormonal activity and abrupt changes in intra-abdominal pressure.[1]

Secondary ovarian torsion is associated with adnexal lesions, with a significantly increased risk of torsion for lesions larger than 5 cm.[2,4]

The incidence of primary ovarian torsion is reported to range from 16% to 49% of all cases of ovarian torsion.[5]

According to the current literature, surgical treatment of POT includes urgent laparoscopic ovarian detorsion (LOD), with adnexectomy no longer indicated.[2]

Given the high recurrence rate of POT after LOD, oophoropexy (OPX) in addition to LOD may be considered a viable option.[6]

The OPX techniques described in the literature are ovarian fixation to the lateral wall of the pelvis (Krause's ovarian fossa), to the round ligament, to the posterior wall of the uterine body, to the lateral portion of the broad ligament, and to the utero-sacral ligament.[6] Regardless of the technique, using non-absorbable suture is advisable.[6]

However, the indications and techniques for OPX remain debated, and the available literature on this topic is limited.[6]

Thus, the main goal of our study is to analyze our experience with OPX in POT in order to highlight its indications. The secondary goal is to compare the efficacy of different ovarian fixation techniques and to identify potential risk factors for recurrence.

Methods

Study Population

All consecutive pediatric patients (aged 1-14 years) with POT who underwent surgical treatment at our Tertiary Care Pediatric Surgery Department between December 2010 and

The study was carried out in Brescia, Italy.

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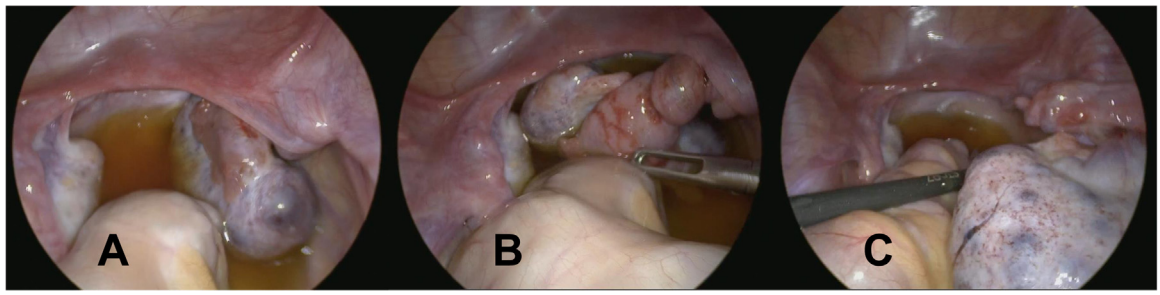

Fig. 1. Right primary ovarian torsion (A), right adnexa during detorsion (B), congested right ovary after complete detorsion (C).

