



# Computed tomography findings of chronic isolated fallopian tube torsion: a case description

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Submitted Feb 10, 2022. Accepted for publication Jul 29, 2022.

doi: 10.21037/qims-22-124

View this article at: <https://dx.doi.org/10.21037/qims-22-124>

## Introduction

Tubal torsion is a rare cause of acute abdominal pain in women (1). The diagnosis and treatment of tubal torsion are often delayed due to its non-specific clinical manifestations. The development of chronic tubal torsion can lead to hematosalpinx, tubal rupture, peritubal hematomas, and subsequent serious adnexal ischemic necrosis, which can potentially affect a patient's fertility (2) and further complicate diagnosis and treatment. Therefore, understanding the imaging features of chronic tubal torsion is extremely important for clinical decision making. Herein, we report a case of chronic tubal torsion in a woman of reproductive age, which, before surgery, was suspected by radiologists to be a cystic-solid tumor. We share this interesting case in the hope of increasing the understanding of the computed tomography (CT) features of chronic or isolated fallopian tube torsion (IFTT).

## Case presentation

All procedures in this study were performed in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent

was obtained from the patient for the publication of this case report and accompanying images. A copy of the written consent form is available for review by the editorial office of this journal.

On November 4, 2021, the patient, a 24-year-old female, began to experience pain with no obvious cause in the lower abdomen, which lasted for 1 hour. After symptomatic treatment (unknown) in a local hospital, the pain was relieved. On November 14, 2021, the patient again experienced severe pain in the lower abdomen for no obvious reason. This time, the pain was accompanied by nausea and vomiting, and the patient was unable to stand upright. The pain could be alleviated by lying flat. Ultrasound (another hospital) suggested the presence of a pelvic mass measuring 8 cm × 9 cm. The patient's pain was noticeably relieved after symptomatic treatment (unknown). The physical examination findings from the patient's initial two hospital visits were not clear. The patient was admitted to our hospital on November 25, 2021, for further diagnosis and treatment.

The patient had menarche at the age of 16 and a history of regular menstruation. Menstruation typically lasted 7 days in every 28–30-day cycle, and the blood was typically dark red in color and of a moderate amount. During menstruation, the patient typically experienced associated

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abdominal pain, lumbago, and soreness of the waist. The patient's last menstruation had been on November 5, 2021. She had no history of sexual activity, pregnancy, or childbirth.

### *Physical examination*

Physical examination found a palpable mass of approximately 10 cm × 9 cm in front of the uterus, with the highest point reaching between the umbilicus and the pubis. The mass had a smooth surface and a clear boundary, and there was associated mild tenderness in the lower abdomen. There was no detectable rebound pain or muscle tension. A palpable 3 cm × 4 cm mass was observed in the right adnexal area. No abnormality was found in the left adnexa.

### *Laboratory examination*

The results of routine laboratory examinations were as follows: cancer antigen-125 (CA125): 69.78 IU/mL, blood human chorionic gonadotropin (HCG) (–), and C-reactive protein (CRP): 16.24 mg/L.

### *Transvaginal ultrasound*

A cystic structure of 10.8 cm × 10.3 cm × 7.0 cm in size was detected in front of the uterus. It had a thick cyst wall with poor tension and a strong echo. The uneven, weak-echo mass in the left anterior uterus was approximately 4.4 cm × 4.3 cm × 4.0 cm in size. It was closely related to the cystic structure with an unclear demarcation and exhibited a dotted blood flow signal. No definite “whirlpool sign” was reported in this case.

### *CT*

A large cystic-solid mass with calcification at the margin of the cystic part was detected in the pelvic cavity. The boundary between the lesion and the right adnexa was not clear. An irregular soft tissue mass was observed to the left of the lesion, with which it seemed to be continuous. Free pelvic fluid was also detected. The radiologist suspected that the lesion was an adnexal tumor.

### *Surgical findings*

Pale yellow fluid (approximately 200 mL) was observed in the pelvic cavity and around the liver, and there was

extensive dense curtain adhesion between the greater omentum and the anterior abdominal wall. The left fallopian tube was enlarged and twisted, and its surface was dark brown and 11 cm × 11 cm in size. The left fallopian tube was extensively adhered to the anterior abdominal wall and greater omentum, and there was a large amount of pus-like tissue at the adhesion site. The left fallopian tube was twisted approximately five times around the root of the left fallopian tube, and an accumulation of old blood and blood clots were observed internally. The direction of rotation was not reported in the surgical records.

