Imaging evaluation of ovarian masses.

Poster No.: C-0988
Congress: ECR 2012
Type: Educational Exhibit
Authors: M. Forment Navarro\textsuperscript{1}, C. La Parra Casado\textsuperscript{2}, A. Vera\textsuperscript{2}, C. Martínez Rubio\textsuperscript{2}, M. Mazón Monparler\textsuperscript{2}, J. Cano Gimeno\textsuperscript{2};\textsuperscript{1} Alzira /ES, \textsuperscript{2}Alzira/ES
Keywords: Abdomen, Genital / Reproductive system female, Pelvis, MR, Diagnostic procedure, Neoplasia, Cysts
DOI: 10.1594/ecr2012/C-0988

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR’s endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys’ fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

To establish CT and MRI indications for evaluating ovarian lesions and to describe radiologic findings that allow their characterization.
Background

Ovarian cancer is the 6th most incident cancer in women, and the most lethal gynaecologic cancer. Nevertheless most ovarian lesions are benign in the reproductive age, and surgical removal, usually with laparoscopy, is all the treatment required. Differentiating benign and malignant ovarian lesion is crucial to choose the best treatment option.
Imaging findings OR Procedure details

Due to its availability, ultrasonography is the first imaging technique to evaluate adnexal lesions. When a suspicious of malignant lesion or advanced disease are found on US or other imaging techniques previously performed, CT is used to stage, and MRI is rarely needed. (Fig. 1 on page 6 and Fig. 2 on page 6).

In case the lesion is difficult to clearly assess with ultrasound, MRI is the modality of choice for further evaluation prior to surgery. Not only to evaluate malignant but also to diagnose benign lesions. In addition, MRI is useful to confirm ovarian origin of a pelvic lesion, and it is a precise tool for staging pelvic endometriosis.

Our standard protocol for adnexal MRI comprises axial, coronal and sagittal T2-weighted images, and axial native and fat-suppressed T1-weighted images, before and after the administration of intravenous gadolinium (Fig. 3 on page 7).

After identifying a pelvic lesion, defining its organ dependence is the first diagnostic step, and many radiologic findings may help us in this objective. We must look for ovarian parenchyma and follicles, and its relationship with the lesion. If ipsilateral ovarian parenchyma is separate from the lesion, this will not be an ovarian tumour. A lesion that distorts the edge of the ovary into a beak shape (beak sign) is likely to be an ovarian lesion (Fig. 4 on page 8). Large ovarian lesions typically displace the ureter posteriorly or laterally (as other intraperitoneal lesions), and iliac vessels laterally, while other origin lesions (lymphadenopathies, for example), can displace iliac vessels medially. Moreover, we can track the suspensory ligament or the ovarian vessels emerging from a pelvic mass, confirming an adnexal origin (either tubarian or ovarian), and the presence of incomplete septa inside a cystic adnexal lesion helps us to determine its tubarian origin (Fig. 5 on page 9).

Next step is to determine the cystic or solid nature of the lesion (Table 1 on page 10 and Table 2 on page 11). Most frequent ovarian lesion corresponds to physiologic cysts, with entirely cystic architecture, thin walls and less than 3cm diameter (Fig. 6 on page 12). Bigger lesions without these characteristics, with thin septations, correspond to serous or mucinous cystadenoma, depending on its content (Fig. 7 on page 13). There are clinical and radiological criteria that help us to distinguish between benign and malignant cystic lesions. A lesion is most probably malignant in elderly patients, with elevated serum CA125, in the presence of thick wall or septation, solid or necrotic component (Fig. 8 on page 14) and, obviously, if there are associated lymphadenopathies or carcinomatosis.
Blood products inside a cystic lesion, with hyperintensity on T1-weighted sequences, and hipointensity on T2-weighted sequences (shading), either diffuse hipointensity or many times with a layered distribution, are radiologic characteristics of endometrioma (Fig. 9 on page 15). Nevertheless, if a thick wall or intracystic solid portion are shown, with enhancement after intravenous contrast injection, associated ovarian cancer has been described (usually clear cell or endometrioid carcinoma). Because of the hyperintense content of the lesion on T1-weighted images, subtraction images are useful to look for enhancement (Fig. 10 on page 16).

Solid homogeneous lesions with low intensity on T2-weighted sequences correspond to lesions with fibrous components, and include fibroma, fibrothecoma and Brenner tumour (Fig. 11 on page 17). Non-fibrous solid or cystic heterogeneous lesions with fat component are mature teratoma (Fig. 12 on page 18), but if solid component is predominant, or capsule is irregular with infiltration signs, immature invasive teratoma must be suspected.

