ADNEXAL TORSION: An uncommon but not exceptional diagnosis in an Emergency Radiology Department.

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Learning objectives

- To raise awareness among radiologists of adnexal torsion as a possible unexpected finding in women referred to the Radiology Department for investigation of other more common processes with similar clinical presentation, such as appendicitis, diverticulitis or renal colic among others.

- To describe the imaging findings of this entity on US and CT, modalities that are widely available in an emergency setting.
Background

Adnexal torsion occurs when the ovary, fallopian tube, or more commonly both of them, twist at least one complete turn around the axis created by the suspensory or infundibulopelvic ligament and utero-ovarian ligament (Fig. 1).

References: Modified from ukgynaecolgist.com

PATHOPHYSIOLOGY

The consequence of adnexal torsion is a gradual obstruction of venous and lymphatic outflow and arterial inflow. First, low-pressure venous and lymphatic outflow are compromised, leading to stromal edema and consequently ovarian enlargement and pain.

- O: Ovary
- T: Fallopian tube
- 1: Utero-ovarian ligament
- 2: Suspensory or infundibulopelvic ligament
increase of pressure. If venous flow is completely obstructed, the massive edema created may subsequently interrupt arterial blood supply. In other situations, interruption of the arterial inflow may be the initial consequence after torsion. In both cases, compromise of arterial supply results in ischaemia. Prolonged ischaemia leads to haemorrhagic infarction and necrosis. This latter scenario may be the origin of systemic complications such as peritonitis, thrombophlebitis or even death.

- **EPIDEMIOLOGY AND PREDISPOSING FACTORS**

The incidence of adnexal torsion in patients undergoing emergency surgery for acute pelvic pain is about 2.5 - 7.4%. Although adnexal torsion may occur in women of any age, the highest prevalence is in young women in their reproductive years. The risk is also increased during the first year of life and around menarche. Pregnancy is a well-known predisposing factor, accounting for approximately 20% of all cases, and most of them occur before week 20. Women undergoing gonadotrophin ovulation induction for in vitro fertilization have also an increased risk for torsion.

Right side is more commonly affected. It has been postulated that a physiologically longer right utero-ovarian ligament may be the cause involved, whereas it has also been reported that space occupied by sigmoid colon within the left side can protect the ipsilateral ovary from swinging. Most of ovarian torsions in otherwise healthy ovaries are right. When torsion is associated to a preexistent mass, frequencies are less different.

Although adnexal torsion may occur in an ovary without an underlying lesion, a higher incidence is reported when there is an ovarian mass. Adnexal torsion in a healthy ovary is more common in adolescents. Different causes have been postulated, such as elongated utero-ovarian ligament or some other kind of malformations. Tubal spasms, strenuous exercise or abrupt changes in intraabdominal pressure may also be responsible. Conversely, a previous history of endometriosis or inflammatory pelvic disease prevent an otherwise healthy ovary from twisting due to the adhesions that are developed by these entities.

One of the main predisposing factors for torsion is the presence of an underlying adnexal mass, accounting for 50 - 90% of cases. The most common involved masses are functional follicles greater than 5cm and benign neoplasms, such as cystoadenoma and especially benign teratomas. Malignant neoplasms also may predispose to adnexal torsion, but it is less typical because this kind of malignancies is a source of adhesions that avoid the ovary from twisting. Adnexal torsion during pregnancy is usually secondary to the presence of a corpus luteum cyst. Tuboovarian torsion in ovulation induction for in vitro fertilization may occur due to the development of large cystic ovaries, but also because of the increase in volume and weight of the ovaries.
There are other several risk factors for adnexal torsion that have been cited. Presence of hydrosalpinx or any other cause that involve any increase of weight or volume within the tube may facilitate not only isolated tubal torsion but also the complete adnexa. Tube ligation is associated with a higher risk for torsion, since electrocoagulation may damage the mesosalpinx, resulting in increase of laxity. Moreover, obstruction of the tube allows the secretions to accumulate causing a hydrosalpinx.