During surgical separation of the left fallopian tube from the surrounding adhesive tissue, the capsular wall ruptured, resulting in the outflow of dark red, old blood and blood clots. The left fallopian tube was cut from the end of the umbrella to the isthmus of the fallopian tube along the left mesosalpinx, and the ovaries were preserved.

### *Histopathological findings*

Chronic inflammation of the left fallopian tube was apparent, as evidenced by infiltration of the muscular layer of the mucosal stroma by lymphocytes, plasma cells, and a small number of neutrophils, together with inflammatory necrosis, granulation tissue hyperplasia, and multifocal calcification.

### **Discussion**

IFTT is an extremely rare gynecological emergency condition. It has a reported incidence of only 1 in 1.5 million and usually occurs in women of reproductive age (1). Continuous torsion leads to obstruction of arterial blood supply, which in turn leads to tubal ischemic necrosis (2). Patients with IFTT may present with various types of abdominal pain—acute or subacute, intermittent or persistent, severe or mild—and are often accompanied by vomiting (3). Diagnosis of IFTT is often delayed due to these nonspecific clinical manifestations, leading to adnexectomy, which can affect fertility.

Adnexal torsion (AT) with a course of more than 3 days is defined as chronic AT, of which solitary tubal torsion accounts for the majority of cases (2). The clinical and imaging manifestations of tubal torsion are nonspecific, which often leads to clinical misdiagnosis. Although surgery is the gold standard for the diagnosis of AT (4), imaging features usually form the basis for the initial clinical diagnosis.

Transvaginal ultrasound is considered to be a superior



**Figure 1** Axial plain CT showing a large cystic structure (asterisk) with thickened and calcified walls. The twisted fallopian tube on the left demonstrates high density, suggesting hemorrhagic changes (arrow). CT, computed tomography.

imaging examination compared to radiography, and can provide a more accurate assessment of pelvic structure and enlarged appendage (5). However, the signal of blood flow to the adnexal structure cannot exclude tubal torsion (5). It is increasingly common for patients with nonspecific clinical findings to choose CT over ultrasound at their first visit.

Cases of IFTT without ovarian torsion are usually accompanied by two risk factors, hydrosalpinx and parafallopian mass (1,2). Some studies have suggested that right fallopian tube torsion is more common than left fallopian tube torsion because the left side is thought to be fixed by the sigmoid mesentery (4,6). However, according to a recent review, most cases of tubal torsion occur on the left side (14/20) (3), which contradicts the previously held view. Notably, our case also happened to occur on the left side.

In the case described in this paper, the fallopian tube was expanded and twisted, and the wall was significantly thickened and calcified, forming a large chronic lesion which was mistaken for a cystic-solid tumor (*Figure 1*). The CT report described irregular, soft tissue that appeared to be contiguous with the lesion, which proved intraoperatively to be a twisted fallopian tube (of approximately five twists) (*Figure 1*). No parafallopian mass was found around the lesion. No abnormality was observed in the right adnexal area during surgery. The CT showed evidence of a suspicious cystic structure in the right adjunct, which may have been pelvic effusion. However, the physical examination and imaging results deviated from the intraoperative records. Although the uterus usually shifts to the torsional side (7), this was not obvious in our case, which we believe may have been related to the lesion size. Since our study was retrospective, we did not have intraoperative images for comparison with the CT images.

In patients with lower abdominal pain accompanied by a pelvic mass, vascular pedicle distortion, thickening of the fallopian tubes, and hemorrhagic infarction can be detected by CT or magnetic resonance imaging (MRI) (5,8). Ovarian enlargement, ovarian edema, vascular pedicle distortion, peripheral ovarian follicles, free fluid, periadnexal fat bundles, and reduced adnexal enhancement have been identified as imaging signs of AT (7). Further, a meta-analysis (9) suggested that adnexal enlargement, an adnexal mass, and a twisted pedicle may be the most important CT features of AT.

