Ovarian torsion: value of asymmetrical presence of contrast medium of ovarian veins

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Purpose

Ovarian torsion is serious cause of lower abdominal pain and is the gynecologic surgical emergency. Ovarian torsion is an uncommon, estimated as the cause of 2.7% of gynecologic emergencies in the United states. An early and accurate diagnosis is important for fertility preservation. In addition, if the ovarian torsion is complete and is not diagnosed and untreated, hemorrhagic infarction can occur and may lead to peritonitis and death.

The clinical presentation is nonspecific and can mimic other diseases of acute abdominal pain. Imaging therefore plays a central diagnostic role.

Although ultrasonography (US) have been reported to be useful in detecting ovarian torsion, computed tomography (CT) and magnetic resonance imaging (MRI) may also be useful in making the preoperative diagnosis of ovarian torsion.

An accurate diagnosis and differentiation of hemorrhagic from nonhemorrhagic infarction is important for treatment planning. The goal is to identify new findings and to discuss the relation of established findings.
Methods and Materials

We retrospectively reviewed the CT and MRI imaging findings in 38 patients with surgically proved ovarian torsion between 2001 and 2012. The age range of the patients was 11-68 years (mean, 36.7 years). All patients complained of abdominal pain. The interval between the onset of symptoms and CT or MRI imaging ranged from 1 day to 1 month (mean, 2 days). The interval between imaging and surgery ranged from 1 to 9 days (mean, 3 days).

Unenhanced CT was performed in 22 patients and contrast enhanced CT (CECT) was performed 22 patients. CECT alone was performed in 5 patients. Multidetector CT (4-, 16-, and 64-channel) was performed with a section collimation of 5-7 mm at 5-7 mm intervals. A total of 100 ml of contrast agent was administrated intravenously at a rate of 1-4 ml/s. The scanning delay was 70 to 90 seconds.

MR was performed in 25 patients. MR imaging was performed with a 1.5-T and 3.0-T. Dynamic contrast MRI was performed after intravenous injection of gadolinium injection in 14 patients.

We evaluated both ovarian veins: homogenous or heterogeneous enhancement and retrograde or antegrade. We also evaluated established findings: fallopian tube thickening, smooth wall thickening, lack of contrast enhancement, ascites, and uterine deviation.
Results

Surgery

The surgical procedure included ipsilateral salpingo-oophorectomy in 27 (71%), removal of a benign ovarian tumor with preservation of the ovary in 9 (23%), total abdominal hysterectomy and bilateral salpingooophorectomy in one (2%), and only adnexal detorsion in one (2%) of the patients.

Pathology

All of ovarian torsion was unilateral, with a slightly right-sided predominance (20:18). The most common histologic diagnosis was mature cystic teratoma, found in 21 (55%) of the 38 patients. Additional histologic diagnoses were benign cystadenoma in nine (23%), simple cyst in one (2%), cystadenofibroma in one (2%), normal ovary in one (2%), dysgerminoma in one (2%), endometrioid carcinoma in one (2%) of the patients, and histopathologic diagnoses were not identified because of complete tissue necrosis in two (5%). Necrosis of the torsed ovary was encountered at pathologic examination in 24 (63%) of the 38 cases.

Imaging findings

The torsed ovary and tumors were 4 to 14cm (mean, 10.0cm) in largest diameter.

Ovarian veins are identified 21 (96%) at CECT, only both ovarian veins could not be reliably identified in one patient. Heterogeneous enhancement of ovary vein was 7 on right ovarian vein and 8 on the left. All of them, ovarian veins were dominantly enhanced in cranial portion (mainly cranial to iliac crest level) than caudal portion (mainly caudal to iliac crest) and retrograde flow. Full enhancement was 14 on each of the ovarian vein. One right vein was no enhanced. The asymmetrical presence of contrast medium was defined when HU difference between ovarian veins were over 50. It was seen in 6 (28%) patients: affected side ovary veins were heterogeneous enhancement or no enhanced and nonaffected side were homogenous enhancement (figure1.2 and Table1). All of the asymmetrical presence of contrast medium cases were hemorrhagic infarction.

Imaging findings below were summarized in Table2. Details in 6 patient with enhanced asymmetrically of ovarian veins and other findings is summarized in Table3.
Fallopian tube thickening was determined if amorphous solid mass or target-like appearance was noted around the ovarian mass. This finding was seen in 23 (60%) of the 38 patients (figure 3).

In 36 (94%) of the cases of torsed ovary had at least a partially cystic component. And 25 (70%) of these cases wall thickening was present, wall thickening was considered if it exceed 3mm. Wall thickest portion was measured and classified into two groups, 3 < 10mm and >10mm. The latter was mentioned to related hemorrhagic infarction. Wall thickest portion measured 3 < 10mm and >10mm were seen in 12 (48%) and 13 (52%) respectively. 11 cases of the latter (92%) were hemorrhagic infarction (figure 4).

Lack of contrast enhancement was 12 (50%) of the 24 patients: both unenhanced and CECT or dynamic MRI was performed (figure 4).

Hemorrhage within the torsed ovary was determined if its attenuation on unenhanced scans exceeds 50 HU at CT (figure 5). Hemorrhage also can be diagnosed with fat-suppressed T1-weighted images. Hemorrhage within the torsed ovary was seen 17 (47%) of the 36 patients.