**Table 1** is a summary of predisposing and protective factors for adnexal torsion.

| Predisposing factors for adnexal torsion |  |
|-----------------------------------------|  |
| Ovary without underlying mass           | Ovary with underlying mass (physiological and non-physiological masses) |
| Elongated uteroovarian ligament         | Functional follicles greater than 5cm |
| Tubal spasms                            | Luteal cyst during pregnancy |
| Abrupt changes in intraabdominal pressure | Ovulation induction |
| Strenous exercises.                     | Teratoma |
| Hydrosalpinx                            | Cystoadenoma |
| Tube ligation                           | Malignant neoplasm (slight increase due to the development of adhesions) |

**Protective factors for adnexal torsion**

( due to the development of adhesions)

- Endometriosis
- History of pelvic inflammatory disease

**Table 1**: Predisposing and protective factors for adnexal torsion.

**References**: A. Urbina Balanz UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES

- **CLINICAL FINDINGS**

Adnexal torsion remains an entity often misdiagnosed in an Emergency Department. Its nonspecific clinical presentation may mimic many other more commonly encountered diseases, such as appendicitis, renal colic, diverticulitis, torsion of an epiploic appendix, rupture of a corpus luteum or tuboovarian abscess among others. Most women with a torsed adnexa experience a sudden onset of intense lower abdominal or pelvic pain. It
often radiates to lumbar region, simulating a renal colic. Nausea and vomiting are present in up to 70% of cases, and pyrexia may rarely occur.

Sometimes partial or intermittent torsion may occur, and this situation usually presents in more subtle and subacute way. There may be a history of intermittent pain during several previous days or similar episodes in the past.

On clinical examination a palpable hypogastric mass may be found. It has also been described unilateral latrouterine pain triggered by vaginal touch as a sign of adnexal torsion. Peritoneal signs are associated with increased risk of ovarian necrosis.

**LABORATORY FINDINGS**

Slight leucocytosis may be present, although it is not a persistent finding. White cell levels and C reactive protein (CRP), if elevated, are lower than in appendicitis. It has also been reported the presence of sterile pyuria, suggesting that urinary tract infection as an alternate diagnosis may delay timely intervention.
Fig. 1: Schematic diagram of the most common type of adnexal torsion, involving the ovary and fallopian tube.

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### Predisposing factors for adnexal torsion

<table>
<thead>
<tr>
<th>Ovary without underlying mass</th>
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### Protective factors for adnexal torsion
( due to the development of adhesions)

- Endometriosis
- History of pelvic inflammatory disease

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**Table 1:** Predisposing and protective factors for adnexal torsion.

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Findings and procedure details

IMAGING FINDINGS

As we have previously discussed, ovarian torsion may occur in an otherwise healthy ovary, or it may be the result of a complication of an adnexal mass. The findings in each of the conditions may be different.

- **X-ray findings**

It is not a useful imaging modality for diagnosing adnexal torsion, as these organs are never displayed on a plain radiograph. Nevertheless, when this diagnosis has not been clinically considered, detection of certain types of coarse pelvic calcifications or mass effects within the pelvis, may lead the radiologist to suspect the presence of a teratoma. In an appropriate clinical setting, the radiologist may be the first to raise the diagnosis of a secondary adnexal torsion as a possibility (Fig. 2).

**Fig. 2**: A 34-year-old female with lower left abdominal pain radiated to left renal fossa. Neither pyrexia, vomiting or peritoneal signs. Analysing revealed leucocytosis. A and
B. An abdominopelvic X-ray examination was performed searching for renoureteral lithiasis. It demonstrated a mass-effect in a midline position (white arrowheads) distorting the shape of the bladder, and a coarse pelvic calcification (white arrow) that resembles a group of three teeth. The radiologist considered the possibility of teratoma, and taking into account the clinical presentation, secondary adnexal torsion had to be raised. Gynaecologic ultrasound confirmed the suspicion of teratoma, and laparoscopy revealed a three turns left adnexal torsion with ischemia and necrosis. Teratoma and left adnexa were surgically removed.

