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# Clinical distinctions of isolated fallopian tube torsion and implications for early diagnosis and treatment: Evidence from a large retrospective cohort

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## Abstract

# BACKGROUND

Isolated fallopian tube torsion (IFTT) is traditionally considered a rare subtype of adnexal torsion (AT) with nonspecific clinical features, making preoperative diagnosis challenging. Existing evidence is limited by small sample sizes. This study aimed to identify optimal management of IFTT by comparing with non-IFTT adnexal torsion (NIAT) in a large retrospective cohort.

# METHODS

A total of 349 patients with surgically confirmed AT treated between March 2013 and May 2023 at a tertiary center were enrolled and divided into IFTT (n = 116) and NIAT (n = 233) groups. Demographic, clinical, ultrasound, laboratory, surgical, and pathological data were compared between groups.

# RESULTS

IFTT accounted for 33.2% of all AT cases. Compared with the NIAT group, IFTT patients were less often postmenopausal (12.93% vs. 24.59%, $P < 0.05$) or pregnant (3.44% vs. 9.44%, $P < 0.05$) and more frequently asymptomatic (21.55% vs. 10.30%, $P < 0.01$), and had lower rates of diffuse abdominal pain (29.31% vs. 45.06%, $P < 0.01$). IFTT was associated with smaller adnexal masses (73.27 ± 28.45 mm vs. 102.45 ± 37.85 mm, $P < 0.01$), lower white blood cell (WBC) counts (8.45 ± 2.97 × $10^3$/μL vs. 9.80 ± 3.85 ×$10^3$/μL, $P < 0.01$) and lower neutrophil ratios (0.72 ± 0.13 vs. 0.76 ± 0.13, $P < 0.01$), but greater degree of torsion (802 ± 331° vs. 604 ± 320°, $P < 0.01$). Radical surgery was performed more frequently in IFTT among patients younger than 40 years (67.69% vs. 34.87%, $P < 0.01$). Pathologically, mesosalpinx cysts and hydrosalpinx predominated in the IFTT group, whereas benign ovarian epithelial tumors and mature ovarian teratomas predominated in the NIAT group.

# CONCLUSIONS

IFTT is not merely a rare variant but a clinically distinct entity characterized by milder symptoms, smaller masses, and relatively normal inflammatory markers despite more severe torsion. This clinical–pathological mismatch may contribute to delayed diagnosis. Our findings highlight the need to reconsider fertility-preserving strategies in patients with IFTT, particularly among women of reproductive age. Importantly, greater clinical awareness of IFTT is warranted, and it should be recognized as a distinct entity from other forms of adnexal torsion to facilitate timely diagnosis and appropriate management.

## INTRODUCTION

Adnexal torsion (AT) is a relatively rare acute abdominal disorder in females, accounting for approximately 2.7% of all gynecological emergency surgical procedures.[1] A 10-year (2009–2018) population-based study from South Korea reported that the incidence of adnexal torsion was approximately 6 per 100,000 women.[2] The condition can occur at any age, predominantly in reproductive-aged women. Most cases of AT involve concurrent torsion of the fallopian tube and ovary or isolated ovarian torsion. Isolated fallopian tube torsion (IFTT)—where only the fallopian tube is twisted—is even rarer, with an estimated incidence ranging from 1:500,000 to 1:1,500,000.[3,4] Delayed detorsion of the twisted adnexa impairs vascular perfusion, leading to complications including ischemic necrosis, rupture and secondary infection, which often necessitates surgical resection of the affected organ.

However, preoperative diagnosis of IFTT remains challenging due to the lack of pathognomonic symptoms, physical signs, and sonographic findings. Despite growing research interest in IFTT in recent years, published data are limited by small sample sizes, hindering the characterization of its clinical profile.[5,6,7,8] Consequently, the true incidence of IFTT in clinical practice remains unclear, and the condition is likely underdiagnosed or misdiagnosed. Supplementary high-quality clinical evidence is therefore essential to optimize diagnostic and therapeutic strategies for IFTT. Therefore, this large-scale retrospective cohort study aims to identify the key factors for achieving early diagnosis and prompt treatment of IFTT by elucidating its clinical characteristics, auxiliary examination features and surgical management strategies through comparison with non-IFTT adnexal torsion (NIAT).

# METHODS

## Study Design and Patient Population

This large-scale, retrospective cohort study was conducted at the Department of Gynecology, The First Affiliated Hospital of Wenzhou Medical University, Zhejiang Province, China, from March 2013 to May 2023.The study was approved by the Ethical Committee of The First Affiliated Hospital of Wenzhou Medical University (reference number: KY2025-R415). Data were extracted from the electronic medical records (EMR) of patients identified using International Classification of Diseases, Tenth Revision (ICD-10) codes corresponding to ovarian, fallopian tube or adnexal torsion.