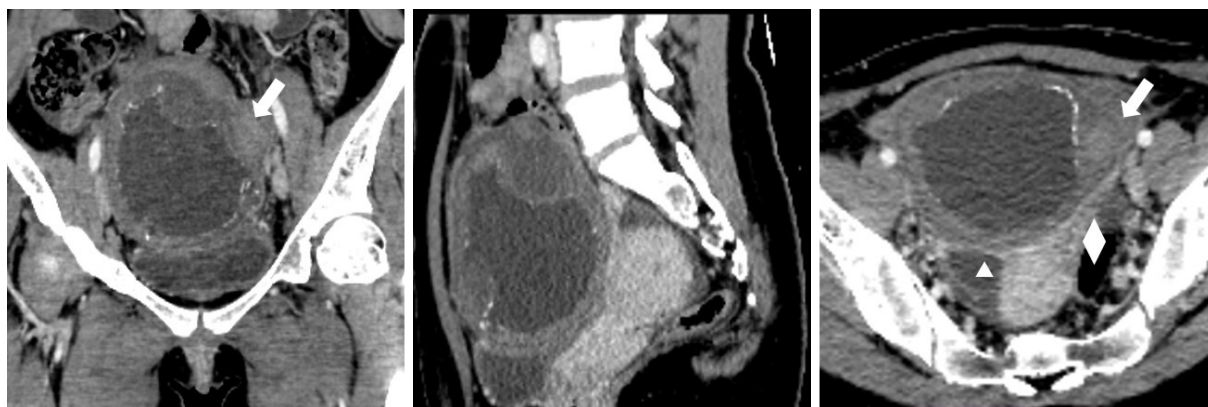
We searched PubMed for literature relating to “isolated tubal torsion”, and most of the papers identified were case reports. After screening out the literature related to CT or MRI imaging signs, 21 articles involving 32 patients were obtained. Among the patients, there were more cases of tubal torsion occurring on the right side (22/32) and 1 case occurred bilaterally. Nine patients had adnexal cysts, 3 patients were pregnant, 15 patients presented with adnexal enlargement, and 17 patients presented with an adnexal mass. Fifteen patients had free fluid, while fat bundles and reduced enhancement were each described in two patients, respectively. In the earlier cases reported, ultrasound was used, and more attention was paid to the clinical features of IFTT. However, with the increasing use of CT and MRI in AT, more attention has been paid to imaging features. As indicated by the data in *Table 1*, adnexal enlargement, adnexal mass, and effusion may be the most common signs of IFTT. Some of imaging features, such as fat bundles and reduced enhancement, are not described in detail in the literature. We do not know whether this is due to cases not having these characteristics or simply because they were not mentioned. As we did not have access to the original images, we could not undertake a secondary evaluation. At present, these data cannot explain the difference between IFTT and AT signs. Also, most research in the literature fails to mention the direction of the tubal torsion and whether the uterus was pulled towards the affected side. Perhaps future research will focus on these questions, especially regarding obstetricians and surgeons. Sakuragi *et al.* (29) analyzed MRI findings in 12 cases of IFTT, 12 (100%) of which showed signs of a twisted pedicle. In *Table 1*, only two cases of twisted pedicle were recorded. We speculate that this was because the sign of twisted pedicle was either not recognized as a sign of tubal torsion due to misdiagnosis or, as mentioned above, simply was not mentioned.

For women who experience abdominal pain, especially following sudden exertion, or whose imaging reveals

**Table 1** Clinical and imaging features of the case

Reference	Age (years)	Side	Accompanied by	Imaging signs	Imaging examination
Ramadan MK (1)	12	R	Paraovarian cyst	Adnexal enlargement	CT
	14	R	–	Adnexal mass, fat bundles, free fluid	CT
Elçi E (10)	20	R	–	Free fluid	MRI
	25	L	–	Adnexal enlargement, free fluid	MRI
	28	R	Ovarian cyst	Adnexal mass, free fluid	CT
	23	R	Ovarian cyst	Adnexal mass, free fluid	CT
	25	R, L	Ovarian cyst	Adnexal mass	CT
	30	R	Ovarian cyst	Adnexal mass, free fluid	CT
	34	L	Ovarian cyst	Adnexal mass, free fluid	CT
Demirel BD (11)	11	R	Ovarian cyst	Adnexal enlargement, adnexal mass, free fluid, twisted pedicle	MRI
Park SN (12)	36	R	Pregnancy	Adnexal mass	CT
Canda MT (13)	41	R		Adnexal enlargement, twisted pedicle	MRI
Takeda A (14)	30	R	Pregnancy	Adnexal mass	MRI
Delacroix C (15)	47	R	–	Adnexal mass, free fluid	CT
	54	R	–	Adnexal enlargement	CT
	33	R	–	Adnexal enlargement	CT
	13	R	–	Adnexal enlargement	CT
Kirkham YA (16)	11	R	–	Adnexal enlargement	CT
Skinner S (17)	50	L	–	Adnexal mass, fat bundles	CT
Taylor S (6)	44	L	Ovarian cyst	Adnexal enlargement, adnexal mass	CT
Park BK (18)	29	L	–	Adnexal enlargement, twisted pedicle	CT, MRI
Orazi C (19)	12	L	–	Adnexal enlargement	MRI
Daniilidis A (20)	17	L	Ovarian cyst	Adnexal mass, free fluid	CT
Gaied F (21)	13	R	–	Adnexal mass	CT
	15	R	–	Adnexal mass	CT
Ohara N (22)	49	R	–	Adnexal mass	CT
Toyoshima M (23)	10	R	–	Adnexal mass, free fluid, reduced enhancement	CT, MRI
Aydin R (24)	33	R	–	Adnexal enlargement, twisted pedicle	MRI
Bharathi A (25)	47	L	Ovarian cyst	Adnexal enlargement, adnexal mass, free fluid	MRI
Macedo M (26)	18	R	Pregnancy	Free fluid	MRI
Pampal A (27)	13	L	–	Adnexal enlargement, free fluid, reduced enhancement	MRI
Ali AM (28)	32	R	–	Adnexal enlargement, free fluid	CT