References: RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES

- Ultrasound findings

When tuboovarian torsion is suspected, ultrasound is usually the imaging modality of choice to be performed. Furthermore, when this entity is not clinically considered, ultrasound is still an appropriate imaging modality for investigating an acute nonspecific lower abdominal or pelvic pain in a usually young woman, since it is free of ionizing radiation exposure and it is widely available in the emergency setting.

Ovary enlargement secondary to edema caused by venous and lymphatic outflow obstruction is the most constant finding reported on US imaging. A torsed ovary usually measures more than 4.5-5 cm, and due to stromal edema, follicles are displaced to the periphery (Fig. 3). This latter finding is a very important feature, since an enlarged ovary with multiple cystic lesions may also be misinterpreted as an uncomplicated ovarian mass. Some of these peripheral cystic lesions may have echoic content due to intracystic haemorrhage secondary to ischemia.
Fig. 3: A 28-year-old female with 8-hour history of right renal fossa pain, nausea and vomiting. An ultrasound was performed to rule out a complicated renal colic. A. An enlarged right ovary up to almost 6 cm with multiple small peripheral follicles was revealed. B. Color Doppler analysis showed lack of intraovarian flow. Surgery revealed a torsed right ovary with ischemic changes. No adnexal masses were found. Oophorectomy was the treatment of choice. U: Uterus.

References: RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES

A previously normal twisted ovary may be located above or medial to its usual position, sometimes placed within the Douglas pouch (Fig. 4). We can also observe deviation of the uterus towards the involved adnexa, probably secondary to traction produced from fallopian tube (Fig. 6 and video from Fig.7).

A concomitant torsed tube may appear as an elongated and dilated structure that may be occupied by hyperechoic haemorrhagic content. When not dilated, it is often difficult to visualize. Sometimes, a torsed tube may enlarge and develop small cystic changes, making it difficult to differentiate from a normal ovary, whereas the twisted ovary itself is misinterpreted as an adjacent ovarian mass (Fig. 5). Other times, a dilated torsed tube may resemble an ovarian cyst.
Fig. 4: A 6-year-old female complaining of 2-day history of right lower quadrant colic pain. No other signs or symptoms, except for a single episode of vomiting. Ultrasound was performed. A: Gray-scale US demonstrated a mass with cystic components located within the pouch of Douglas in a midline position. There was also a small amount of free intraperitoneal fluid (white arrow) with finely granular echogenic content. B. Color Doppler analysis did not show intralesional flow. A slight Doppler signal was evident in a small rounded structure located next to the mass (see Figure 5). Findings suggested an ovarian mass, probably a teratoma, and a possible secondary adnexal torsion had to be raised in an appropriate clinical context because of the atypical location of the mass, the presence of intraperitoneal fluid and the abnormal Doppler signal. Continue in Fig. 5 B Bladder

References: RADIOLIOgy, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
Fig. 5: Same patient as in Fig. 4. Gray-scale ultrasound demonstrating again the mass with cystic components located in the pouch of Douglas. Adjacent to it there is a small round structure with small cystic changes (red arrow). This structure was at first misinterpreted as a normal adjacent ovary with an associated mass. Surgery revealed a twisted right adnexa with necrosis and without an underlying mass. The smaller round structure corresponded to the torsed fallopian tube.

References: RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
Fig. 6: A 14-year-old female with thirty-six hours history of progressive right lower quadrant pain, nausea and vomiting. No other signs or symptoms. No analytical findings of interest. Initial ultrasound performed to rule out appendicitis did not show findings of interest. A second ultrasound was performed due to the persistence of symptoms. A. Gray-scale ultrasound revealed an enlarged right ovary with several peripheral small follicles. The uterus was deviated to the side of the involved adnexa (white arrow: body of the uterus; red arrow: endometrial stripe). This is best appreciated in video of Fig. 7. B: Color Doppler ultrasound showed lack of intraovarian flow. C: Intraperitoneal fluid in right hepatorenal recess. Surgery revealed a torsed right adnexa with necrotic changes. No adnexal masses were found. Salpingo-oophorectomy was performed.