## Inclusion and Exclusion Criteria

Inclusion criteria: 1. surgical intervention with intraoperative confirmation of adnexal torsion; 2. complete EMR data containing: demographics and medical history, documented clinical symptoms and signs at presentation, preoperative transvaginal/transabdominal ultrasound reports and relevant preoperative laboratory data, detailed operative notes and pathological reports. Exclusion criteria:other concurrent acute abdominal pathologies (e.g., acute appendicitis, cholecystitis) diagnosed during the same admission; missing key data as defined in the inclusion criteria.(Fig. 1)

## Data Collection

For all eligible patients, a standardized data collection form was used to extract the following from the EMR: demographic profiles, relevant medical and surgical history, detailed clinical symptoms and signs, key sonographic parameters (mass size, doppler flow status, presence of pelvic free fluid), preoperative laboratory indices (complete blood count, and C-reactive protein (CRP) level if available), and comprehensive intraoperative findings (degree of torsion, surgical procedure, and pathological diagnosis).

## Surgical Management Protocol

Surgical Management Protocol
Surgical management for adnexal torsion at our department followed an individualized approach based on tumor size, clinical suspicion of malignancy, fertility demands, and patient age, with laparoscopic surgery preferred when feasible. Conservative surgery was defined as the detorsion of the twisted adnexal structure while preserving the integrity of the affected organ, combined with lesion enucleation when indicated. Radical surgery referred to the complete resection of the torsed organ, including salpingectomy, oophorectomy and adnexectomy. For patients with suspected malignant lesions, total hysterectomy combined with bilateral adnexectomy will be performed accordingly. Conservative surgery was prioritized for reproductive-aged patients without evidence of malignancy or severe organ necrosis. Radical surgery was indicated for patients with: (1) severe organ necrosis; (2) suspected or confirmed malignancy;(3) large adnexal masses (> 10 cm); (4) Age ≥ 40 years with no fertility requirements.

## Group Classification and Primary Objective

Eligible patients were divided into two groups: the IFTT group (isolated fallopian tube torsion) and NIAT group (isolated ovarian torsion or combined ovarian and fallopian tube torsion). The primary objective was to identify key factors for achieving early diagnosis and prompt treatment of IFTT by elucidating its clinical characteristics, auxiliary examination features and surgical management strategies.

# Statistical Analysis

Continuous variables were assessed for normality using the Shapiro-Wilk test. Normally distributed data are reported as mean ± standard deviation (SD) and were compared using independent samples t-tests. Non-normally distributed data are presented as median with interquartile range and were compared using the Mann-Whitney U test. Categorical variables are expressed as number (percentage) and were compared using the chi-square test. Fisher’s exact test was employed when more than 20% of the expected cell counts were less than 5. A two-tailed p-value < 0.05 was considered statistically significant. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA).

# RESULTS

**IFTT is not a rare subtype of adnexal torsion and occurs more frequently in premenopausal women.**

Over the 10-year study period, 349 patients with surgically confirmed adnexal torsion were included: 116 (33.2%) with IFTT and 233 (66.8%) with NIAT.

The demographic and medical characteristics of the two groups are summarized in Table 1. Overall, the two groups were comparable in baseline characteristics, with no statistically significant differences observed in age (36.19 ± 12.80 vs. 36.52 ± 18.13 years, P = 0.270), BMI (22.62 ± 3.32 vs. 22.73 ± 4.10 kg/m², P = 0.604), parity distribution (all P > 0.05), history of abdominal surgery (38.79% vs. 33.48%, P = 0.388), or controlled ovarian hyperstimulation (0.86% vs. 0.86%, P = 1.000).

Table 1
Demographic and medical characteristics of the IFTT group and the NIAT group

| **Characteristics** | **IFTT(n = 116)** | **NIAT(n = 233)** | ***P*** |
|---|---|---|---|
| Age | 36.19 ± 12.80 | 36.52 ± 18.13 | 0.270 |
| postmenopausal | 15 (12.93) | 46 (24.59) | 0.011 |
| BMI,kg/$m^2$ | 22.62 ± 3.32 | 22.73 ± 4.10 | 0.604 |
| Parity | | | |
| Nulliparous | 37 (31.90) | 90 (38.63) | 0.207 |
| Primiparous | 34 (29.31) | 51 (21.89) | 0.126 |
| two-parous | 34 (29.31) | 63 (27.04) | 0.656 |
| ≥three-parous | 11 (9.48) | 29 (12.44) | 0.408 |
| Pregnant | 4 (3.44) | 22 (9.44) | 0.044 |
| Trimster | | | |
| First trimester | 1 (0.86) | 13 (5.58) | 0.028 |
| Second trimester | 2 (1.72) | 6 (2.57) | 0.420 |
| Third trimester | 1 (0.86) | 3 (1.29) | 0.700 |
| Previous abdominal surgery | 45 (38.79) | 78 (33.48) | 0.388 |
| Controlled ovarian hyperstimulation | 1 (0.86) | 2 (0.86) | 1.000 |
| Data are presented as mean ± SD or number (percentage) | | | |
| Abbreviation: *BMI* Body mass index, *IFTT* isolated fallopian tube torsion, *NIAT* non-IFTT adnexal torsion | | | |