Infiltration of pelvic fat was seen in 8 (21%) of the patients. Ascites was seen 10 (26%). Uterine deviation to the side of the involved ovary seen 19 (50%).
Fig. 1: A 46-year-old woman with torsion of left mature cystic teratoma. CECT scan shows asymmetrical presence of contrast medium of ovarian veins. Right vein (arrows) is 160HU and left vein is 60HU (arrowhead) in axial view. Left ovarian vein were dominantly enhanced in cranial portion. * left renal vein.
Fig. 2: A 30-year-old woman with torsion of right mature cystic teratoma. CECT scan shows asymmetrical presence of contrast medium of ovarian veins. Right vein (arrows) is no enhanced: 40HU both unenhanced and CECT. Left vein is 40HU at unenhanced and 110HU at CECT (arrowhead).

Fig. 2

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Table 1: Enhancement of Ovary Veins at CECT

<table>
<thead>
<tr>
<th>Enhanced equally</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>enhanced homogenous</td>
<td>16</td>
</tr>
<tr>
<td>dominantly enhanced in cranial portion</td>
<td>13</td>
</tr>
<tr>
<td>Enhanced asymmetrically</td>
<td>3</td>
</tr>
<tr>
<td>affected side: dominantly enhanced in cranial portion</td>
<td>6</td>
</tr>
<tr>
<td>nonaffected side: homogenous enhancement</td>
<td>5</td>
</tr>
<tr>
<td>affected side: no enhanced</td>
<td>1</td>
</tr>
<tr>
<td>nonaffected side: homogenous enhancement</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
</tr>
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</table>

Table 1

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Table 2: Imaging Findings and percent of hemorrhagic infarction (n=38)

<table>
<thead>
<tr>
<th>Findings</th>
<th>No.</th>
<th>% of seen</th>
<th>% of hemorrhagic infarction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymmetrical enhancement of ovarian veins</td>
<td>6/22</td>
<td>27</td>
<td>100</td>
</tr>
<tr>
<td>Fallopian tube thickening</td>
<td>23/38</td>
<td>60</td>
<td>78</td>
</tr>
<tr>
<td>Wall thickening</td>
<td>25/36</td>
<td>70</td>
<td>72</td>
</tr>
<tr>
<td>thickest portion 3 &lt; 10mm</td>
<td>12/25</td>
<td>48</td>
<td>58</td>
</tr>
<tr>
<td>thickest portion &gt; 10mm</td>
<td>13/25</td>
<td>52</td>
<td>92</td>
</tr>
<tr>
<td>Lack of enhance</td>
<td>12/24</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Hemorrhage within the ovary</td>
<td>17/36</td>
<td>47</td>
<td>82</td>
</tr>
<tr>
<td>Infiltration of pelvic fat</td>
<td>8/38</td>
<td>21</td>
<td>75</td>
</tr>
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</table>
**Table 3: Details in 6 patient with Enhanced asymmetrically**

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
<th>Case 5</th>
<th>Case 6</th>
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<tr>
<td><strong>Age</strong></td>
<td>53</td>
<td>54</td>
<td>11</td>
<td>46</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td><strong>Pathology</strong></td>
<td>Cyst adeno fibroma</td>
<td>Serous cyst adenoma</td>
<td>dysgerminoma</td>
<td>teratoma</td>
<td>teratoma</td>
<td>teratoma</td>
</tr>
<tr>
<td><strong>Laterality</strong></td>
<td>Right</td>
<td>Left</td>
<td>Left</td>
<td>Left</td>
<td>Right</td>
<td>Right</td>
</tr>
<tr>
<td><strong>Tube thickening</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Wall thickening</strong></td>
<td>+ &lt;10mm</td>
<td>+ 10mm&lt;</td>
<td>-</td>
<td>+ 10mm&lt;</td>
<td>+ &lt;10mm</td>
<td>+ 10mm&lt;</td>
</tr>
<tr>
<td><strong>Lack of enhance</strong></td>
<td>+</td>
<td>NA</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td><strong>Hemorrhage</strong></td>
<td>-</td>
<td>NA</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td><strong>Infiltration of pelvic fat</strong></td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**NA=Not applicable**

**Table 3**

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Fig. 3: A 67-year–old woman with torsion of left mature cystic teratoma. Fallopian tube thickening was determined by amorphous solid mass was noted around the ovarian mass (curved arrow). Uterus deviated to the twisted side (arrow) and ascites was seen.

Fig. 3

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**Fig. 4:** A 33-year-old woman with torsion of right mature cystic teratoma. Wall thickening was seen (>10mm) (arrow) and lack of contrast enhancement was seen by comparison unenhanced and CECT. and ascites was seen.

* left ovarian cystic teratoma

**Fig. 4**

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Fig. 5: A 40-year-old woman with torsion of right mature cystic teratoma. Wall thickening was seen (>10mm) Hemorrhage within the torsed ovary was determined by its attenuation on unenhanced scans exceeds 50 (arrow).

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Conclusion

All patient of asymmetrical enhancement of ovarian veins were accompanied with fallopian tube thickening. Since fallopian tube thickening are specific findings to ovarian torsion, asymmetrical enhancement of ovarian veins may have little diagnostic value of torsion. But all of the asymmetrical presence of contrast medium cases were hemorrhagic infarction. Differentiation of hemorrhagic from nonhemorrhagic infarction is important for treatment planning. This finding may suggest hemorrhagic infarction on CECT alone was performed, even if abdomen is only scanned.

Our study had a number of limitations. Our observations were subject to selection bias because only patients referred for CT or MRI were included.

Retrograde flow of ovarian veins was reported in about 40% asymptomatic women. Since serial CT is not available, it is unknown whether flow of ovarian veins are anterograde or retrograde before disease.

Asymmetrical presence of contrast medium of ovarian veins in cases of lower abdominal pain should raise suspicion of ovarian torsion and hemorrhagic infarction.
References


Personal Information

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