References: RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
**Fig. 7:** Same patient as in Fig. 6. The video shows an enlarged right ovary and a deviated uterus (upper right corner) to the right side, probably secondary to traction from right fallopian tube. It can also be observed a cystic structure with echoic content, probably a haemorrhagic follicle. Free intraperitoneal fluid is also seen.

**References:** RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES

When torsion is secondary to an adnexal mass, gray-scale ultrasound may just reveal the underlying lesion. An abnormal location near the midline, above the uterus or in the pouch of Douglas, should raise the suspicion of a possible associated torsion in a compatible clinical setting. When a cystic lesion is responsible, a thickened wall may
be present, although it a very nonspecific sign. When the lesion has a peripheral solid component or is predominantly solid, intralesional Doppler signal must be obtained. It must be remembered that not only ovarian lesions are involved in adnexal torsion, but also tubaric lesions. These lesions, often cystic, may cause tuboovarian torsion and less frequently isolated tubal torsion. This latter diagnosis may be even more challenging (Fig. 8).

Fig. 8: A 14-year-old female complaining of 8-hour history of right lower quadrant pain with nausea and vomiting. Analytical revealed leucocytosis. She underwent an ultrasound for investigation of a possible appendicitis. A. A complex mass was identified in the right adnexal region. Although it was predominantly cystic, there were multiple solid poles (white arrow). B. Color Doppler analysis revealed no flow within the largest solid component. C. An enlarged right ovary was identified. D. Left ovary remained a normal size and shape. These findings led the radiologist to raise the possibility of right adnexal torsion secondary to an underlying solid-cystic mass. Surgery revealed a right paraovaric cystic lesion complicated with three turns isolated right fallopian tube torsion. Both ovaries were normal. Pathology revealed a mesonephric cyst.

References: RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
A variable amount of free intraabdominal fluid is usually revealed when there are ischemic or necrotic changes.

- **Doppler ultrasound findings**

Color Doppler imaging in a torsed adnexa may demonstrate a wide range of variability depending on the degree of vascular compromise. When there is venous outflow obstruction but there is still arterial inflow, Doppler signal can show normal arterial spectral Doppler tracings without venous flow. In fact, as it is described in the literature, decreased or absence of venous waveforms is the most common finding, regardless of the arterial waveforms. The presence of arterial Doppler signal in a torsed adnexa is explained not only by the persistence of arterial inflow in the early stages of torsion but also by the dual arterial supply of the ovary.

When arterial Doppler signal becomes abnormal, it is always preceded by abnormal venous flow. Sometimes, even central venous Doppler signal is confirmed in a twisted ovary. This has been linked to viability of the ovary after detorsion. Intermittent or partial torsion may also show arterial venous normal waveforms.

In conclusion, although a wide variability of Doppler findings limits its value for diagnosing adnexal torsion, any abnormal spectral Doppler tracing found in an abnormal gray-scale appearance ovary is highly suspicious for torsion.

In all cases we have presented, Doppler signal analysis revealed absence of arterial and venous flow (see **Fig. 3**, **Fig. 4**, **Fig. 6** and **Fig. 8**).

Sometimes, a twisted vascular pedicle can be identified on US. This rotation site may appear as a round shape mass with multiple concentric and hypoechoic stripes. When color Doppler imaging show flow inside these concentric vascular structures, it is called the whirlpool sign. Nevertheless it is not a common finding.

- **CT findings**

In recent years there has been a widespread use of CT in an Emergency Department. It has become a very useful imaging modality to assess an increasing number of pathologies with acute lower abdominal or pelvic pain. In addition, CT also allows the radiologist a better evaluation when US exam has been incomplete or unclear.