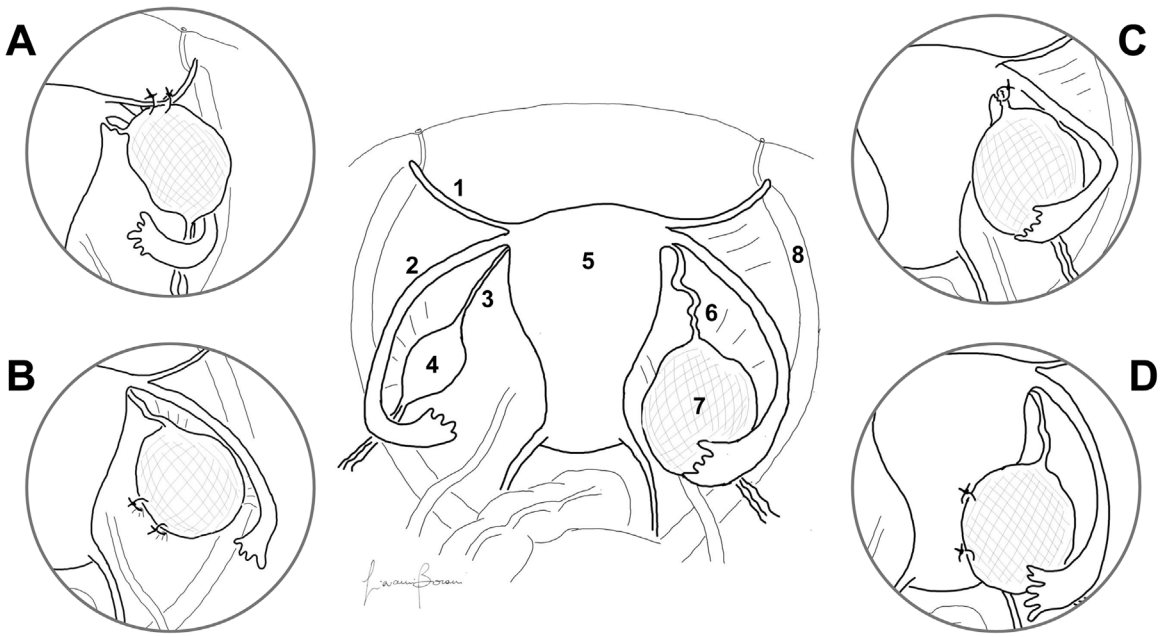

Fig. 2. (1) Round ligament; (2) Fallopian Tube; (3) normal utero-ovarian ligament; (4) normal ovary; (5) uterine body; (6) long-hypermobile utero-ovarian ligament; (7) congested ovary after detorsion; (8) iliac vessels. (**A**) round ligament OPX; (**B**) Krause's ovarian fossa OPX; (**C**) Utero-ovarian ligament plication; (**D**) posterior uterine body OPX.

December 2024 were included in this retrospective study. Patients with secondary ovarian torsion (adnexal lesions) were excluded from the study. Institutional Review Board (IRB) approval was obtained.

Protocol of Treatment

Preoperative assessment included blood tests, abdominal ultrasound (US), and abdominopelvic MRI when US was inconclusive for the diagnosis. In our center, urgent MRI is promptly available without delaying surgery. All patients with suspected ovarian torsion underwent urgent laparoscopic exploration (Fig. 1).

The choice to perform LOD or LOD+OPX, as well as the fixation technique, were at the surgeon's discretion. Oophoropexy was performed using 1 or 2 nonabsorbable sutures (Ethibond or Prolene) at different fixation sites presented in Figure 2 (round ligament, ovarian fossa, utero-ovarian ligament, and uterine body).

For round ligament, OPX sutures were placed through the round ligament below the fallopian tube, then through the utero-ovarian ligament and ovary, and back to the round ligament, sparing the fallopian tube (Fig. 2A).

For ovarian fossa OPX sutures fixed the ovary to the lateral pelvic sidewall in Krause's ovarian fossa, below the iliac vessels (Fig. 2B).

For utero-ovarian ligament plication suture was passed 3–4 times along the ligament and tightened to bring the ovary adjacent to the uterus (Fig. 2C).

For uterine body OPX sutures secured the ovary to the posterior uterine wall (Fig. 2D).

Scheduled postoperative follow-up included ultrasound at 1, 3, and 12 months after surgery, and then annually until adulthood.

Data Collection and Statistics

Patients were identified by reviewing all electronic surgical records reporting a diagnosis of ovarian torsion without associated adnexal lesions. For each patient demographic and clinical data, imaging, intraoperative findings, postoperative complications, and recurrences were collected from patient electronic medical records. To ensure accuracy, data were independently extracted by 3 authors and subsequently cross-checked. Any discrepancies were resolved by consensus. Data were then entered into an electronic database and analyzed using Jamovi.

Table 1
Surgical Procedure and Recurrences After the First Surgery.

Recurrence Rates Following Initial Surgery		
	No. Patients	*No. Recurrences (row %)*
Only LOD	10	4 (40%)
Round ligament OPX	3	3 (100%)
Nonround ligament OPX	5	1 (20%)

The analyzed variables included age, laterality, surgical procedure (LOD vs LOD+OPX), site of fixation, recurrence, ovarian size and parenchymal structure at ultrasound follow-up.

Quantitative data were expressed as median (range). Fisher's exact test was performed for qualitative variables, and the Shapiro-Wilk test and Mann-Whitney U test were used for quantitative variables. Statistical significance was set at $P < .05$.

