Magnetic resonance imaging findings in adnexial torsion
Achados da ressonância magnética na torção anexial

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ABSTRACT
Adnexial torsion is an unusual event, but a major cause of abdominal pain in women. It is often associated with ovarian tumor or cyst, but can occur in normal ovaries, especially in children. The twisting of adnexal structures may involve the ovary or tube, but frequently affects both. In most cases, it is unilateral, with slight predilection for the right side. In imaging findings, increased ovarian volume and adnexial masses are observed, with reduced or absent vascularization. In cases of undiagnosed or untreated complete twist, hemorrhagic necrosis may occur leading to complications; in that, peritonitis is the most frequent. Early diagnosis helps preventing irreversible damage with conservative treatment, thereby saving the ovary. Limitations in performing physical examination, possible inconclusive results in ultrasound and exposure to radiation in computed tomography makes magnetic resonance imaging a valuable tool in emergency assessment of gynecological diseases. The objective of this study was to report two confirmed cases of adnexial twist, emphasizing the contribution of magnetic resonance imaging in the diagnosis of this condition.

Keywords: Ovary/pathology; Adnexal diseases/diagnosis; Adnexa uteri/diagnosis; Magnetic resonance imaging; Torsion abnormality

INTRODUCTION
Adnexal torsion may affect the ovary, fallopian tube or both. It is an uncommon but important cause of low abdominal pain in women, and it is difficult to make the differential diagnosis with other causes of acute abdomen. It is frequently associated to cystic or solid ovarian masses (50 to 81%) that may develop a pedicle, which is a predisposing factor for partial or complete torsion. Torsion may also affect normal ovaries, usually in children, and is usually unilateral with a slight predominance on the right side, which could be explained by the left pelvis being occupied by the colon, or by hypermobility of the cecum and distal ileum, which are on the right pelvis.

This report examined two confirmed case of adnexial torsion, stressing the contribution of magnetic resonance imaging (MRI) in the diagnosis of this condition.
CASE REPORTS

Case 1

A two-year old patient with history of abdominal discomfort and low fever for one week. The initial laboratory evaluation presented leukocytosis with over 18,000 cells (74% segmented) and the type I urine analysis showed Gram-negative bacteriuria associated with discrete leucocyturia.

Abdominal ultrasound showed normal kidneys, bladder, uterus and right ovary. A solid-cystic nodular formation was observed in the retrovesical region, extending to the left adnexial region (Figure 1). On color Doppler, predominantly peripheral vascularization was seen around the lesion.

In view of the fact that the left ovary was not observed in its usual morphology, a pelvic MRI was requested in order to characterize the adnexial lesion more precisely (Figures 2, 3 and 4). It showed a large increase in volume of the left ovary and uterine tube. A heterogeneous signal of this annex was perceived with slight hypersignal areas in T1 (suggesting hemorrhage) interspersed with small cystic formations, and associated to intense alterations in signal of the periadnexial adipose planes. No enhancement of the lesion was observed in the postcontrast phases. This image corroborated the

Figure 1. Ultrasonography showing a solid-cystic nodular formation occupying the retrovesical region extending to the left adnexial region

Figure 2. Axial T1 weighted MRI imaging with fat suppression, before contrast, showing enlarged left ovary, with heterogeneous sign and some high signal areas

Figure 3. Weighted T2 images – (a) axial, (b) sagittal and (c) coronal – show enlarged left ovary (arrows), with predominance of low signal, and small peripheral follicles of up to 1 cm

Figure 4. Weighted T1 images, after contrast with fat suppression – (a) axial, (b) sagittal and (c) coronal –, with no appropriate contrast of the left ovary. Observe intense enhancement of periovarian fat plans
possibility of adnexial torsion, probably with associated hemorrhagic infarction.

Based on the MRI findings, the patient underwent surgery, characterizing left ovary/annex with a 720° torsion and a well-defined necrosis area, being submitted to a salpingo-oophorectomy. The pathological examination showed necrosis of the ovarian parenchyma and tube with extensive hemorrhagic areas thereby confirming the diagnosis of hemorrhagic infarction (Figure 5).

CASE 2

A 38-year-old patient with a history of low abdominal pain for one day, with nausea and vomiting (four episodes). The laboratory tests showed discreet leukocytosis, with 12,060 cells, with no shifts. The other exams were negative including type I urine analysis and β-HCG. She had been submitted to cholecystectomy and clinical diagnosis of polycystic ovary syndrome, with irregular ovarian cysts observed in a prior ultrasonography. The obstetric past history included one pregnancy and a cesarian section for twins (assisted reproduction).

A transvaginal ultrasonography was performed and showed normal uterus and right ovary (Figure 6). The left ovary presented with normal shape and contour, characteristic ecotexture and slightly increased dimensions. In the left adnexial region, between the uterus and ovary, a heterogeneous, irregular and unspecific formation, with vascularization, was identified. A minimal quantity of free liquid in the posterior cul de sac was seen.