R, right; L, left; CT, computed tomography; MRI, magnetic resonance imaging.



**Figure 2** CT multiplanar reconstruction images show a cystic structure with a markedly thickened tube wall. The tortuous soft tissue on the left is a twisted tube with five twists, forming a twisted pedicle (arrow). The thickened left broad ligament with adnexal fat bundles and reduced enhancement can be seen. The nearby cystic lesion was suspected to be ovarian (rhomboid). A suspicious cyst (triangular) can be seen in the right adnexal area. CT, computed tomography.

enlarged tubular or cystic structures around the ovaries, tubal torsion should be suspected (30). In young patients, timely intervention, whether conservative or surgical, may help to preserve fertility.

The chronic changes observed in our case have not been reported before. There is no data to confirm how long it takes for fallopian tubes with chronic inflammation to calcify, but it is known that calcification can take months or longer. The cause of calcification in the adnexal area needs to be differentiated from other causes, such as adnexal tuberculosis, urinary calculi, pelvic phleboliths, and tumors with calcification. Calcification due to tubal tuberculosis usually takes the form of small linear streaks that can be straight, bent, or curved, and ovarian abscesses or granuloma may also be present (31). The “comet sign” is often seen in pelvic phleboliths; the head is phlebolith and the irregular tapering soft tissue attached to it is the comet tail (32). Pelvic phleboliths need to be differentiated from ureteral calculi. High-density calculi are surrounded by ring-thickened soft tissue, namely the “rim sign” (32). Adnexal tumors with calcification that need to be identified include serous epithelioma, ovarian fibrothecoma, teratoma, and Brenner tumor. Gritty calcification is common in serous neoplasms (33). The calcification observed with Brenner tumors is often extensive pleomorphic calcification (34). Dense calcification is common in ovarian fibrothecoma (35). An immature teratoma often has small calcifications, while those with mature teratoma are often large. The calcification features of chronic IFTT have not been previously reported. Due to present study being limited to

only one case, the differential characteristics of calcification in chronic IFTT cannot be summarized. Interestingly, in our case, the punctate or short strips of calcification surrounding the wall of the fallopian tube were suggestive of a tubular lesion (*Figures 1,2*). In future cases with similar calcification distribution, we can reasonably suspect tubal disease.

Skinner *et al.* suggested that thickened, broad ligaments with surrounding inflammatory changes that show a “rat tail” sign might be used to distinguish between AT and pelvic tumors (17). However, the broad ligament does not show up very well on CT. When reviewing our CT images, we could see thickening of the left broad ligament with surrounding inflammation and decreased enhancement; hence, the nearby cystic lesion was suspected to be ovarian (*Figure 2*).

While surgery is the gold standard for diagnosis, for radiologists, improved understanding of the imaging of tubal torsion can help determine whether emergency surgery should be performed and improve patient outcomes. Tubular or cystic masses should be considered AT or differentiated from AT in women with acute lower abdominal pain, especially those of reproductive age.

### Acknowledgments

*Funding:* None.

### Footnote

*Conflicts of Interest:* All authors have completed the ICMJE



uniform disclosure form (available at <https://qims.amegroups.com/article/view/10.21037/qims-22-124/coif>). The authors have no conflicts of interest to declare.

**Ethical Statement:** The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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**Cite this article as:** Liao M, Long X, Tang M, Cao X, Liang G, Xie M. Computed tomography findings of chronic isolated fallopian tube torsion: a case description. *Quant Imaging Med Surg* 2022;12(12):5485-5491. doi: 10.21037/qims-22-124