Objectives

• To review interesting cases
• To discuss the applications of different imaging modalities for optimal diagnostic approach
• To review a few important features of imaging diagnosis in gynaecologic abnormalities

Disclosures

• None.

Case 1

• 39 year old female
• Clinical history: Assess right ovarian cyst
  – Clinically diagnosed endometriosis
  – Started fertility treatment
  – Fertility clinic US performed during treatment apparently showed a complicated right ovarian lesion, presumed endometrioma
  – Initial presentation for diagnostic US August 2015
Case 1

- Worsening symptoms over subsequent months
  - Abnormal vaginal bleeding (menometrorrhagia)
  - LLQ intense pain
  - Abdominal distension
- US repeated
Case 1

- What is the most likely diagnosis for the adnexal masses?
  A. Endometriomas
  B. Ovarian cancer
  C. Ovarian hyperstimulation syndrome
  D. Clustered functional ovarian cysts

Case 1

- MRI recommended for further assessment
Case 1

• Does this patient have additional abnormalities beyond the adnexal masses?
  A. Yes.
  B. No.

• What is the most concerning additional abnormality?
  A. Adenomyosis
  B. Endometriotic plaques
  C. Endometrial mass
  D. Uterine leiomyoma

• Summary of imaging findings:
  – Bilateral complex solid/cystic ovarian masses with enhancement of the solid components
  – Enhancing polypoid endometrial mass

• Presumptive Diagnosis:
  – Ovarian Cancer
  – Endometrial polyp vs cancer
Case 1

• Final Diagnosis:
  – Stage 1C endometrioid adenocarcinoma of the bilateral ovaries and Stage 1A endometrial adenocarcinoma of the endometrium arising in a polyp
  – Synchronous primary tumours favoured

Case Discussion

• Endometrioid subtype accounts for ~20% of cases of ovarian epithelial carcinoma
• Endometrioid cancer when associated with endometriosis:
  – Is more likely to occur at younger age and earlier stage
  – Carries a slightly improved prognosis
  – Has higher rates of synchronous primary malignancy – endometrial carcinoma in 94%

Case 2

• 27 year old female
• 15 weeks pregnant
• Enlarging right adnexal lesion on Nuchal Translucency US
Case 2

• What is the most likely diagnosis for the right ovarian lesion?
  1. Ovarian cancer
  2. Hemorrhagic cyst
  3. Decidualized endometrioma
  4. Dermoid cyst

Case 2

• What is the most likely diagnosis for the right ovarian lesion?
  1. Ovarian cancer
  2. Hemorrhagic cyst
  3. Decidualized endometrioma
  4. Dermoid cyst

Case 2

• Decidualized endometriomas are a complication of endometriosis arising in pregnancy
  • Key features = pregnant patient with history of endometriosis

Case 2

• Decidualized endometrioma on US:
  – Predominantly cystic lesion with low level internal echoes
  – Echogenic nodular component with internal vascularity

• Decidualized endometrioma on MRI:
  – Classically, T1 hyperintense lesion with T2 shading
  – Nodular components isointense to uterine endometrium
Case 3

• 40 year old female status post kidney-pancreas transplant, ongoing follow-up
• Long-standing right adnexal cyst with mildly complex fluid but no solid component, also continually assessed on follow-up ultrasound
  – Size at 2006 baseline approximately 5 cm; in 2015, approximately 12 cm

Case 3

• Recently decided to start fertility treatment; successful implantation of 1 embryo
• Adnexal cyst slightly larger; a solid component was not present previously
Case 3

• What is your favoured diagnosis for the adnexal cyst?
  A. Functional ovarian cyst, new confluent debris
  B. Ovarian endometrioma, new decidualization in pregnancy
  C. Peritoneal inclusion cyst, the solid component is the right ovary
  D. Ovarian cystic neoplasm

Case 3

• Discussion points:
  – The solid component has internal vascularity; debris is unlikely
  – If the adnexal abnormality has always been a peritoneal inclusion cyst and not an ovarian cyst, why was the suspected contained right ovary not identified previously?
  – Decidualized endometrioma is possible, as is neoplasm

Case 3

• Favoured diagnosis now?
  A. Complicated functional right ovarian cyst
  B. Decidualized endometrioma
  C. Peritoneal inclusion cyst
  D. Right ovarian neoplasm