As on US, asymmetric ovarian enlargement is the most common finding on CT. An enlarged ovary usually appears as a well-defined pelvic mass with smooth margins.
Multiple peripheral follicles are also a common finding, although they are worse defined than on US (Fig. 9). Sometimes, these peripheral cysts may have a higher density due to the presence of haemorrhagic content. They even may show a layering hematocrit level. Diffuse adnexal haemorrhage, another described feature of torsion, is often difficult to confirm, since most CT are contrast-enhanced. On contrast-enhanced CT imaging, a twisted adnexa may not enhance at all or it may be partially enhanced, depending on the degree of flow obstruction.

**Fig. 9:** Same patient as in Fig. 3. Contrast-enhanced CT scan. A. An enlarged hypoenhancing right ovary (white arrowheads) with several peripheral cysts (white arrows) is revealed. B. A contrast-enhanced CT scan obtained caudad to A, showing a slight deviation of the uterus (U) towards the right side (yellow arrow), probably because of traction from the torsed adnexa. C. A contrast-enhanced CT scan obtained caudad to B. Free intraperitoneal fluid and mild fat-stranding is observed (red arrows), suggestive of ischaemic/necrotic changes.

**References:** RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
The location within the pelvis of a twisted adnexa may be unusual, normally deviated towards the contralateral side or in a midline position, frequently in a far posterior position in the pouch of Douglas or in a far anterior location above the uterus. This finding is better depicted when adnexal torsion is secondary to an underlying mass. In fact, an adnexal lesion abnormally located in or near the midline, in the pouch of Douglas, or above the uterus, may raise the possibility of complication with torsion in an appropriate clinical setting. A thickened wall in case the underlying lesion is cystic is another key finding to suspect torsion. See Fig. 10, Fig 15 and Fig. 16

**Fig. 10:** A 46-year-old woman presenting to Emergency Department with lower abdominal pain radiated to left flank. She had complained about similar episodes in the recent past. No other clinical findings of interest. A. Contrast-enhanced CT scan showing an unilocular cystic lesion (yellow asterisk) with a mild thickened wall. It seems to be adnexal in origin, but it is abnormally located very near the midline. B. A reformatted coronal contrast-enhanced CT scan showing the lesion located above the uterus (green arrow). B=Bladder. The radiologist raised the possibility of torsion secondary to a cystic lesion. Surgery revealed a twisted cystic adnexal lesion on the right. Necrotic changes were found.

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Visualization of a torsed fallopian tube may be very difficult. Sometimes it can be displayed as wall thickening greater than 3mm and distention/dilatation (Fig 11, Fig. 12, Fig. 13 and Fig. 14). When dilated it is possible to detect a layering hematocrit level secondary to haemorrhagic content (Fig 15 and Fig. 16). Nevertheless it is not a rare finding for a twisted fallopian tube to appear as a poorly-defined amorphous masslike structure. This structure is difficult to differentiate from a twisted vascular pedicle.
Free intraperitoneal fluid and fat infiltration are also common findings when ischaemic and necrosis are present.

**Fig. 11:** A 40-year-old female with a 3-day history of right lower quadrant pain. No other clinical or analytical findings of interest. A. An ultrasound was performed. It demonstrated a predominantly cystic lesion with mild thickening of the wall. Doppler signal was absent B. Contrast-enhanced CT scan revealed an unilocular cystic right adnexal mass (yellow asterisk) far anterior and above the uterus, near the midline. A thin band of ovarian tissue is displayed (white arrow). C. Contrast-enhanced CT scan obtained caudad to B showing an amorphous masslike structure with inflammatory changes corresponding to an enlarged fallopian tube and twisted pedicle (red arrow). Free intraperitoneal fluid (yellow arrow) and a uterine fibroid (F) are also seen. The radiologist raised the possibility of adnexal mass and associated adnexal torsion. Surgery confirmed these findings and pathology revealed cystoadenoma. See also Fig. 12.