In view of the findings the patient was referred to pelvic MRI, that showed a tenuous tissue with T2 low density signal posterior to the uterus, in the transition between the corpus and the cervix (Figures 7, 8, 9). The left ovary had increased volume with discreet hypersignal of the stroma in weighted T2 images, suggesting edema. There was thickening and heterogeneity in the left ovary/annex, characteristic ecotexture and slightly increased dimensions. In the left adnexial region, between the uterus and ovary, a heterogeneous, irregular and unspecific formation, with vascularization, was identified. A minimal quantity of free liquid in the posterior cul de sac was seen.

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death. In both cases described, the surgical procedure
was carried out as soon as the MR diagnosis was made.
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discomfort and low fever over a period of a week, the
patient was received at the Emergency Service with no
clinical signals that would suggest acute abdomen. In
spite of this, magnetic resonance findings were highly
suggestive of this condition, as confirmed in the surgical
procedure, a 720° adnexial torsion being observed, with
hemorrhage areas (previously observed in the weighted
T1 sequences) and necrosis. Therefore, it was decided
to perform ooforectomy. In the second case, the more
acute clinical status on onset of symptoms allows an
earlier diagnosis with immediate surgical procedure
through laparoscopy which enabled manual distortion
and sparing the gonad.

Ultrasound is usually the first exam to be performed
in emergencies, though it does not have a well-established
role in early diagnosis. Its most common findings are
cystic or complex solid masses, with or without fluid
accumulation in the pelvis, cystic hemorrhage and
parietal thickenings which were considered not specific.
Doppler may be useful in the analyses of twisted
structures by enabling the detection of venous and
arterial flows in the vascular pedicle, but has a limited
specificity as in some cases it may show normal arterial
waves in the annex.

The multiplanar imaging methods, such as tomography
and MRI, enable a global pelvic analysis, favoring the
evaluation of the uterine tube, characterization of the
vascular pedicle and adnexial mass, when present, as
well as detection of other peritoneal findings, such as
ascites and hemoperitoneum. The rapid advance in MR
techniques enabled the differential diagnosis of acute
gynecological conditions, and the development of fast
sequences sufficiently reduced the acquisition time for
their use in emergencies. One combination of weighted
T1 images with and without fat suppression is useful
to envisage the difference between blood and fat and
improves the detection of hyperintense (hematic) lesions
surrounded by fat. The T2 weighted sequences with
and without fat suppression improve conspicuousness of
inflammatory lesions, besides being the ideal sequences
for anatomic evaluation. The images acquired after the
injection of intravenous contrast, with protocols with
dynamic sequences and subtraction techniques, are
useful to evaluate the lesion vascularity.

Kimura et al. demonstrated the most prevalent
signs of ovarian torsion as follows: deviation of the uterus
towards the torsion side, ingurgitation of the ipsilateral
blood vessels, small amount of ascites and obliteration
of the fatty planes around the tumor, these however
being unspecific signs. The uterine deviation towards
the twisting side is explained because the torsion shortens
the supporting structures of the uterus. The ingurgitation
of the blood vessels represents distal venous congestion
to torsion and also on the surface of the tumor.

Hemorrhagic necrosis due to ovarian torsion may be
identified in MR examinations with a combination of T1
weighted images with the suppression of fat before and after
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**DISCUSSION**

The most common presentation of adnexial torsion
consists in abdominal pain of sudden onset, an unspecific
symptom that also appears in other clinical conditions,
such as hemorrhagic acute abdomen, appendicitis and
salpingitis. Although it is considered an acute event,
a subacute or intermittent course may make diagnosis
more difficult.

The torsion of the ovarian pedicle produces
circulatory stasis that is initially venous and that evolves
to an arterial component as the edema from the initial
affection increases. In cases of obstruction of the
arterial supply, the clinical status may also evolve to
hemorrhagic-gangrenous necrosis of the ovary, and, if
there is a suspicion of full torsion, immediate surgery
becomes essential to remove the damaged tissue
and avoid a more serious evolution to peritonitis and
death. In both cases described, the surgical procedure
was carried out as soon as the MR diagnosis was made.
In the first case, a subacute history, with abdominal
discomfort and low fever over a period of a week, the
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spite of this, magnetic resonance findings were highly
suggestive of this condition, as confirmed in the surgical

Figure 9. In weighted T1 images with fat suppression after early (a) and late (b) contrast there is no satisfactory contrast of the ovary and tube on the left (arrows)

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Kimura et al.

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hemorrhage), as well as the absence of enhancement in the postgadolinium dynamic sequences\(^\text{3}\). Other hemorrhagic necrosis indicators include regular and eccentric parietal thickening of the ovarian cystic mass, converging to a thickened tube and hematoma or twisted ovarian mass with the presence of hemoperitoneum\(^\text{1}\).

**CONCLUSION**

Magnetic resonance imaging can help diagnose the adnexial torsion, which is rare and with unspecific clinical presentation, especially in cases in which ultrasound presents negative or non-characteristic findings.

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**REFERENCES**