Diagnosis

• Histologic Diagnosis: low malignant potential ovarian tumour
Case Discussion

• Low malignant potential ovarian tumour:
  – Represent ~15% of all epithelial ovarian cancers
  – May be of serous or mucinous histology
  – ~75% are stage I at time of diagnosis
    • FIGO staging is the same as invasive ovarian carcinoma
  – Excellent survival rates; reported 5-year survival rate of 97%, 20-year survival rate of 89%

Case Discussion

• Low malignant potential ovarian tumour:
  – Treatment = surgical resection
    • Role of complete surgical staging is still controversial
    • Early stage disease may be managed by unilateral salpingo-oophorectomy; no other treatment indicated
    • Complete TAH/BSO, omentectomy, node sampling, and cytoreductive surgery required for stage III or IV disease
    • Chemo/radiotherapy not of proven benefit for residual late-stage disease but chemotherapy is delivered if disease progresses

Case 4

• Clinical History:
  – 80 year old female with new onset abnormal uterine bleeding
  – Outside US reportedly documented multiple uterine leiomyomas and suspected endometrial mass (images not provided for review)
  – Speculum exam demonstrated vaginal mass, which prevented complete insertion for cervical visualization
  – Vaginal biopsy performed – adenocarcinoma

Imaging Findings

• Low malignant potential epithelial neoplasms:
  – Predominantly cystic
  – Usually thin walls; often have papillary projections
    • Presence of papillary projections is helpful to distinguish LMP tumours from benign neoplasms
  – Absence of ascites and peritoneal deposits
  – These lesions may be very large; MRI is often helpful for complete lesion evaluation
Case 4

- Is the lesion isolated to the vagina?
  A. Yes.
  B. No.

Case 4

- Which of the following is involved with tumour?
  A. Vagina.
  B. Cervix.
  C. Endometrium.
  D. All of the above.
Case 4

• Are any other pelvic structures involved with neoplasm?
  A. Yes.
  B. No.

Diagnosis

• Histologic diagnosis: adenocarcinoma of gynecologic tract (tumor markers indeterminate cervical vs endometrial origin)

Case Discussion

• Cervical cancer:
  – Third most-common gynecologic malignancy
  – Histologically, 80% are squamous cell carcinoma, 20% non-squamous cell (adenocarcinoma and variants, small cell carcinoma, lymphoma)
  – Cervical lymphatic drainage to parametrial nodes
  – external/internal iliac or sacral nodes
  – common iliac and para-aortic nodes
  – Most common spread of squamous cell carcinoma = direct invasion > nodal > hematogenous

• Cervical Cancer Staging:
  – As per the International Federation of Obstetrics and Gynecology (FIGO)
  – Clinical staging system; MRI specifically not included to ensure international applicability
  • Note that nodal staging is not incorporated
  – Known poor correlation between clinical stage and pathologic findings
  • Staging contributes to treatment decision

International Federation of Gynecology and Obstetrics (FIGO) Staging of Cervical Cancer

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>The carcinoma is strictly confined to the cervix (extension to the uterine corpus should be disregarded).</td>
</tr>
<tr>
<td>IA</td>
<td>Invasive cancer identified only microscopically. All gross lesions even with superficial invasion are stage IB cancer. Invasion limited to measured stromal invasion with a maximum depth of 5m and no wider than 7mm.</td>
</tr>
<tr>
<td>IIA</td>
<td>Clinical cancer confined to the cervix or preclinical lesion greater than stage IA.</td>
</tr>
<tr>
<td>IIB</td>
<td>The carcinoma extends beyond the uterine but not to the lower third of the vagina.</td>
</tr>
<tr>
<td>IIIA</td>
<td>Involvement of up to the upper two-thirds of the vagina. No obvious parametral involvement.</td>
</tr>
<tr>
<td>IIIB</td>
<td>Obvious parametral involvement but not onto the pelvic sidewall.</td>
</tr>
<tr>
<td>IVA</td>
<td>The carcinoma has extended onto the pelvic sidewall. On rectal examination there is no cancer-free space between the tumor and the pelvic sidewall. The tumor involves the lower third of the vagina. All cases of hydronephrosis or nonfunctioning kidney should be included unless they are known to be due to other causes.</td>
</tr>
<tr>
<td>IVIA</td>
<td>Involvement of the lower vagina but no extension onto pelvic sidewall.</td>
</tr>
<tr>
<td>IVIB</td>
<td>Extension onto the pelvic sidewall or hydronephrosis or nonfunctioning kidney.</td>
</tr>
<tr>
<td>IV</td>
<td>The carcinoma has extended beyond the true pelvis or has clinically invaded the musculature of the bladder or the rectum or both.</td>
</tr>
<tr>
<td>IIIB</td>
<td>Spread to adjacent pelvic organs.</td>
</tr>
<tr>
<td>IIIB</td>
<td>Spread to distant organs.</td>
</tr>
</tbody>
</table>
Case Discussion