In contrast, significant intergroup differences were identified in menopausal and pregnancy status. The proportion of postmenopausal women was significantly lower in the IFTT group compared with the NIAT group (12.93% vs. 24.59%, P = 0.011). Similarly, pregnancy was less frequent among patients with IFTT (3.44% vs. 9.44%, P = 0.044). Further stratification by gestational stage revealed that this difference was primarily driven by first-trimester pregnancies, which were significantly less common in the IFTT group (0.86% vs. 5.58%, P = 0.028), whereas no significant differences were observed in second- or third-trimester pregnancies (both P > 0.05). The above results showed that IFTT is not a rare subtype of adnexal torsion and occurs more frequently in premenopausal women.

**Abdominal pain occurred less frequently in patients with IFTT.**

The clinical characteristics of the IFTT and NIAT groups are summarized in Table 2. Overall, the clinical presentation differed between the two groups primarily in terms of abdominal pain patterns. The IFTT group had a significantly higher proportion of asymptomatic patients compared with the NIAT group (21.55% vs. 10.30%, P = 0.008). In contrast, diffuse lower abdominal pain was less frequently reported in the IFTT group (29.31% vs. 45.06%, P = 0.005).

Table 2
Clinical characteristics of the IFTT group and the NIAT group

| **Characteristics** | **IFTT(n = 116)** | **NIAT(n = 233)** | ***P*** |
|---|---|---|---|
| abdominal pain location | | | |
| No pain | 25 (21.55) | 24 (10.30) | 0.008 |
| Left lower quadrant pain | 24 (20.69) | 34 (14.59) | 0.149 |
| Right lower quadrant pain | 26 (22.41) | 63 (27.04) | 0.350 |
| Diffuse lower pain | 34 (29.31) | 105 (45.06) | 0.005 |
| Flank pain | 7 (6.03) | 7 (3.00) | 0.174 |
| Nausea or vomiting | 29 (25.00) | 73 (31.33) | 0.257 |
| Fever | 2 (1.72) | 6 (2.57) | 0.614 |
| Vaginal bleeding | 1 (0.86) | 3 (1.29) | 0.682 |
| Data are presented number (percentage) | | | |
| Abbreviation: *IFTT* isolated fallopian tube torsion, *NIAT* non-IFTT adnexal torsion | | | |

With respect to localized pain distribution, no significant differences were observed between the two groups. The proportions of patients presenting with left lower quadrant pain (20.69% vs. 14.59%, P = 0.149), right lower quadrant pain (22.4% vs. 27.04%, P = 0.350), and flank pain (6.03% vs. 3.00%, P = 0.174) were comparable. In addition, the prevalence of accompanying symptoms was similar between the two groups. There were no statistically significant differences in the occurrence of nausea or

vomiting (25.00% vs. 31.33%, P = 0.257), fever (1.72% vs. 2.57%, P = 0.614), or vaginal bleeding (0.86% vs. 1.29%, P = 0.682). The results indicated that abdominal pain occurred less frequently in patients with IFTT.

**IFTT is characterized by smaller adnexal masses and lower degrees of leukocytosis.**

The sonographic features and laboratory results of the two groups are presented in Table 3. On ultrasound examination, the maximum diameter of adnexal masses was significantly smaller in the IFTT group compared to the NIAT group (73.27 ± 28.45 mm vs. 102.45 ± 37.85 mm, $P < 0.01$). However, there were no significant differences between the groups in terms of preoperative sonographic suspicion of adnexal torsion (43.97% vs. 45.06%, P = 0.845), presence of pelvic free fluid (34.48% vs. 29.18%, P = 0.313), or absent Doppler flow (22.41% vs. 24.46%, P = 0.672).

