

Diagnostic Imaging Pathways - Tubo-ovarian Torsion (Suspected)

Population Covered By The Guidance

This pathway provides guidance on the diagnosis of female patients who present with non-specific, lower abdominal pain with clinical suspicion of tubo-ovarian torsion.

Date reviewed: December 2015

Date of next review: 2017/2018

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Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	> 10 mSv

Pathway Diagram

What do I need to know?

Tubo-ovarian torsion should be considered as a diagnosis in girls or women who have unilateral pelvic pain

TUBO-OVARIAN TORSION (SUSPECTED)

Date reviewed: December 2015
Please note that this pathway is subject to review and revision

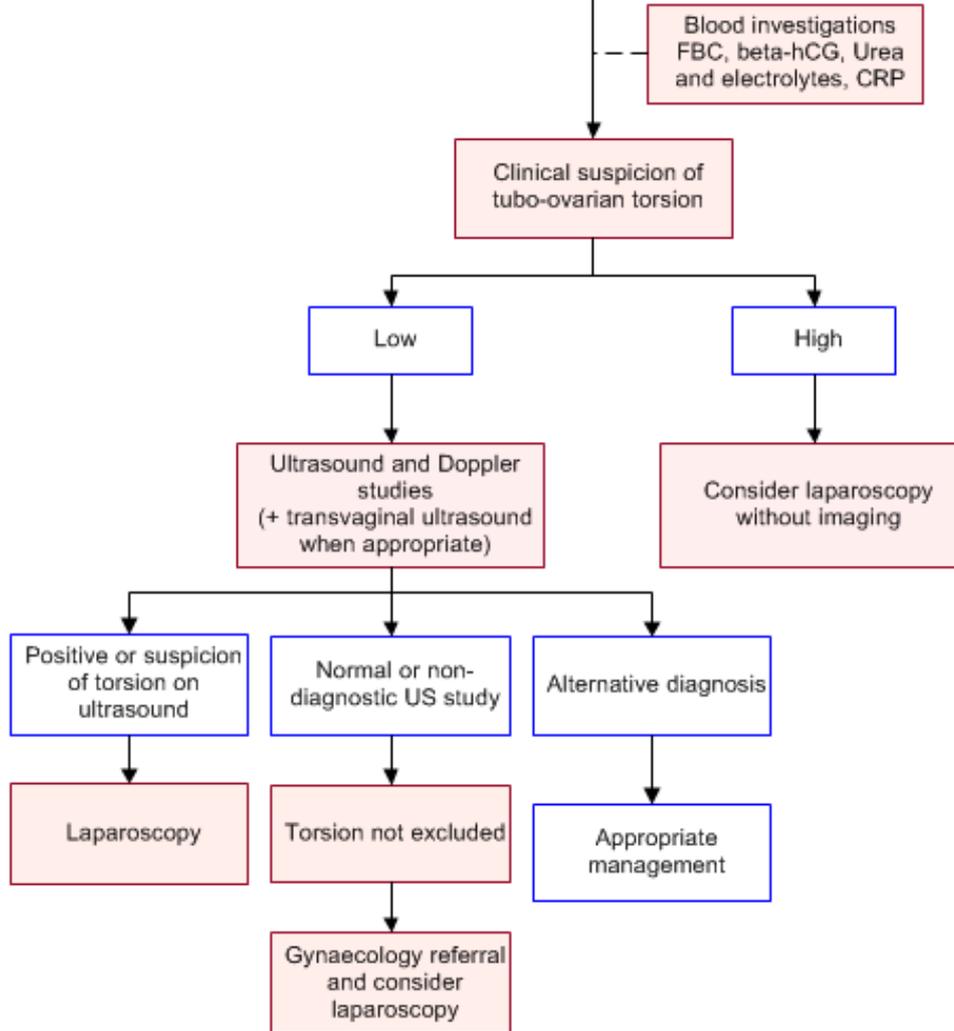


Image Gallery

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Teaching Points

- The clinical presentation of tubo-ovarian torsion is often non-specific and mimics many abdominopelvic surgical diseases
- Laboratory tests are often unhelpful in trying to verify a diagnosis of ovarian torsion. However, they can assist in ruling out alternative or co-existing diagnosis of lower abdominal or pelvic pain
- The sonographic appearance of ovarian torsion can vary significantly and the presence of tubo-ovarian vascularization on Doppler imaging, does not exclude the diagnosis of ovarian torsion
- Laparoscopy is considered the best diagnostic and therapeutic approach for younger children, older adolescent females and in pregnancy