Outcome

The main outcome was recurrence of torsion after surgery (LOD vs LOD+OPX).

The secondary outcome was the efficacy of different ovarian fixation techniques in terms of recurrence.

Results

Over a 14-year period, 18 patients underwent laparoscopic exploration for POT. The median age of the patients was 9.4 years (3.8-14.2 years), with 15 out of 18 patients (83%) in the premenarchal stage. Salpingo-ovarian torsion was identified in 13 of 18 cases (72%), while isolated ovarian torsion was observed in the remaining 5 cases (28%). In 12 cases (67%), the torsion involved the right ovary. The median degree of torsion was 720° (360°-1440°). During surgery, LOD was performed in 10 patients (56%), while OPX in addition to LOD was performed in 8 patients (44%). OPX was performed at the round ligament in 3 cases, at Krause's ovarian fossa in 3 cases, and at the utero-ovarian ligament in 2 cases.

Recurrence After the First Operation

POT relapsed in 8 of 18 cases (44%) at a median time of 12 months (17 days-3.5 years). All cases of recurrence presented to the emergency department with a sudden onset of acute ipsilateral pelvic pain and were observed before puberty in 7 out of 8 patients (88%).

The recurrence was observed in 4 of 10 patients (40%) after LOD and in 4 of 8 patients (50%) after LOD + OPX ($P = 1$). In those with LOD+OPX, torsion recurrence occurred despite previous fixation to the round ligament in 3 cases and to the ovarian fossa in 1 patient with severe ovarian ischemia who relapsed 17 days after the first operation (Table 1).

The recurrence rate was higher in cases of round ligament OPX compared to other sites of OPX [3/3 (100%) vs 1/5 (20%), $P = .143$].

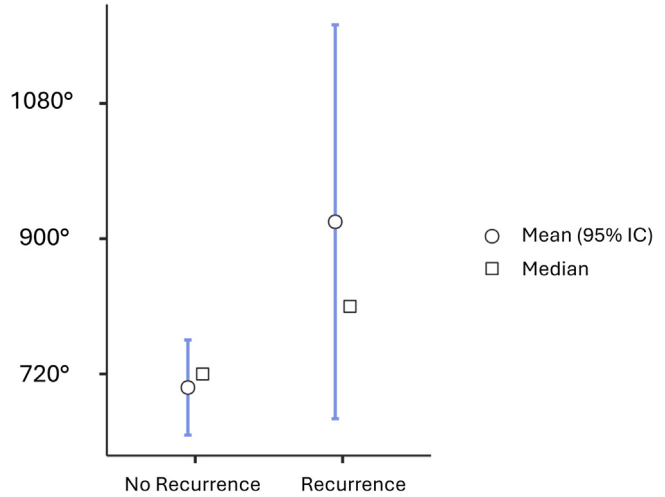

Fig. 3. Torsion rounds (1 round = 360°) in patients who did not relapse vs patients who did relapse.

Table 2
Recurrences Per Surgical Procedure Performed at First Surgery and Reintervention [X2 (2, N = 36) = 7.2, $P = .027$].

Overall Recurrence Rates		
	No. Patients	*No. Recurrences (row %)*
Only LOD	11	4 (36%)
Round ligament OPX	5	4 (80%)
Nonround ligament OPX	10	1 (10%)

The degree of torsion at the first operation was lower in patients who did not relapse [702° ± 102° vs 922° ± 378°, $P = .130$] (Fig. 3).

Comparing patients who relapsed after the first surgery vs patients who did not relapse, there was no correlation between recurrence and patient's age [8.5 ± 2.4 vs 9.5 ± 3.1 years, $P = .762$] or laterality [62.5% vs 70 0.5% right POT, $P = 1$].

Recurrence After Reoperation

Among the 8 patients with POT recurrence, OPX was performed in 7 patients (88%). OPX was performed at the round ligament in 2 cases, at Krause's ovarian fossa in 2 cases, at the uterine body in 2 cases and at the utero-ovarian ligament in 1 case. Among these, 1 of the 2 patients who underwent OPX at the round ligament experienced subsequent recurrence.