Table 3
Sonographic features and Laboratory results of the IFTT group and the NIAT group

| **Characteristics** | **IFTT(n = 116)** | **NIAT(n = 233)** | **P** |
|---|---|---|---|
| Sonographic features | | | |
| Diagnose or indicate adnexal torsion | 51 (43.97) | 105 (45.06) | 0.845 |
| Free fluid in the pelvis | 40 (34.48) | 68 (29.18) | 0.313 |
| Absent Doppler flow | 26 (22.41) | 57 (24.46) | 0.672 |
| the maximum diameter of adnexal mass | 73.27 ± 28.45 | 102.45 ± 37.85 | < 0.001 |
| Laboratory results | | | |
| WBC, $10^3$/μL | 8.45 ± 2.97 | 9.80 ± 3.85 | < 0.001 |
| Neutrophil ratio | 0.72 ± 0.13 | 0.76 ± 0.13 | < 0.001 |
| platelets, $10^3$/μL | 270.06 ± 66.39 | 270.67 ± 82.35 | 0.650 |
| Laboratory abnormalities | | | |
| WBC count>10 × $10^3$/μL | 41 (35.34) | 106 (45.49) | 0.074 |
| Neutrophil ratio>0.75 | 52 (44.84) | 136 (58.37) | 0.016 |
| CRP>10mg/L | 22 (30.56)† | 36 (25.90)†† | 0.466 |
| Data are presented as mean ± SD or number (percentage) | | | |
| Abbreviation: *CRP* C-reactive protein, *WBC* white blood cell, *IFTT* isolated fallopian tube torsion, *NIAT* non-IFTT adnexal torsion | | | |
| †Percentage of those of IFTT group who received CRP test preoperatively(n = 72). | | | |
| ††Percentage of those of NIAT group who received CRP test preoperatively(n = 139). | | | |

Regarding laboratory findings, the IFTT group demonstrated significantly lower white blood cell (WBC) counts (8.45 ± 2.97 vs. 9.80 ± 3.85 × $10^3$/μL, P < 0.001) and lower neutrophil ratios (0.72 ± 0.13 vs. 0.76 ± 0.13, P < 0.001) compared with the NIAT group. Consistently, the proportion of patients with a neutrophil ratio > 0.75 was significantly lower in the IFTT group (44.84% vs. 58.37%, P = 0.016). No significant differences were observed in platelet counts (P = 0.650), the proportion of patients with WBC > 10 × $10^3$/μL (P = 0.074), or CRP > 10 mg/L (P = 0.466). The results indicated IFTT is characterized by smaller adnexal masses and lower degrees of leukocytosis.

**IFTT is associated with a greater degree of torsion and is more frequently managed with radical surgery, especially in patients under 40 years of age.**

The surgical and pathological characteristics of the two groups are shown in Table 4. The degree of torsion was significantly greater in the IFTT group compared with the NIAT group (802 ± 331° vs. 604 ± 320°, P < 0.001). Correspondingly, the overall rate of radical surgery was significantly higher in the IFTT group (81.03% vs. 54.94%, P < 0.001), while conservative surgery was more frequently performed in the NIAT group.

Table 4
Surgical and Pathological Features of the IFTT group and the NIAT group

| **Characteristics** | **IFTT(n = 116)** | **NIAT(n = 233)** | ***P*** |
|---|---|---|---|
| Degree of torsion° | 802 ± 331 | 604 ± 320 | < 0.001 |
| Surgical type, n (%) | | | < 0.001 |
| Radical surgery | 94 (81.03) | 128 (54.94) | |
| Conservative surgery | 22 (18.97) | 105 (45.06) | |
| Radical surgery by age, n/total (%) | | | |
| < 40 years | 44/65 (67.69) | 53/152 (34.87) | < 0.001 |
| ≥ 40 years | 50/51 (98.04) | 75/81 (92.59) | 0.263 |
| pathological types,n(%) | | | |
| mesosalpinx cyst | 51 (43.97) | 4 (1.72) | |
| hydrosalpinx | 40 (34.48) | N/A | |
| benign ovarian epithelial tumor | 8 (6.90) | 96 (41.20) | |
| ovarian mature teratoma | 2 (1.72) | 89 (38.20) | |
| benign tumor of fallopian tubes | 3 (2.59) | N/A | |
| salpingitis | 8 (6.90) | N/A | |
| functional cyst | N/A | 19 (8.15) | |
| ovarian sex cord-stromal tumor | 1 (0.86) | 10 (4.29) | |
| ovarian endometriotic cyst | 1 (0.86) | 5 (2.15) | |
| borderline ovarian tumor | N/A | 6 (2.58) | |
| ovarian malignant tumor | 1 (0.86) | 2 (0.86) | |
| Detorsion and No pathology | 1 (0.86) | 2 (0.86) | |
| Data are presented number (percentage) | | | |
| Abbreviation: *IFTT* isolated fallopian tube torsion, *NIAT* non-IFTT adnexal torsion | | | |

Age-stratified analysis revealed that among patients younger than 40 years, the rate of radical surgery remained significantly higher in the IFTT group than in the NIAT group (67.69% vs. 34.87%, P < 0.001). In contrast, no significant difference was observed between the groups in patients aged ≥ 40 years (98.04% vs. 92.59%, P = 0.263).

