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Ovarian Torsion In Children: Is Oophorectomy The Only Option.

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Abstract

Background: Ovarian torsion is a surgical emergency in children. Although oophorectomy has historically been performed for an ischaemic appearing ovary, conservative surgery offers the possibility of ovarian preservation. Aim: To describe the presentation, surgical management and available follow-up outcomes of ovarian torsion in children, with emphasis on ovarian preservation. ***Materials and Methods***: A retrospective descriptive review included 25 consecutive children who underwent surgery for ovarian torsion at the Department of Pediatric Surgery, Indira Gandhi Institute of Child Health, Bengaluru, between November 2015 and November 2024. Clinical, ultrasonographic, operative, histopathological and available follow-up findings were reviewed. Categorical variables were summarized as frequencies and percentages with Wilson 95% confidence intervals. Comparative analyses were not performed because patient-level data were unavailable. ***Results***: Age ranged from 18 days to 13 years, and mean symptom duration was 3.8 days. Right-sided torsion occurred in 17 children (68.0%). Ultrasonography identified torsion in 18 (72.0%), while normal ovarian vascularity was reported in nine (36.0%). Laparoscopic surgery was performed in 17 children (68.0%). Ovarian preservation was achieved in 15 (60.0%; 95% CI 40.7-76.6%), and 10 underwent oophorectomy (40.0%; 95% CI 23.4-59.3%). The source reported vascular improvement in 12 preservation cases, but conflicting follow-up counts prevented definitive estimation of recovery and recurrence rates. ***Conclusion***: Ovarian preservation was feasible in a substantial proportion of children with torsion. Oophorectomy was therefore not universally required. Consistent follow-up and objective assessment of ovarian recovery are necessary to establish long-term outcomes.

Keywords: Ovarian torsion; Children; Ovarian preservation.

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INTRODUCTION

Ovarian torsion is an important surgical emergency in children, involving rotation of the ovary and sometimes the fallopian tube around their supporting vascular pedicle. Progressive venous congestion and impaired arterial perfusion may cause haemorrhage, ischaemia and loss of ovarian tissue. Its management has particular significance in childhood because preservation of ovarian tissue may contribute to future endocrine and reproductive function. Historically, an ovary appearing dark or necrotic at surgery was frequently removed. However, Dasgupta et al. (2018)[1], in their systematic review, found that gross ovarian appearance did not reliably predict subsequent viability and supported detorsion with ovarian preservation as the preferred approach in most paediatric cases.

Diagnosis remains challenging because symptoms may resemble other causes of acute abdominal pain. Children may present with abdominal pain, vomiting or nonspecific gastrointestinal complaints, while neonatal presentations may differ considerably. Tielli et al. (2022)[2] emphasised the importance of considering torsion even when an underlying ovarian lesion was absent. Ultrasonography is central to evaluation, but clinical suspicion and timely surgical assessment remain essential.

Evidence supporting conservative surgery has strengthened the rationale for attempting ovarian preservation. Walker et al. (2018)[3] reported ovarian preservation in 86% of their cohort and demonstrated follicles in 74% of patients who underwent postoperative imaging. Geimanaite et al. (2019)[4] reported recovery of ovarian anatomy and folliculogenesis following detorsion, highlighting the value of follow-up ultrasonography in documenting recovery and detecting persistent underlying lesions. These observations distinguish an initially ischaemic appearance from irreversible loss of function.

Nevertheless, preservation rates vary across institutions and patient groups. Spinelli et al. (2023)[5] identified associations between ovarian-sparing surgery and several clinical and operative characteristics, illustrating the complexity of surgical decision-making. Institutional studies remain useful for examining presentation, diagnostic findings, operative practices and follow-up outcomes. The present study reviewed children treated for ovarian torsion at a tertiary pediatric surgical

center to describe their clinical characteristics and evaluate the feasibility of ovarian preservation, addressing whether oophorectomy was necessary in every case.

AIM

To evaluate the clinical presentation, surgical management and follow-up outcomes of ovarian torsion in children, with particular emphasis on ovarian preservation.

OBJECTIVES

1. To describe the demographic characteristics, clinical presentation and ultrasonographic findings of children with ovarian torsion.
2. To document intraoperative findings and the frequency of ovarian-sparing surgery and oophorectomy.
3. To assess available histopathological findings and follow-up outcomes, including ovarian vascularity, recurrence and menstrual development.