Tubo-ovarian Torsion (Suspected)

- Tubo-ovarian torsion's incidence in women under 20 is estimated at 4.9/100,000 with a mean age at presentation of 12 years (paediatric cases making up 15%) [1](#) and a prevalence of 2.7% [2](#)
- It may also occur in pregnancy, with an incidence of approximately 1 in 5000. [3](#) Ovarian torsion occurs most commonly in the first trimester (incidence of 68%), followed by 20% in the second, and 22% in the third [4](#)
- The clinical presentation of tubo-ovarian torsion is often non-specific, with symptoms and signs such as, primarily abdominal pain (90-100%), [1,5](#) nausea, vomiting, pyrexia and leucocytosis [3](#)
- It can mimic many abdominopelvic surgical diseases with only about one half of the patients suspected of tubo-ovarian torsion at the time of the first clinical diagnosis [1](#)
- Differentiating tubo-ovarian torsion from acute appendicitis can be challenging as there is a significant overlap of clinical presentation. Often, both occur in the setting of leucocytosis which further hampers accurate diagnosis (50–82%) [1,6](#)

Blood Investigations

- Laboratory tests are often unhelpful in trying to verify a diagnosis of ovarian torsion. However, they can assist in ruling out alternative or co-existing diagnosis of lower abdominal or pelvic pain [7](#)
- The following blood investigation are commonly requested
 - TWBC - an elevated white cell count is a nonspecific finding and is rarely of value
 - FBC - haemorrhage may result in anaemia
 - BetaHCG - should be performed to diagnose a concomitant pregnancy
 - C-reactive protein - raised in the presence of inflammation
 - Urea and electrolytes - electrolyte imbalances may be seen in severe cases where there has been persistent vomiting
 - Interleukin-6 - increased but limited evidence to be used as a diagnostic tool
 - Tumour markers* (if suspected) - LDH, alpha-fetoprotein, CA-125

*Note

- In the paediatric age group the risk of malignant ovarian neoplasm associated with torsion ranges from 2% to 6% [1,8](#)
- Factors associated with malignancy in children include [9](#)
 - Precocious puberty in children aged 1 to 8 years presenting with abdominal mass
 - Mass of >8 cm in size with a solid area
 - Raised tumour markers (?-HCG, ?FP, and CA125, which may also be seen with benign mass)

Clinical Suspicion of Tubo-ovarian Torsion

Risk Factors

- Torsion of normal ovaries is more commonly seen in children and adolescents than in adults, as the uterus is relatively small and the utero-ovarian ligaments disproportionately long [2](#)
- Unlike adults, up to 25% of paediatric patients with tubo-ovarian torsion may have normal ovaries [2](#)
- The primary risk factor for ovarian torsion is an ovarian mass (up to 81% of cases) and is most common if the ovary is 5 cm or larger [8,10](#)



- Other predisposing risk factors include [1,2,5,6,11,12](#)
 - Normal adnexa
 - Excess mobility of the adnexa due to an abnormally long Fallopian tube, mesosalpinx or mesovarium
 - Jarring movement of the body
 - Vigorous exercise
 - Sudden changes in body position
 - Increases in intra-abdominal pressure
 - Trauma
 - Tubo-ovarian disorders
 - Ovarian cysts and tumours
 - Polycystic ovaries
 - Congenital anomalies (agenesis, hypoplasia, or mal-development of Mullerian structures)
 - Ovulation induction and ovarian hyperstimulation (*in vitro* fertilization)
 - Pregnancy
- Differential diagnoses [3,5,6,8](#)
 - Appendicitis
 - Ruptured ovarian cyst
 - Pelvic inflammatory disease
 - Endometriosis
 - Nephrolithiasis
 - Pyelonephritis
 - Ectopic pregnancy
 - Colitis
 - Necrosis of a leiomyoma
 - Consider UTI and intussusception in younger children
- In children, a robust association of the triad of intermittent pain, non-radiating pain and increased tubo-ovarian size and tubo-ovarian torsion has been reported, but the absence of these signs does not necessarily reduce the urgency of surgical evaluation in a patient who continues to have a high suspicion of ovarian torsion [13](#)

Ultrasound and Doppler Studies (+ Transvaginal Ultrasound When Appropriate)