Pathological findings differed markedly between the two groups. In the IFTT group, the most common pathological types were mesosalpinx cysts (43.97%) and hydrosalpinx (34.48%). In contrast, the NIAT group was predominantly characterized by benign ovarian epithelial tumors (41.20%) and mature ovarian teratomas (38.20%). Malignant tumors were rare in both groups, with similarly low proportions (0.86% vs. 0.86%). Therefore, IFTT is associated with a greater degree of torsion and is more frequently managed with radical surgery, especially in patients under 40 years of age,

# DISCUSSION

This large-scale retrospective study provides comprehensive insights into the clinical and pathological profile of IFTT by comparing it with NIAT in a cohort of 349 patients with surgically confirmed adnexal torsion. To our knowledge, this is one of the largest single-center studies on IFTT to date. Our key findings are as follows: (1) IFTT accounts for ~ 33% of adnexal torsion cases, a higher proportion than previously reported; (2) IFTT is rare in postmenopausal and pregnant women; (3) Abdominal pain occurred less frequently in patients with IFTT; (4) IFTT is associated with smaller adnexal masses, lower leukocytosis, and greater degree of torsion; (5) radical surgery is more frequently performed for IFTT, especially in patients under 40 years of age; and (6) mesosalpinx cysts and hydrosalpinx are the most common pathological correlates of IFTT.

In our study, the proportion of IFTT among all adnexal torsion cases was 33.2%, which is substantially higher than the 11–14% reported in earlier studies.[6,9] This notable discrepancy may be attributed to the our department's status as a regional tertiary referral center serving a population of nearly 10 million, which likely captures a higher volume of complex, rare or atypical cases of adnexal torsion. This suggests that the actual incidence of IFTT may be higher than previously estimated and that the epidemiological data for IFTT require updating. To our knowledge, this study is the first to report that the incidence of IFTT is markedly lower in postmenopausal women relative to NIAT. The proportion of postmenopausal patients among all adnexal torsion cases in our study was 17.5%, which is consistent with the 18.7% documented by Li et al.[10] Additionally, the proportion of pregnant women in the IFTT group was significantly lower than that in the NIAT group, a finding consistent with previous studies. [6,9] Nevertheless, IFTT should still be included in the differential diagnosis for postmenopausal and pregnant women presenting with abdominal pain and an adnexal mass, even with normal ovarian blood flow on ultrasound, to avoid misdiagnosis and delayed treatment.

Adnexal torsion can present with a diverse spectrum of clinical signs and symptoms. The typical clinical manifestation is sudden, severe, unilateral, lower abdominal or pelvic pain accompanied by nausea and vomiting in reproductive - age women in the context of risk factors such as an adnexal mass.[11] However, our findings demonstrate that IFTT has a more atypical and insidious clinical presentation, characterized by a higher incidence of asymptomatic patients and a lower proportion of diffuse lower abdominal pain. Prior research with a small sample size (involving 9 cases of IFTT and 55 cases of adnexal torsion) found no significant differences in abdominal pain presentation between IFTT and NIAT. [6] Given the

much larger sample size of our study, our data are deemed more reliable and representative of the true clinical profile of IFTT. We observed that there were no significant differences in the prevalence of associated symptoms (nausea/vomiting, fever, vaginal bleeding) between the IFTT and NIAT groups. The absence of specific clinical symptoms for IFTT means that its diagnosis relies more heavily on preoperative ultrasonography and laboratory examinations.

Ultrasonography is the first-line imaging modality for the diagnosis of adnexal torsion, but its diagnostic accuracy varies widely, ranging from 26% to 79% .[12] This variability is mainly attributed to the presence or absence of typical sonographic features and the diagnostic proficiency of sonologists.[12] Yatsenko et al demonstrated that the presence of vascular pedicle twisting and the follicular ring sign was highly associated highly correlated with a positive ovarian torsion diagnosis, with 100% specificity.[13] Due to the absence of these typical sonographic findings in IFTT, missed or delayed diagnosis is common, especially in cases complicated with hydrosalpinx. Lopez-Rippe et al also reported that transabdominal ultrasound may be less accurate in detecting tubal torsion compared to isolated ovarian torsion in pediatric patients.[14] Therefore, clinicians should maintain a high index of suspicion for IFTT in patients with ultrasonographic findings of parovarian cysts or hydrosalpinx. The maximum diameter of adnexal mass in the IFTT group was significantly smaller than that in the NIAT group, which may be explained by the anatomical characteristics. Some ovarian tumors can grow to a large size and even occupy the entire pelvic and abdominal cavity, whereas fallopian tube lesions such as mesosalpinx cysts and hydrosalpinx typically remain smaller.