MATERIALS AND METHODS

Source of data

Data were obtained from the available hospital records of children who underwent surgery for ovarian torsion. The records reviewed included admission documentation, clinical findings, imaging reports, tumour-marker results where available, operative findings, histopathology reports and follow-up documentation.

Study design

The study was a retrospective, single-center, descriptive surgical case series with review of available follow-up outcomes. Treatment had been determined during clinical care; patients had not been randomly allocated to ovarian preservation or oophorectomy.

Study location

The study was conducted in the Department of Pediatric Surgery, Indira Gandhi Institute of Child Health, Bengaluru, Karnataka, India.

Study duration

Children operated on between November 2015 and November 2023 were included. Follow-up duration was reported as a median of 3.4 years, ranging from three months to seven years.

Sample size

All 25 consecutive surgically managed cases identified during the study period were included through total enumeration:

Inclusion criteria

The series included children who:

- Had ovarian torsion confirmed during surgery.
- Underwent operative management at the study institution within the specified period.
- Had records documenting the diagnosis and surgical procedure.

The observed age range was 18 days to 13 years; this should not be presented as a prespecified eligibility limit without protocol confirmation.

Exclusion criteria

Patients without operative confirmation of ovarian torsion and those managed outside the stated study period were outside the defined series. Additional exclusions, includes antenatal torsion or incomplete records.

Procedure and methodology

The clinical records were reviewed for age, presenting symptoms, symptom duration and examination findings. Particular attention was given to abdominal pain, vomiting, fever, tachycardia, abdominal tenderness and a palpable abdominal mass. Ultrasonographic findings were reviewed for ovarian size, laterality, suspected torsion, pelvic free fluid, vascularity and associated cystic lesions. The source classified ovarian diameter as less than 5 cm or at least 5 cm. Doppler vascularity was categorized as reduced or normal.

Tumour markers, including alpha-fetoprotein, beta-human chorionic gonadotropin, CA-125 and CA19-9, had been obtained selectively when malignancy was suspected.

Surgery had been performed through laparoscopic or open approaches. Operative findings included the number of twists and the gross appearance of the ovary. Procedures were categorized as ovarian-sparing surgery or oophorectomy. Ovarian-sparing procedures included detorsion alone and detorsion with additional procedures such as cystectomy or fixation.

Available follow-up records were reviewed for ovarian vascularity and volume, readmission, recurrence and attainment of menarche. No uniform follow-up schedule or objective definition of ovarian recovery was documented.

Sample processing

This was a retrospective record-based study; no additional research samples were collected. Histopathology diagnoses were retrieved for excised specimens.

Statistical methods

Categorical variables were summarized as frequencies and percentages. Wilson 95% confidence intervals were calculated for proportions with clear denominators. Reported means, ranges and medians were retained; standard deviations were not estimated from ranges.

The available information did not include individual observations or cross-tabulations linking clinical characteristics with surgical treatment. Consequently, between-group tests, odds ratios, regression analyses and associations with ovarian preservation could not be calculated.

No clinically justified null proportions were prespecified. Tests against an arbitrary 50% frequency were therefore not performed. In the tables, NE denotes a test statistic or p value that was not estimable or not applicable to the available descriptive data; it does not mean "not statistically significant."

RESULTS

Table 1: Demographic characteristics and clinical presentation of children with ovarian torsion

Characteristic	Finding, n (%) unless specified	95% CI for percentage
Total patients	25	
Age range	18 days-13 years	
Most frequently reported age	12 years	
Symptom duration, mean	3.8 days; SD unavailable	NE
Right-sided torsion	17 (68.0)	48.4-82.8
Left-sided torsion	8 (32.0)	17.2-51.6
Abdominal pain*	19 (76.0)	56.6-88.5
Vomiting*	16 (64.0)	44.5-79.8
Fever*	16 (64.0)	44.5-79.8
Tachycardia†	22 (88.0)	70.0-95.8
Abdominal tenderness†	20 (80.0)	60.9-91.1
Palpable abdominal mass	8 (32.0)	17.2-51.6

The study included 25 children, with ages ranging from 18 days to 13 years; 12 years was the most frequently reported age. Mean symptom duration was 3.8 days, although its standard deviation was unavailable. Right-sided torsion occurred in 17 children (68.0%). The symptom chart indicated abdominal pain in 19 children (76.0%) and vomiting and fever in 16 children each (64.0%). According to the narrative, tachycardia occurred in 22 children (88.0%), abdominal tenderness in 20 (80.0%) and a palpable mass in eight (32.0%). These findings describe the presentation of confirmed cases and do not establish diagnostic specificity.