**References:** RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
**Fig. 12:** Same patient as in Fig. 11. Reformatted coronal contrast-enhanced CT scan showing the unilocular cystic right adnexal mass (yellow asterisk) abnormally located near the midline, and an enlarged and poorly-defined masslike structure suggestive of a torsed fallopian tube and twisted pedicle (red arrows).

**References:** RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
**Fig. 13:** A 27-year-old woman complaining of left lower quadrant pain. No analytical findings of interest. Axial oblique reformatted contrast-enhanced CT scan reveals a fat-containing mass located in the midline within the pouch of Douglas (yellow asterisk). A small calcification is also observed within the mass. An enlarged and dilated left fallopian tube is also identified (red arrows). These findings are very suggestive of mature teratoma based on the fat content. Its abnormal location in the midline and the enlargement of fallopian tube should make us think about a possible associated torsion. Surgery revealed a three turns torsed teratoma associated to tubal torsion. Multiplanar reformatted CT scan in Fig. 14.

**References:** RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
Fig. 14: A, B and C. Multiplanar reformatted contrast-enhanced CT scan of the same patient as in Fig. 13 (oblique sagital, oblique coronal and oblique axial). Teratoma located in the Douglas pouch (yellow asterisk) and enlarged fallopian tube (red arrows) are displayed. D. Axial contrast-enhanced CT scan. U: Uterus.

References: RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
**Fig. 15**: A 20-year-old female presenting to Emergency Department with a 2-day history of right lower quadrant pain. Clinical examination revealed peritoneal signs. Analytical revealed slight leucocytosis. Contrast-enhanced CT scan was performed. A. An enlarged ovary (white arrowheads) with several peripheral cystic lesions (white arrows) is observed. B. Contrast-enhanced CT scan caudad to A reveals a tortuous elongated tubular structure within the pouch of Douglas corresponding to a dilated fallopian tube (white asterisks). We can also observe a layering hematocrit level inside the dilated tube, related to the presence of intratubal haemorrhage (red arrow). A normal left ovary is also identified (yellow arrow). C. Contrast-enhanced CT scan obtained caudad to B shows fat infiltration (green arrow), probably related to ischaemic or necrotic changes. These findings are also depicted in video in Fig. 16.

**References**: RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL DEL TAJO - Madrid/ES
Fig. 16: Same patient as Fig. 16. Video showing all the findings described in Fig. 16.

References: RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL DEL TAJO - Madrid/ES
Fig. 2: A 34-year-old female with lower left abdominal pain radiated to left renal fossa. Neither pyrexia, vomiting or peritoneal signs. Analysing revealed leucocytosis. A and B. An abdominopelvic X-ray examination was performed searching for renoureteral lithiasis. It demonstrated a mass-effect in a midline position (white arrowheads) distorting the shape of the bladder, and a coarse pelvic calcification (white arrow) that resembles a group of three teeth. The radiologist considered the possibility of teratoma, and taking into account the clinical presentation, secondary adnexal torsion had to be raised. Gynaecologic ultrasound confirmed the suspicion of teratoma, and laparoscopy revealed a three turns left adnexal torsion with ischemia and necrosis. Teratoma and left adnexa were surgically removed.

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Fig. 3: A 28-year-old female with 8-hour history of right renal fossa pain, nausea and vomiting. An ultrasound was performed to rule out a complicated renal colic. A. An enlarged right ovary up to almost 6 cm with multiple small peripheral follicles was revealed. B. Color Doppler analysis showed lack of intraovarian flow. Surgery revealed a torsed right ovary with ischemic changes. No adnexal masses were found. Oophorectomy was the treatment of choice. U: Uterus.