- Despite the advances in imaging modalities in recent years, it has been shown that reaching a specific radiological diagnosis in many pelvic conditions, including tubo-ovarian torsion, can be difficult [3](#)
- Ultrasound findings and Doppler studies aid the diagnosis of suspected ovarian torsion but also provide an opportunity to identify mimickers
- Pelvic ultrasonography is the imaging study most commonly used to help diagnose tubo-ovarian torsion. [2,10,11,14](#) Used in conjunction with colour Doppler studies, it is the most accurate imaging study available for female paediatric patients presenting with acute abdominal symptoms [2](#)
- Whenever feasible, a transvaginal ultrasound should be performed as it offers better views of the ovarian status, vascularity and the twisted pedicle, and offers better characterisation of an tubo-ovarian mass if any. [11](#) A combination of both transabdominal and transvaginal ultrasound should be performed as the former helps to rule out other bowel or urologic acute pelvic conditions [10,11](#)
- Advantages [5,10](#)
 - No ionising radiation



- Less expensive than CT and MRI, but similar diagnostic performance
- Widely available
- The sonographic appearance of ovarian torsion can vary significantly depending on the degree of pedicle twisting, degree of vascular compromise, time delay from initial onset of symptoms to imaging, and presence or absence of an ovarian mass or cyst [15](#)
- B-mode ultrasound using morphological criteria (absolute or relative ovarian size, echotexture, location, and configuration) is both sensitive and specific (average 92 and 96%, respectively) for the diagnosis of ovarian torsion in girls younger than 18 years. Doppler ultrasound DUS is specific in diagnosing ovarian torsion, but not very sensitive [16](#)
- Absent venous Doppler flow had a positive predictive value as high as 94% for ovarian torsion; however, arterial Doppler flow persisted in up to 60% of patients with torsion. The absence of Doppler flow does not occur in every case and may occur only as a late finding in ovarian torsion. The persistence of normal Doppler flow in proved torsion may be due to the dual blood supply of the ovary (ovarian artery and branches from the uterine artery or a second ovarian artery) and to intermittent or partial torsion [5,6](#)
- Therefore, ***it is crucial to understand that the presence of Doppler flow cannot be used to exclude the diagnosis***, [6,17](#) rather a combination of findings (history, physical examination, and an abnormal ultrasound finding) all which are neither sensitive nor specific, must be used to establish the diagnosis of ovarian torsion [6](#)
- Due to its limited and varied accuracy, when ultrasound findings are inconclusive, emphasis should be placed on proceeding with surgery [18](#)
- Ultrasound findings suggestive of tubo-ovarian torsion include [2,3,5,7,8,10,11,12,15,19](#)
 - Ovarian enlargement (often asymmetric)
 - Ovary located above and medial to its usual location
 - Free pelvic fluid
 - Oedematous echogenic ovarian stroma
 - Absent arterial / venous flow
 - Presence of tubo-ovarian mass
 - Peripherally placed follicles
 - A fallopian tube that has undergone torsion can appear dilated, edematous and fluid-filled if a hydrosalpinx or paratubal cyst is present
 - The 'beak sign' refers to the tapered ends of the fallopian tube
 - Twisting of the vascular pedicle can produce a specific feature, the 'whirlpool sign'
- As computed tomography (CT) is commonly used in emergencies involving acute abdominal pain, it may be the first modality performed in patients with torsion. [3,5,9,11](#) In this instance, when CT demonstrates findings of ovarian torsion, the performance of another imaging exam (i.e. US) that delays therapy is unlikely to improve preoperative diagnostic yield [20](#)
- Nevertheless, computed tomography has a low diagnostic sensitivity and should not be used to diagnose ovarian torsion in children [16](#)
- MRI is not commonly employed as a first-line imaging study in suspected torsion, but can be helpful in pregnant patients or as a problem solver in equivocal cases. [2,3,5,8,12,21](#) However, when ovarian torsion is suspected, laparoscopy is still considered the best diagnostic and therapeutic approach for younger children, older adolescent females and in pregnancy [1,2,4,7,9,17,18,22,23,24](#)

Laparoscopy

- Imaging features (e.g. twisted pedicle or abnormal enhancement) are insensitive. Similarly, sensitive features (e.g. ovarian enlargement or mass) are nonspecific and cannot confirm the diagnosis [19](#)