Table 2: Ultrasonographic characteristics of ovarian torsion

Ultrasonographic finding	Finding, n (%) unless specified	95% CI for percentage
Ovarian diameter, mean	5.3 cm; SD unavailable	NE
Ovarian diameter, range	3.6-8.0 cm	
Ovarian diameter <5 cm	12 (48.0)	30.0-66.5
Ovarian diameter ≥5 cm	13 (52.0)	33.5-70.0
Torsion identified on ultrasound	18 (72.0)	52.4-85.7
Pelvic free fluid	22 (88.0)	70.0-95.8
Reduced ovarian vascularity	16 (64.0)	44.5-79.8
Normal ovarian vascularity	9 (36.0)	20.2-55.5
Associated ovarian lesion	13 (52.0)	33.5-70.0
No associated lesion reported	12 (48.0)	30.0-66.5
Unilocular cystic lesion	8 (32.0)	17.2-51.6
Multilocular cystic lesion	5 (20.0)	8.9-39.1

Mean ovarian diameter was 5.3 cm, with a range of 3.6-8.0 cm. Thirteen children (52.0%) had an ovarian diameter of at least 5 cm. Ultrasonography identified torsion in 18 cases (72.0%), while pelvic free fluid was reported in 22 (88.0%). Reduced vascularity was present in 16 children (64.0%); importantly, nine children (36.0%) had normal vascularity despite operative confirmation of torsion. Associated lesions were described in 13 children (52.0%), comprising eight unilocular

and five multilocular cystic lesions. Because only confirmed surgical cases were included, specificity, predictive values and overall diagnostic accuracy could not be estimated.

Table 3: Operative findings and surgical management

Operative characteristic	n (%)	95% CI for percentage
Laparoscopic surgery	17 (68.0)	48.4-82.8
Open surgery	8 (32.0)	17.2-51.6
Single turn	3 (12.0)	4.2-30.0
Two turns	14 (56.0)	37.1-73.3
More than two turns	8 (32.0)	17.2-51.6
Gross appearance described as gangrenous	21 (84.0)	65.3-93.6
Gross appearance described as normal	4 (16.0)	6.4-34.7
Ovarian-sparing surgery	15 (60.0)	40.7-76.6
Oophorectomy	10 (40.0)	23.4-59.3

Laparoscopic surgery was performed in 17 children (68.0%), while eight (32.0%) underwent open surgery. Two turns were the most frequent operative finding, occurring in 14 children (56.0%), followed by more than two turns in eight (32.0%) and a single turn in three (12.0%). The ovary was described as gangrenous in 21 cases (84.0%). Ovarian-sparing surgery was performed in 15 children (60.0%; 95% CI 40.7-76.6%), while 10 (40.0%) underwent oophorectomy.

Table 4: Histopathological findings and reported follow-up outcomes

Finding or outcome	Result and denominator	95% CI for percentage
Histopathology after oophorectomy†	**n=10**	
Haemorrhagic cyst with necrosis	3/10 (30.0%)	10.8-60.3
Follicular cyst	2/10 (20.0%)	5.7-51.0
Necrotic ovarian tissue	3/10 (30.0%)	10.8-60.3
Yolk sac tumour	1/10 (10.0%)	1.8-40.4
Immature teratoma	1/10 (10.0%)	1.8-40.4
Follow-up outcomes		
Follow-up duration	Median 3.4 years; range 0.25-7 years	
Documented vascular improvement after preservation‡	12/15 (80.0%)	54.8-93.0
Lost to follow-up after preservation‡	3/15 (20.0%)	7.0-45.2
Readmission	2 cases; denominator unclear	
Recurrent torsion	None reported; evaluable denominator unclear	
Attainment of menarche	14 cases; eligible denominator unclear	

Among the 10 oophorectomy specimens, the narrative reported haemorrhagic cyst with necrosis and necrotic ovarian tissue in three specimens each (30.0%), follicular cyst in two (20.0%), and yolk sac tumour and immature teratoma in one each (10.0%). Median follow-up was 3.4 years. The documented improved vascularity in 12 of the 15 ovarian-preservation cases (80.0%) and loss to follow-up in three (20.0%). Two readmissions and attainment of menarche in 14 children were reported without clear eligible denominators. No recurrence was reported, but a reliable recurrence rate could not be calculated.