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Fig. 4: A 6-year-old female complaining of 2-day history of right lower quadrant colic pain. No other signs or symptoms, except for a single episode of vomiting. Ultrasound was performed. A: Gray-scale US demonstrated a mass with cystic components located within the pouch of Douglas in a midline position. There was also a small amount of free intraperitoneal fluid (white arrow) with finely granular echogenic content. B. Color Doppler analysis did not show intralesional flow. A slight Doppler signal was evident in a small rounded structure located next to the mass (see Figure 5). Findings suggested an ovarian mass, probably a teratoma, and a possible secondary adnexal torsion had to be raised in an appropriate clinical context because of the atypical location of the mass, the presence of intraperitoneal fluid and the abnormal Doppler signal. Continue in Fig. 5 B Bladder © RADIOLOGY, UCR: Unidad Central de Radiodiagnóstico, HOSPITAL INFANTA SOFÍA - Madrid/ES
**Fig. 5**: Same patient as in Fig. 4. Gray-scale ultrasound demonstrating again the mass with cystic components located in the pouch of Douglas. Adjacent to it there is a small round structure with small cystic changes (red arrow). This structure was at first misinterpreted as a normal adjacent ovary with an associated mass. Surgery revealed a twisted right adnexa with necrosis and without an underlying mass. The smaller round structure corresponded to the torsed fallopian tube.

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Fig. 6: A 14-year-old female with thirty-six hours history of progressive right lower quadrant pain, nausea and vomiting. No other signs or symptoms. No analytical findings of interest. Initial ultrasound performed to rule out appendicitis did not show findings of interest. A second ultrasound was performed due to the persistence of symptoms. A. Gray-scale ultrasound revealed an enlarged right ovary with several peripheral small follicles. The uterus was deviated to the side of the involved adnexa (white arrow: body of the uterus; red arrow: endometrial stripe). This is best appreciated in video of Fig. 7. B: Color Doppler ultrasound showed lack of intraovarian flow. C: Intraperitoneal fluid in right hepatorenal recess. Surgery revealed a torsed right adnexa with necrotic changes. No adnexal masses were found. Salpingo-oophorectomy was performed.

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Fig. 7: Same patient as in Fig. 6. The video shows an enlarged right ovary and a deviated uterus (upper right corner) to the right side, probably secondary to traction from right fallopian tube. It can also be observed a cystic structure with echoic content, probably a haemorrhagic follicle. Free intraperitoneal fluid is also seen.

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Fig. 8: A 14-year-old female complaining of 8-hour history of right lower quadrant pain with nausea and vomiting. Analytical revealed leucocytosis. She underwent an ultrasound for investigation of a possible appendicitis. A. A complex mass was identified in the right adnexal region. Although it was predominantly cystic, there were multiple solid poles (white arrow). B. Color Doppler analysis revealed no flow within the largest solid component. C. An enlarged right ovary was identified. D. Left ovary remained a normal size and shape. These findings led the radiologist to raise the possibility of right adnexal torsion secondary to an underlying solid-cystic mass. Surgery revealed a right paraovaric cystic lesion complicated with three turns isolated right fallopian tube torsion. Both ovaries were normal. Pathology revealed a mesonephric cyst.

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Fig. 9: Same patient as in Fig. 3. Contrast-enhanced CT scan. A. An enlarged hypoenhancing right ovary (white arrowheads) with several peripheral cysts (white arrows) is revealed. B. A contrast-enhanced CT scan obtained caudad to A, showing a slight deviation of the uterus (U) towards the right side (yellow arrow), probably because of traction from the torsed adnexa. C. A contrast-enhanced CT scan obtained caudad to B. Free intraperitoneal fluid and mild fat-stranding is observed (red arrows), suggestive of ischaemic/necrotic changes.

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Fig. 10: A 46-year-old woman presenting to Emergency Department with lower abdominal pain radiated to left flank. She had complained about similar episodes in the recent past. No other clinical findings of interest. A. Contrast-enhanced CT scan showing an unilocular cystic lesion (yellow asterisk) with a mild thickened wall. It seems to be adnexal in origin, but it is abnormally located very near the midline. B. A reformatted coronal contrast-enhanced CT scan showing the lesion located above the uterus (green arrow). B=Bladder. The radiologist raised the possibility of torsion secondary to a cystic lesion. Surgery revealed a twisted cystic adnexal lesion on the right. Necrotic changes were found.