Inflammatory markers provide additional valuable parameters for assessing adnexal torsion. Some studies have indicated that leukocytosis may indicate irreversible ischemic changes in a torsed ovary,and elevated CRP levels may result from tissue necrosis and inflammation.[15,16] In our study, the IFTT group had significantly lower WBC count, neutrophil ratio, and a lower proportion of patients with a neutrophil ratio > 0.75 compared to the NIAT group. Notably, our findings are inconsistent with those published by Raanan Meyer et al., in which no statistically significant difference was observed.[9] Meanwhile, there was no significant difference in the proportion of patients with WBC level > 10 × $10^3$/μL or CRP level > 10 mg/L between the two groups.These results highlight that IFTT should be highly suspected in patients with an adnexal mass on ultrasound and normal or only mildly elevated inflammatory markers, as the absence of significant leukocytosis does not exclude the diagnosis of IFTT.

A notable finding of our study is that the degree of torsion was significantly greater in the IFTT group than in the NIAT group, and to our knowledge, no previous studies have reported similar comparative findings. This phenomenon can be elucidated from an anatomical perspective: the fallopian tube lacks strong ligamentous support, and has greater mobility compared with the ovary, which may render it more susceptible to severe torsion when exposed to predisposing factors.This greater degree of torsion may also contribute to the higher rate of radical surgery observed in IFTT patients, as surgeons may encounter more severe ischemic changes intraoperatively. Pathological evaluations confirmed that

benign lesions were the predominant finding in both groups, which is consistent with the existing literature.[10,17] Hydrosalpinx and mesosalpinx cysts were the two most common pathological subtypes in the IFTT group, while benign ovarian epithelial tumors and mature ovarian teratomas were the most frequent in the NIAT group.

Surgical management of adnexal torsion at our department is guided by tumor diameter, clinical suspicion of malignancy, fertility requirements and patient age. Detorsion is the first-line choice for adolescence and reproductive-age patients, particularly those with ovarian torsion. Our findings revealed that IFTT patients under 40 years of age were significantly more likely to undergo radical surgery compared with NIAT patients of the same age group.This difference may be attributed to several factors: First, even necrotic appearing ovaries may retain some function after detorsion.[18] The risk of postoperative thrombosis and infection of simple detorsion is not higher than that of resection. Therefore, ovary preservation has become the standard treatment for premenopausal patients. [19] Second, the core function of the fallopian tube is gamete transport. If irreversible edema and necrosis develop following torsion, or if concurrent pathologies such as hydrosalpinx and adhesion are present, preservation efforts may not only fail to restore function but could also heighten the risk of chronic abdominal pain and recurrent infection. Furthermore, large-scale, long-term follow-up data on fertility after conservative management of fallopian tube torsion are currently lacking, and there is no consensus yet on the surgical management for IFTT. Considering these factors, radical resection has become the preferred surgical strategy for IFTT in our department. Future studies are required to comprehensively evaluate the impact of conservative fallopian tube surgery on residual tubal function and long-term fertility outcomes in affected patients.

Our study has several limitations. First, as a retrospective single-center investigation, it inherently carries biases such as information and selection bias. Second ,long-term fertility outcomes were not available, limiting our ability to assess the impact of surgical type (conservative vs. radical) on reproductive function. Finally, preoperative ultrasound reports were not re-reviewed by a blinded radiologist, and sonographic features specific to IFTT were not systematically evaluated. This may have led to under-reporting of subtle tubal signs. Despite these limitations, our study is one of the largest cohort studies to characterize the clinical and surgical features of IFTT to date, providing valuable data to guide the diagnosis and management of this rare condition. Future prospective multicenter studies with long-term follow-up are needed to validate our findings, evaluate the fertility outcomes of conservative surgery for IFTT, and develop standardized diagnostic algorithms and management guidelines.