- In the context of patients with a high level of clinical suspicion of torsion, the absence of suspicious imaging features does not exclude the diagnosis, unless another cause for the patient's symptoms is identified [18,19](#)
- The difficulty in diagnosis was illustrated in a series of 115 cases of tubo-ovarian torsion that revealed that the correct preoperative diagnosis was made in only 38 percent of patients [10](#)
- In cases where examination and ultrasound suggest a high probability of ovarian torsion, surgery should be performed as quickly as possible to enable prompt restoration of the ovarian blood supply before significant damage occurs [8](#)
- The reported interval from admission to surgery ranged between 4.8 and 35.7 hours in the paediatric population presenting with ovarian torsion. A delay of up to 25 hours is considered by many authorities not detrimental to the future viability of the ovary. [6,17,18](#) Laparoscopy is considered the best diagnostic and therapeutic approach, especially for the younger children and older adolescent females, [1,2,7,9,17,18,22,23](#) with similar outcomes when compared to laparotomy but with shorter hospital stay, fewer febrile morbidities and lesser analgesic requirement post-operation [9,18,26](#)
- If the torsed ovary is > 75 mm, laparotomy should be performed [27](#)
- Pregnancy
 - Ovarian torsion occurs most commonly in the first trimester (incidence of 68%), followed by 20% in the second, and 22% in the third [4](#)
 - Therefore, surgical treatment remains the management of choice in ovarian torsion irrespective of the size, nature of the mass and the trimester in which the patient presents [11](#)
 - Laparoscopy in pregnancy is well tolerated and should be the primary option in the symptomatic patient [4,24](#)
- The reasoning behind this is due to the unique pathophysiology of ovarian torsion and ovarian anatomy, that is [28,29](#)
 - Ovarian torsion leads first to lymphatic and venous obstruction followed by obstruction of arterial flow
 - Secondly, the dual blood supply of ovaries (ovarian and uterine arteries) protects them against complete ischemia. As a result, patients can experience significant pain from torsion while still maintaining adequate arterial blood flow to the ovary
- Regardless, the likelihood of preserving viable ovarian tissue with conservative surgery (de-torsion) decreases over time, with some evidence that pain for longer than 48 hours is associated with a significant decrease in successful outcome [8,28](#)
- A comparative study has shown that girls presenting with suspected ovarian torsion waited 2.5 times as long for diagnostic imaging and 2.7 times as long to be taken to the operating room when compared to boys with suspected testicular torsion with gonadal salvage rates significantly worse for girls [30](#)
- Factors contributing to this include patient and healthcare factors
 - Patient factors
 - The nonspecific and vague pelvic pain [results in delayed (up to 72 hours of pain) presentation to hospital] [30](#)
 - Inconclusive physical examination (unreachable ovaries, pelvic organ) [30](#)
 - Patient refusal to undergo emergency operation during the night hours [18](#)
 - Stabilization of patients with additional systemic disease [18](#)
 - Healthcare
 - Less urgent clinical assessment in girls with suspected ovarian torsion, to rule-out common diagnosis, such as appendicitis [30](#)
 - Ultrasound findings which are either non-diagnostic or an enlarged ovary is often misinterpreted as concerning for an underlying malignancy, which causes a hesitancy to implement ovarian salvage in many case series were seen [30](#)
 - Anesthesiologist's request for a full 6-hour fast [18](#)

- Surgeon's allowing a delay due to low clinical suspicion [18](#)
- This result in the window of opportunity for salvage often felt to have already closed, resulting in most girls undergoing an oophorectomy [30](#)
- Other authors have recommended that a more urgent intervention for ovarian torsion, with liberal use of diagnostic laparoscopy and without reliance on a definitive diagnosis by imaging, should be considered in girls with lower abdominal pain with high suspicion of ovarian torsion, [25,30](#) with a prospective study demonstrating > 80% of patients were accurately diagnosed as having tubo-ovarian torsion clinically before undergoing laparoscopy, thus stressing the importance of performing the procedure in cases with high clinical suspicion [31](#)
- Although a radiologist should raise concern for ovarian torsion especially when multiple suggestive imaging features are encountered, the radiologist should also communicate the need for an experienced gynaecologic evaluation for further patient management. [19](#) This is because a confirmed or suspected ovarian torsion will require surgical intervention [6](#)

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Date of literature search: December 2015

The search methodology is available on request. [Email](#)

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

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