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**Fig. 11:** A 40-year-old female with a 3-day history of right lower quadrant pain. No other clinical or analytical findings of interest. A. An ultrasound was performed. It demonstrated a predominantly cystic lesion with mild thickening of the wall. Doppler signal was absent B. Contrast-enhanced CT scan revealed an unilocular cystic right adnexal mass (yellow asterisk) far anterior and above the uterus, near the midline. A thin band of ovarian tissue is displayed (white arrow). C. Contrast-enhanced CT scan obtained caudal to B showing an amorphous masslike structure with inflammatory changes corresponding to an enlarged fallopian tube and twisted pedicle (red arrow). Free intraperitoneal fluid (yellow arrow) and a uterine fibroid (F) are also seen. The radiologist raised the possibility of adnexal mass and associated adnexal torsion. Surgery confirmed these findings and pathology revealed cystoadenoma. See also Fig. 12.

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Fig. 12: Same patient as in Fig. 11. Reformatted coronal contrast-enhanced CT scan showing the unilocular cystic right adnexal mass (yellow asterisk) abnormally located near the midline, and an enlarged and poorly-defined masslike structure suggestive of a torsed fallopian tube and twisted pedicle (red arrows).

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Fig. 13: A 27-year-old woman complaining of left lower quadrant pain. No analytical findings of interest. Axial oblique reformatted contrast-enhanced CT scan reveals a fat-containing mass located in the midline within the pouch of Douglas (yellow asterisk). A small calcification is also observed within the mass. An enlarged and dilated left fallopian tube is also identified (red arrows). These findings are very suggestive of mature teratoma based on the fat content. Its abnormal location in the midline and the enlargement of fallopian tube should make us think about a possible associated torsion. Surgery revealed a three turns torsed teratoma associated to tubal torsion. Multiplanar reformatted CT scan in Fig. 14.

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Fig. 14: A, B and C. Multiplanar reformatted contrast-enhanced CT scan of the same patient as in Fig. 13 (oblique sagittal, oblique coronal and oblique axial). Teratoma located in the Douglas pouch (yellow asterisk) and enlarged fallopian tube (red arrows) are displayed. D. Axial contrast-enhanced CT scan. U: Uterus.

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**Fig. 15:** A 20-year-old female presenting to Emergency Department with a 2-day history of right lower quadrant pain. Clinical examination revealed peritoneal signs. Analytical revealed slight leucocytosis. Contrast-enhanced CT scan was performed. A. An enlarged ovary (white arrowheads) with several peripheral cystic lesions (white arrows) is observed. B. Contrast-enhanced CT scan caudad to A reveals a tortuous elongated tubular structure within the pouch of Douglas corresponding to a dilated fallopian tube (white asterisks). We can also observe a layering hematocrit level inside the dilated tube, related to the presence of intratubal haemorrhage (red arrow). A normal left ovary is also identified (yellow arrow). C. Contrast-enhanced CT scan obtained caudad to B shows fat infiltration (green arrow), probably related to ischaemic or necrotic changes. These findings are also depicted in video in Fig. 16.

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Fig. 16: Same patient as Fig. 16. Video showing all the findings described in Fig. 16.

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Conclusion

Adnexal torsion is a gynaecological emergency that usually occurs in young women, and timely diagnosis and treatment is essential to preserve the ovary and avoid serious complications such as peritonitis or even death. However, clinical diagnosis is challenging due to its nonspecific clinical presentation, and misdiagnosis is not rare. Radiologists should therefore be familiar with this entity since it may become an unexpected finding when patients are being assessed for other more common diseases.

US and CT are widely available imaging modalities in an emergency setting and can be very helpful in the diagnosis of this pathology. An enlarged ovary with multiple peripheral follicles is the most common finding when there is not an underlying mass. Doppler signal is usually abnormal, although adnexal torsion cannot be excluded when it is present and its value is not yet well established. When adnexal torsion is secondary to an underlying lesion, its abnormal location near the midline is one of the main findings that should raise torsion as a possibility.
References


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