# CONCLUSION

IFTT should be recognized as a clinically distinct entity rather than a rare variant of adnexal torsion. It is characterized by relatively mild clinical manifestations, smaller adnexal masses, and less pronounced inflammatory responses despite a greater degree of torsion, reflecting a potential clinical–pathological mismatch. These features may contribute to delayed or missed diagnosis. Improved clinical awareness and careful ultrasonographic evaluation of the fallopian tube are essential for early recognition,

particularly in the presence of parovarian cysts or hydrosalpinx. In equivocal cases, a low threshold for diagnostic laparoscopy should be considered to avoid irreversible tubal damage. Furthermore, given the limited evidence supporting tubal preservation, our findings underscore the need for individualized and fertility-preserving management strategies in women of reproductive age. Future studies are warranted to establish standardized guidelines for the diagnosis and management of IFTT.

## Abbreviations

AT adnexal torsion

BMI body mass index

CRP C-reactive protein

EMR electronic medical records

IFTT isolated fallopian tube torsion;

NIAT non-IFTT adnexal torsion;

WBC white blood cell

## Declarations

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Not applicable.

# Authors’ contributions

Qiuyuan Zhu: Data collection and manuscript writing. Weiting Xia: Data collection.

Huijun Chen: Data collection. Jianzhang Wang: Study conception and design, manuscript writing and editing, project supervision.Guangyan Wang:Study conception and design, manuscript writing and editing, project supervision. All authors commented on the manuscript. All authors read and approved the final manuscript.

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# Data availability

All data are available and can be supplied by all authors upon reasonable request.

# Ethics approval and consent to participate

The study was approved by the Ethical Committee of The First Affiliated Hospital of Wenzhou Medical University on December 26, 2025(reference number: KY2025-R415). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Informed consent was waived due to the retrospective nature of the study and the use of de-identified clinical data.

# Consent for publication

All participants give their approval for publication.

# Competing interests

The authors declare no competing interests.

## References


1. Bridwell RE, Koyfman A, Long B. High risk and low prevalence diseases: Ovarian torsion. Am J Emerg Med. 2022;56:145-150.
2. Yuk JS, Yang SW, Lee MH, Kyung MS. Incidence of Adnexal Torsion in the Republic of Korea: A Nationwide Serial Cross-Sectional Study (2009-2018). J Pers Med. 2021;11(8):743.
3. Casey RK, Damle LF, Gomez - Lobo V. Isolated fallopian tube torsion in pediatric and adolescent females: a retrospective review of 15 cases at a single institution. J Pediatr Adolesc Gynecol. 2013;26:189–192.
4. Hansen OH. Isolated torsion of the Fallopian tube. Acta Obstet Gynecol Scand. 1970;49:3-6.
5. Ojima T, Yazawah, Yazawa R, et al. Surgical Results and Current Status of Adnexal Torsion Management, with a Comparison of Entire Adnexal Torsion and Isolated Fallopian Tube Torsion: A Single - center Study. Gynecol Minim Invasive Ther. 2025;14(4):304-310.
6. Hagege R, Sharvit M, Hamou B, et al. Isolated Fallopian Tube Torsion: An Underdiagnosed Entity with Debatable Management. J Minim Invasive Gynecol. 2022;29(1):158-163
7. Shevach A, Kerner, Ginath S, et al. Clinical Characteristics of Women with Isolated Fallopian Tube Torsion Compared with Adnexal Torsion. Isr Med Assoc J. 2019;21(9):575-579
8. Schwartz B, Weerasooriya N, Mercier R, et al. Factors Associated With Isolated Fallopian Tube Torsion in Pediatric Patients. J Pediatr Surg. 2024; 59(8): 1538 - 1544
9. Raanan M, Nir M, Aya M-S, et al. Clinical features of isolated Fallopian tube torsion: evidence from a large series.Hum Fertil (Camb). 2023 Dec;26(5):971-977.

10. Li M, Wang H, Hou S, et al. Comparison of characteristics and outcomes of premenopausal and postmenopausal women with adnexal torsion. J Int Med Res. 2024 Dec;52(12):3000605241305251
11. Bridwell RE, Koyfman A, Long B. High risk and low prevalence diseases: Ovarian torsion. Am J Emerg Med. 2022;56:145-150.
12. Chen Y, Liu M, Zhang M, et al. Ultrasonographic scoring system for the diagnosis of adnexal torsion. J Clin Ultrasound. 2022;50(4):525 - 531.
13. Yatsenko O, Vlachou PA, Glanc P. Predictive Value of Single or Combined Ultrasound Signs in the Diagnosis of Ovarian Torsion. J Ultrasound Med. 2021;40(6):1163-1172.
14. Lopez-rippe J, Velez-florez MC, Hwang R, et al. Transabdominal ultrasound for positive, negative, and equivocal ovarian and tubal torsion in girls. Emerg Radiol. Published online October 8, 2025.
15. Takayasu, H.; Masumoto, K.; Tanaka, N.; et al. A clinical review of ovarian tumors in children and adolescents. Pediatr. Surg. Int. 2020, 36, 701–709
16. Pepys, M.B.; Hirschfield, G.M. C - reactive protein: A critical update. J. Clin. Investig. 2003, 111, 1805–1812
17. Li S, Xie F, Wang J, et al. Clinicopathological characteristics and etiological considerations of isolated fallopian tube torsion in pediatric patients: a single center study. Transl Pediatr. 2025;14(11):3053-3060
18. Asfour V, Polson A, Varma R, et al. Evaluating ovarian preservation after ovarian torsion using the ovarian preservation score and tissue necrosis score. Clin Obstet Gynecol Reprod Med 2015; 1(2): 34–39.
19. 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.