DISCUSSION

Clinical presentation

The present series demonstrated that ovarian torsion affected children across a broad age range, including a neonate. Right-sided involvement predominated, and the reported mean symptom duration of 3.8 days suggested that presentation was not invariably immediate. This interval should not be interpreted as hospital-related delay because the source did not distinguish symptom onset, first medical contact, referral and operation.

Prieto et al. (2019)[8] examined differences in presentation among premenarchal patients, while Ashwal et al. (2015)[9] compared premenarchal and postmenarchal torsion. Their work supports considering developmental stage when interpreting symptoms and management. The present study could not examine these differences because menarchal status at presentation was unavailable.

Rey-Bellet Gasser et al. (2016)[10] evaluated clinical, biological and radiological prediction signs, emphasising the diagnostic challenge posed by this condition. Bolli et al. (2017)[11] investigated a predictive score in children. These approaches are relevant to the present series, in which pain, vomiting and examination findings were common, but their diagnostic performance could not be assessed without a comparison group of children without torsion.

Tsai et al. (2022)[12], in a cohort of 118 patients, found associations between ischaemic torsion and vomiting, leukocytosis and increased C-reactive protein. Although vomiting was frequent in the present study, laboratory measurements and

patient-level linkage to operative appearance were unavailable. Consequently, the present findings cannot establish predictors of ischaemia. The relatively high fever frequency extracted from the symptom chart also warrants checking against the original records.

Ultrasonography and Doppler findings

Ultrasonography identified torsion in 72.0% of this surgical series. Normal vascularity was nevertheless reported in 36.0%, demonstrating that detectable flow occurred in confirmed torsion. This observation is consistent with ACOG guidance (2019)[6], which cautions against using Doppler flow alone to guide exclusion of torsion.

Ssi-Yan-Kai et al. (2018)[13] discussed the radiological evaluation of adnexal torsion, while Sims et al. (2022)[14] examined the relationship between Doppler findings and paediatric torsion. These studies support interpreting vascularity alongside ovarian morphology and the clinical presentation.

Wattar et al. (2021)[15] reported pooled ultrasound sensitivity of 0.79 and specificity of 0.76 in a systematic review incorporating pediatric and adult populations. Bronstein et al. (2015)[16] identified substantial variability in imaging performance specifically for pediatric torsion. The present 72% detection proportion cannot be directly equated with a validated sensitivity estimate because imaging interpretation was not prospectively standardized and the cohort was selected through surgery.

The finding of ovarian diameter below 5 cm in 48.0% of cases further illustrates that a size threshold cannot independently exclude torsion. Conversely, enlargement and pelvic free fluid are descriptive findings rather than proof of irreversible ovarian damage.

Operative findings and ovarian preservation

The principal finding was that ovarian preservation was achieved at surgery in 60.0% of children. This directly answers the study question: oophorectomy was not the only operative option in this cohort. However, the wide confidence interval reflects the small sample and limits precision.

The 84.0% frequency of grossly gangrenous appearance was substantially higher than the 40.0% oophorectomy frequency. Although the absence of cross-tabulated data prevents exact subgroup analysis, these aggregate findings indicate that a concerning appearance did not invariably lead to removal. Dasgupta et al. (2018)[1] concluded that gross appearance was an unreliable indicator of long-term viability, supporting attempts at preservation when appropriate.

Walker et al. (2018)[3] reported 86% ovarian preservation, exceeding the present 60%. In contrast, the multicentre cohort of Spinelli et al. (2023)[5] reported preservation in 49.5%. These differences should not be interpreted as comparative treatment performance because age, prenatal torsion, pathology, selection and institutional practice differed.

Oskaylı et al. (2015)[20] examined conservative management and long-term follow-up in children with torsion. Santos et al. (2015)[21] reported follicles in 28 of 29 preserved ovaries on follow-up imaging and found no relationship between initial gross appearance and subsequent follicular counts. Their findings reinforce the importance of distinguishing operative appearance from postoperative recovery.