• Endometrial cancer:
  – Most common gynecologic malignancy in developed countries
  – Over 90% of cases are in women > 50 years of age
  – Histologically, ~90% of tumours are endometrioid adenocarcinoma (type 1); remaining (type 2) tumours include serous papillary and clear cell adenocarcinoma
  • Type 2 tumours carry a 50% risk of locally advanced or distant disease at diagnosis

Case Discussion

• Endometrial cancer treatment is predominantly surgical but MR imaging is still advocated to guide the surgical approach
  – Tumour grade based on biopsy may be inaccurate
  – Stage I low-risk tumours may be treated with TAH/BSO alone; Stage I high-risk tumours are managed with TAH/BSO and pelvic/para-aortic nodal dissection
  – Stage II and higher tumours also require TAH/BSO and pelvic +/- para-aortic nodal dissection

Case Discussion

• Important for MRI:
  – Do not need to determine endometrial-only vs inner myometrial invasion; both are Stage IA disease
  – Stage II = cervical stromal invasion. Endocervical invasion is Stage I disease.

Conclusion

• Multi-modal imaging is helpful for complete evaluation of gynecologic abnormalities
  • In particular, MR imaging is of increasing importance in gynecologic oncologic imaging due to treatment implications

References

• Davis, M; Rauh-Hain, JA; Andrade, C; Boruta, DM; Schorge, JD; Horowitz, NS; May, J, and del Carmen, MG (2014). Comparison of clinical outcomes of patients with clear cell and endometrioid ovarian cancer associated with endometriosis to papillary serous carcinoma of the ovary. Gynecologic Oncology 133(1): 760-766.

References

• Freeman, SJ; Aly, AM; Katakis, MF; Addley, HC; Reinhold, C; and Sala, E (2012). The Revised FIGO Staging System for Uterine Malignancies: Implications for MR Imaging. Radiographics 32(6):1805-1827
• Jung, SE; Lee, JM; Rha, SE; Byun, JI; and Hahn, ST (2002). CT and MR Imaging of Ovarian Tumors with Emphasis of Differential Diagnosis. Radiographics 22(6):1305-1325.
Case 5

- 34 year old female
- Sudden onset severe RLQ pain
- Rapid resolution in ER
- Similar symptoms in 2012, ultrasound performed then documented a 4cm right ovarian cyst
Case 5

• What is the most likely diagnosis for the right ovarian lesion?
  A. Ovarian functional cyst
  B. Ovarian endometrioma
  C. Ovarian cancer
  D. Peritoneal inclusion cyst

Case Discussion

• Endometriosis has 3 distinct manifestations:
  – Ovarian endometriomas
  – Superficial peritoneal implants
  – Deep pelvic (infiltrating)
• Ovarian endometriomas on MRI:
  – T1 hyperintense
  – T2 shading (ie some T2 hypointense signal)
  – May restrict on diffusion
  – Should not have internal enhancement

Case 5

• CA-125 elevated at 325 u/mL
• MRI was recommended but the patient was referred to Gynecologic Oncology instead
• Laparotomy performed for right salpingo-oophorectomy (following inadvertent right cyst rupture draining “chocolate-y” fluid), intentional left ovarian cyst drainage (similar fluid), pelvic and left para-ovarian biopsies

Case Discussion

• Patients with endometriosis have a higher risk of ovarian cancer
  – Also tend to have slightly elevated CA125 levels
• Endometriosis is associated with endometrioid adenocarcinoma and clear cell ovarian cancer
  – Increased risk with larger lesion size (endometrioma > 9cm) and increasing patient age

Case 5

• Histologic diagnosis:
  – Right ovarian endometriotic cyst
  – Pelvic and left paraovarian biopsies negative for malignancy and endometriotic involvement