Overall Recurrence Rate Per Surgical Procedure

The overall POT recurrence rate was also evaluated considering both first surgery and reintervention: POT relapsed in 4 out of 11 cases (36%) after LOD and in 5 out of 15 cases (33%) after LOD+OPX ($P = 1$). As shown in Table 2, significantly more recurrences were observed for round ligament OPX [4/5 recurrences for round ligament OPX (80%) vs 1/10 for other fixation sites (10%), $P = .017$].

Considering both first surgery and reintervention, recurrence was not associated with the number of fixation stitches (fixation with 2 stitches was performed in 5 out of 7 patients who relapsed [71.5%] and in 3 out of 6 patients who did not relapse [50%], $P = .592$, 2 missing data).

Ultrasound Follow-Up

Median ultrasound follow-up time was 2.4 years. At last US, 8/13 (62%) patients had normal ovarian size with follicles, while 5/13 patients (38%) had ovarian hypotrophy or a normal size ovary with homogeneous parenchyma but no follicles. Imaging data were not available for 5 patients.

Discussion

In our cohort of patients, POT occurred mainly in premenarchal age, with an overall high recurrence rate. The most likely reason for this seems to be a long and/or hypermobile utero-ovarian ligament in young patients with anatomically normal ovaries.[1–3,7] Notably, in our series, the degree of torsion was higher in patients who relapsed.

The prevalence of right-side POT aligns with the literature: before puberty, the relatively higher mobility of the cecum in comparison to the sigmoid colon makes it easier for the right ovary to be twisted.[8]

Role of Oophoropexy in Primary Ovarian Torsions

In POT, LOD remains the most common approach, although it predisposes to recurrences in up to 64% patients.[1] Due to the lack of strong evidence of its efficacy, the advantages of OPX are still a matter of debate.[8]

In our study, the different oophoropexy techniques effectively prevented recurrence, except for round ligament OPX, which always relapsed after the first episode of POT. Indeed, the recurrence rate was significantly higher in cases of round ligament OPX compared to other sites of OPX. This result reaches statistical significance when considering both primary surgery and reinterventions [4/5 recurrences for round ligament OPX (80%) vs 1/10 for other sites of OPX (10%), $P = .017$]. To the best of our knowledge, this inadequacy of round ligament OPX has never been previously described. One possible explanation is that ovarian fixation to the round ligament excessively alters the ovary's anatomical position, increasing the likelihood of retorsion, particularly in cases of long/hypermobile utero-ovarian ligaments.

In this context, considering both first surgery and reinterventions, the recurrence rate was higher for LOD compared to “non-round ligament” OPX.

While no single fixation technique has demonstrated superiority, utero-ovarian ligament plication seems to minimize anatomical distortion between the ovary and the uterus.[3,4,8] Fuchs et al. suggest this method as the simplest and most effective in premenarchal patients with a long utero-ovarian ligament.[9] Combined double-site oophoropexy and interval oophoropexy, performed after resolution of the acute episode to allow fixation of non-edematous ovarian tissue, are other surgical options, although no specific pediatric literature is available on this topic. However, in the absence of strong evidence, the choice of fixation technique should reflect the surgeon's expertise and intraoperative findings.[3]

In conclusion, our data seem to suggest that LOD+OPX at sites other than the round ligament may be more effective than LOD alone at the first episode of POT, even if further data are needed to confirm this finding. Stronger evidence supports LOD+OPX at reintervention in case of POT recurrence.[3] However, it must be considered that, despite fixation, recurrence can still occur in the presence of significant ovarian congestion.[10]

Follow-Up

At the last US evaluation, 62% of patients had normal sonography features. Notably, an increased number of follicles 3 months after surgery suggests good ovarian function recovery, whereas reduced ovarian volume or homogeneous parenchyma with no follicles suggests progressive ovarian atrophy, whose impact on fertility remains unclear.[4,11-13]

Conclusions

In our experience, all OPX techniques except round ligament OPX were effective in preventing POT recurrence.

Considering the high recurrence rate associated with LOD, it seems appropriate to perform LOD+OPX at the first intervention, avoiding OPX at the round ligament; however, large, multicenter, prospective studies are required to substantiate this suggestion.

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Conflicts of Interest

None of the authors has potential conflicts to disclose.

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