Julania et al. (2021)[22] reviewed management and conservation outcomes at a tertiary children's hospital. Together with the present experience, such institutional studies provide a basis for auditing preservation practice. The current study, however, cannot identify whether particular clinical or institutional factors accounted for its oophorectomy rate.

Pathology and oncological considerations

The narrative identified one yolk sac tumour and one immature teratoma among the excised specimens. Tumour grade, stage and management were not provided; therefore, the two diagnoses should not be combined into a fully characterized oncological outcome.

Tielli et al. (2022)[2] described malignancy as uncommon in pediatric torsion. The present small referral series should not be used to infer a higher population malignancy risk. Selective tumour-marker testing with unspecified denominators also prevents calculation of marker sensitivity or interpretation of normal results as excluding neoplasia.

Ollivier et al. (2019)[23] investigated differences between torsion of an otherwise healthy ovary and torsion associated with an underlying mass. This distinction is relevant because 48.0% of the present cohort had no associated lesion reported on imaging. Nevertheless, imaging classification alone is insufficient to establish pathological normality or predict subsequent ovarian recovery.

Follow-up, recurrence and oophoropexy

The vascular improvement in 12 preservation cases suggests potential recovery after conservative management. Geimanaite et al. (2019)[4] demonstrated preserved anatomy and folliculogenesis in 42 detorsed ovaries, supporting serial ultrasound assessment. The current study's qualitative vascularity findings are encouraging but do not provide standardized measurements of follicular development, ovarian volume or endocrine function.

Attainment of menarche in 14 children cannot establish recovery of the previously torsed ovary: menstrual function may be supported by the contralateral ovary. Likewise, loss to follow-up must not be counted as treatment failure or assumed recovery.

Bertozzi et al. (2017)[17] reported recurrence in 12% of torsion episodes in their multicentre study. Comeau et al. (2017)[18] evaluated oophoropexy techniques, and Smorgick et al. (2016)[19] highlighted recurrence risk in premenarchal girls with torsion of normal adnexa. These studies justify individualised consideration of fixation, particularly in recurrent or anatomically predisposed cases. They do not establish that every first episode requires oophoropexy.
Saberi et al. (2022)[24] reported much lower recurrent-torsion rates in administrative data and similar readmission rates between preservation and oophorectomy groups. Differences in surveillance, coding and outcome definitions help explain why recurrence estimates vary. The absence of reported recurrence in the present small series, with uncertain follow-up completeness, should therefore be interpreted cautiously.

Implications for practice

Huerta et al. (2024)[25] examined contemporary ovarian-sparing surgery and laparoscopy, while Ayemoba et al. (2024)[26] documented changes in oophorectomy practice over time. These studies place the present findings within a broader movement toward ovarian preservation.
Scheier (2022)[7] emphasised timely recognition of atypical presentations and preservation-focused surgical management. The present series supports the feasibility of that approach, but it does not establish superiority through a controlled comparison. Its most defensible contribution is the documentation that ovarian preservation was possible in a substantial proportion of affected children, alongside the need for reliable postoperative surveillance.

CONCLUSION

Oophorectomy was not the only option for ovarian torsion in children. Ovarian-sparing surgery was performed in 15 of 25 children (60.0%), and available follow-up information suggested recovery of vascularity in several preserved ovaries. These findings support consideration of detorsion and ovarian preservation where clinically appropriate, without relying solely on gross ovarian appearance to determine removal. However, inconsistent follow-up reporting and the absence of standardized functional measurements limit conclusions regarding long-term ovarian recovery and fertility.

LIMITATIONS OF THE STUDY

1. The retrospective, single-center design introduced potential selection and documentation bias.
2. The sample of 25 children produced wide confidence intervals and limited subgroup analysis.
3. Only aggregate data were available; associations between presentation, operative findings and treatment could not be evaluated.
4. Follow-up losses, examination findings and histopathology differed between portions of the source document.
5. Means were reported without standard deviations or individual measurements.
6. Neonatal and older childhood cases were combined without separate assessment of possible prenatal torsion.
7. Surgical indications and criteria for assessing ovarian viability were not standardised in the supplied report.
8. The ultrasound findings could not establish diagnostic specificity or predictive values because non-torsion patients were not included.
9. Follow-up imaging intervals, ovarian volumes and follicular counts were incompletely described.
10. Menarche was not a side-specific measure of recovery, and long-term ovarian reserve and fertility outcomes were unavailable.

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