Session: Advanced Imaging Series

Topic: MR Application in Ovarian Lesions

Location: French Radiology Society Annual Meeting
Paris, France

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CME:

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MR Application: Ovarian Lesions

Comprehensive Ultrasound Imaging of Type-I and Type-II Ovarian Cancers
MR Application: Ovarian Lesions
### Epithelial Tumors:
- 60% of all ovarian tumors
- 85% of all ovarian malignancies
- 2/3 are Benign & 1/3 are Malignant
- 5% borderline (low malignancy potential)

Most common: Serous & Mucinous

### Endometriosis:
- 1- Endometroid CA
- 2- Clear Cell CA

### Serous tumors:
- Unilocular (uniform content)
- Papillary projections (Common)
- Calcifications (Common)
- Bilateral (Common)

### Mucinous tumors:
- Multilocular (different contents)
- Papillary projections (Uncommon)
- Calcifications (Uncommon)
- Bilateral (Uncommon)
<table>
<thead>
<tr>
<th><strong>Sign of Benignity:</strong></th>
<th><strong>Sign of Malignancy:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size &lt; 4 cm</td>
<td>4 cm &lt; Size</td>
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<tr>
<td>Uni-locular</td>
<td>Multi-locular</td>
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<tr>
<td>Thin wall (&lt;3mm)</td>
<td>Large soft tissue component</td>
</tr>
<tr>
<td></td>
<td>Thick wall (&gt;3mm)</td>
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<tr>
<td>DWI: No diff restriction in solid component</td>
<td>2ndry signs:</td>
</tr>
<tr>
<td></td>
<td>Ascites</td>
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<tr>
<td></td>
<td>Met</td>
</tr>
<tr>
<td></td>
<td>LNs</td>
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<tr>
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<td>DWI: Restricted diffusion in solid component</td>
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</tbody>
</table>
**Endometriomas:**

- Ectopic endometrium
- Hemorrhage

- T1: Hyper
- T2: Hypo (T2 shading from Fe)

- T2 dark spots:
  - Discrete markedly hypo intense foci within adnexal lesion
  - Specificity: 93%
  - Helpful in DDX endometrioma from Cystic adnexal lesion with hemorrhage

**DWI:**

- 50% show restriction & 50% don’t!
MR Application: Ovarian Lesions

**Teratomas:**

- = germ cell tumors (3 germ cell layers)
- Categories:
  - Mature: Benign
  - Immature: Malignant
  - Highly specialized: Monodermal

- Mature cystic teratomas:
  - = most common
  - Includes Dermoid
  - Containing: Fat/Debris/Calcifications/Rokitansky nodule /Hair

- Macroscopic fat (Fat Sup technique) & Microscopic fat (out of phase)

- **DWI:**
  - Restriction of diffusion (cause: Keratinoid content)
  - Low ADC values
•**Fibrous Tumors:**
  • Includes:
    • Fibromas, Fibrothecomas, Brenner Tumors
    • All look alike on MR
  • **Stromal tumors:** Fibroma & Fibrothecoma
  • **Epithelial tumors:** Brenner Tumor

•**Fibroma & Fibrothecoma**
  • Association: Meig’s Syndrome

•**MR:**
  • Low T2 + Low DWI = T2 Blackout Effect

**Point:** Any ovarian lesion with T2 Blackout Effect is benign!
**MR Application: Ovarian Lesions**

### DWI Pitfalls: ADC Overlap between Benign & Malignant

- Most malignant show restricted diffusion
  - Few exceptions:
    - Due to heterogeneity, necrosis, low cellularity, cystic components

- Most benign lesions show un-restricted diffusion
  - Few exceptions:
    - Teratoma & Endometrioma

### DWI Pitfalls: T2 Shine-through Effect

- Hi SI from T2 (not from DWI restricted diffusion)
- Long T2 decay time: Hi T2 SI

- Hi SI in both DWI & ADC

- Solution: Always review DWI/ADC with T2
MR Application: Ovarian Lesions

**DWI Pitfalls: Susceptibility Artifact**

- Field heterogeneity: Susceptibility artifact
- Worse as B increases: 3T>1.5T>0.5T

**Solution:**
- Using shorter echo time (ET)
- Decreased Echotrain length (ETL)
- Higher BW

**DWI Pitfalls: Low SNR & Low Spatial Resolution**

- Because DWI have **low SNR & Low Spatial resolution**, they need to be reviewed with other MR images
<table>
<thead>
<tr>
<th>Ovarian Lesions:</th>
<th>T1</th>
<th>T2</th>
<th>Enhances?</th>
<th>DWI</th>
<th>ADC</th>
<th>True Restriction?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Malignant Ovarian Lesions</strong></td>
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<td></td>
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<tr>
<td>Adenocarcinoma</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
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<td>Yes</td>
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<tr>
<td>Clear Cell Carcinoma</td>
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<td>Yes</td>
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<td>Yes</td>
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<tr>
<td>Endometrioid Carcinoma</td>
<td></td>
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<td>Yes</td>
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<tr>
<td>Poorly Differentiated Carcinoma</td>
<td></td>
<td></td>
<td>No</td>
<td></td>
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<tr>
<td>Peritoneal Implant</td>
<td></td>
<td></td>
<td>Yes</td>
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<td>Yes</td>
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<tr>
<td><strong>Benign Ovarian Lesions</strong></td>
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<tr>
<td>Endometrioma</td>
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<td></td>
<td>No</td>
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<td>No</td>
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<tr>
<td>Mucinous Cystadenoma</td>
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<td></td>
<td>No</td>
<td></td>
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<td>No (T2 shine through)</td>
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<tr>
<td>Serous Cystadenoma</td>
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<td></td>
<td>No</td>
<td></td>
<td></td>
<td>No (T2 shine through)</td>
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<tr>
<td>Teratoma</td>
<td></td>
<td></td>
<td>No</td>
<td></td>
<td></td>
<td>Yes</td>
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<tr>
<td>Fibrothecoma</td>
<td></td>
<td></td>
<td>Mild</td>
<td></td>
<td></td>
<td>No (T2 blackout)</td>
</tr>
<tr>
<td>Brenner Tumor</td>
<td></td>
<td></td>
<td>Mild</td>
<td></td>
<td></td>
<td>No (T2 blackout)</td>
</tr>
</tbody>
</table>

**Conclusion**

DWI/ADC is most helpful in ruling out malignancy in lesions that *enhance* but show "**T2 blackout**"
Thank you for inviting me to your prestigious conference and the magnificent city of Paris.

Questions / Comments?

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