Cystic solid mixed lesions, and solid lesions hyperintense on T2-weighted sequences are a heterogeneous group of tumours including immature teratoma, disgerminoma or metastasis (Fig. 13 on page 19 and Fig. 14 on page 20) and are considered probably malignant lesions, and must receive surgical treatment.

Concerning all these criteria, MRI sensitivity for malignant ovarian lesions according to previous studies is 91-100%, with a specificity of 90-92%.
**Fig. 1:** Cystadenocarcinoma. Ultrasonography shows an ovarian predominantly cystic mass, with prominent solid papila.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
Fig. 2: Same patient CT shows bilateral mixed cystic and solid ovarian lesions, a large amount of ascites, and peritoneal thickening with solid implants mainly on diaphragmatic surface and both paracolic gutters, and omental cake, consistent with peritoneal carcinomatosis.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
Fig. 3: Fig. 3. Standard protocol for adnexal MRI.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
**Fig. 4**: Fig. 4. Endometrioma. The edge of the ovary is distorted into a beak shape, so the lesion is likely to be ovarian.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
**Fig. 5:** Fig. 5. Hematosalpinx. Incomplete septa inside a cystic adnexal lesion indicate a tubarian origin.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
Table 1

**Table 2**: Scheme 2. Signal intensity of diverse ovarian tumours.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES

<table>
<thead>
<tr>
<th>Scheme 2</th>
<th>T2</th>
<th>T1</th>
<th>FS T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYSTIC</td>
<td>↑↑</td>
<td>→↓</td>
<td>→↓</td>
</tr>
<tr>
<td>MATUER TERATOMA</td>
<td>→↑</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>ENDOMETRIOMA</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>FIBROUS LESIONS</td>
<td>↓</td>
<td>→↓</td>
<td>→↓</td>
</tr>
</tbody>
</table>
**Fig. 6:** Case 1. Bilateral ovarian lesions. The right one is hyperintense on T1-weighted sequences, and diffusely hypointense on T2-weighted images (shading). These characteristics correspond to an endometrioma. In the left ovary we can see two simple cysts, with a thin septa separating them.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
**Fig. 7:** Case 2. Mucinous cystadenoma. A big ovarian lesion is identified, predominantly cystic, with many thin septa and without solid component. Cysts content presents variable signal intensity on T1-weighted sequences.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
Fig. 8: Case 3. Mucinous cystadenocarcinoma. These images show a big ovarian tumour with a predominantly cystic component, with variable signal intensity, but with prominent solid contrast-enhancing elements.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
**Fig. 9:** Case 4. Bilateral endometriomas and pelvic endometriosis. These images show bilateral ovarian lesions with high signal intensity content on T1-weighted sequences, and low signal intensity on T2-weighted sequences, with a layered distribution. Both ovaries are posteriorly displaced, as a consequence of pelvic endometriosis (kissing ovaries).

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
Fig. 10: Case 5. Endometrioid adenocarcinoma. Left ovarian tumour with haemorrhagic content similar to endometriomas. The left aspect of the lesion wall is irregular, with solid enhancing papila, best shown on subtraction images.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
**Fig. 11:** Case 6. Ovarian fibroma. These images show a right ovarian solid lesion, with low signal intensity on T2-weighted image and without enhancement after endovenous contrast administration.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
**Fig. 12:** Case 7. Mature teratoma. These images show a left ovarian lesion, with cystic and fatty content, and a solid protuberance projecting inside the lesion (Rokitansky node).

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
**Fig. 13:** Case 8. Endometrioid adenocarcinoma. These three images show a left ovarian lesion, predominantly solid with cystic and necrotic component, and heterogeneous enhancement after endovenous contrast administration.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
Fig. 14: Case 9. Gastric carcinoma metastasis. These images show bilateral ovarian tumours. Both lesions are predominantly solid with intense contrast enhancement.

© Radiologia, Hospital de la Ribera, Hospital de la Ribera - Alzira /ES
Conclusion

Ultrasonography is the initial diagnostic tool for ovarian lesion characterization, but if a diagnosis cannot be made, further evaluation with MRI is required. CT can be used for malignant lesion staging.

Radiologist must be able to select the best diagnostic tool and must know each ovarian lesion’s characteristics to approach a correct diagnosis.
Personal Information

Miquel Forment Navarro

Email address: mforment@hospital-ribera.com
References


JEONG YY, OUTWATER EK, KANG HK. Imaging evaluation of ovarian masses. Radiographics 2000; 20:1445-1470


JUNG SE, LEE JM, RHA SE, BYUN JY, JUNG JI, HAHN ST. CT and MR imaging of ovarian tumors with emphasis on differential diagnosis . Radiographics 2002; 22:1305-1325


STEVENS SK, HRICAK H, STERN JL. Ovarian lesions: detection and characterization with gadolinium-enhanced MR imaging at 1.5T. Radiology 1991; 181:481-488