# Figures

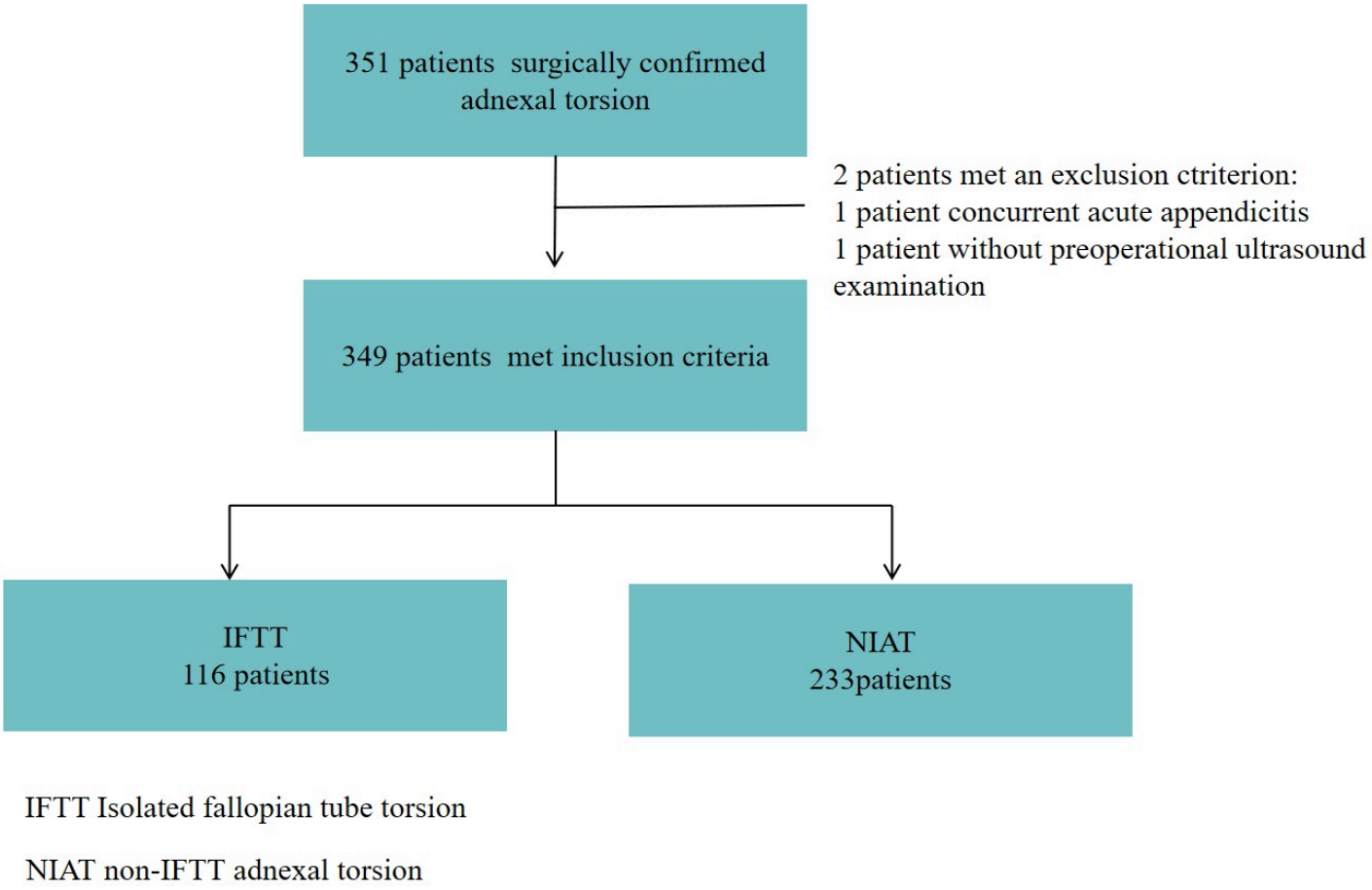



**Figure 1**

Legend not included with this version.