Sonographic assessment of pelvic tumors
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- Key points in the sonographic assessment of women with gynaecological tumors -
  1/ Adnexal tumors
  2/ Disseminated malignancy with a pelvic mass
  3/ Endometrial cancer
  4/ Cervical cancer

1/ Adnexal lesion without signs of disseimantion

Subjective assessment using "Pattern recognition" in discriminating benign from malignant lesions

Absence of solid components and irregularities suggests benignity.

Solid vascularized components and irregularities suggest malignancy.

Adnexal lesion, key point: Estimate risk of malignancy

• Predicting risk of malignancy using
  • Pattern recognition
  • Simple rules
  • Should patient undergo surgy (yes/no?)
  • If Yes: When? Where? What procedure? By whom?
  • Case examples

Accuracy of ultrasound in the diagnosis of malignancy using subjective “pattern recognition”

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
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<tbody>
<tr>
<td>Malignancy vs Benignity</td>
<td>88-96%*</td>
<td>90-96%*</td>
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Correct specific diagnosis over all 40%
in benign tumours 68%*

Expert ultrasound examiners were “uncertain” in 8% of cases. (Valentin et al., 2007; n=1066).

Example of difficult tumours:
- Fibroma
- Pedunculated/intraligamental Fibroid
- Struma ovarii
- Borderline
- Cystadenofibroma

Difficult masses 1: With papillary projections
- Benign:
  - ≤ 3 papillary projections
  - Papillary max diameter < 7 mm
  - No papillary flow
  - Shadowing
- Malignant/Borderline:
  - ≥ 4 papillary projections
  - Papillary diameter > 7 mm
  - Papillary flow

Difficult masses 2: Solid ovarian masses
- Fibroma - benign
  - Regular echogenicity
  - Sparse vascularization supports benign diagnosis
  - Irregular echogenicity/outline, no shadowing suggest malignancy
- Malignant granulosa cell tumor

Difficult masses 3: Multilocular cysts with a large number of locules
- Mucinous cystadenoma
- Mucinous intestinal borderline
- Technetium cyst (functional pregnancy/molar/trophoblastic disease)

Benign or malignant?

IOTA Simple Rules - Classifies 80% of all lesions
Benign (B) - features

- B1: Unilocular
- B2: Solid component < 7mm
- B3: Acoustic shadowing
- B4: Multilocular smooth, < 10 cm
- B5: No blood flow

Malignant (M) - features

- M1: Irregular solid lesion
- M2: Ascites
- M3: > 4 papillary projections
- M4: Multilocular solid, > 10 cm
- M5: Strong blood flow

Simple Rules - interpretation

Benign (B) features
- B1: Unilocular
- B2: Largest solid component diameter < 7 mm
- B3: Presence of acoustic shadowing
- B4: Smooth multilocular tumour with largest diameter < 10 cm
- B5: No blood flow

At least one B feature, No M features = probably benign
At least one M feature, No B feature = probably malignant
Both M and B features or neither B nor M features = inconclusive

Malignant (M) features
- M1: Irregular solid tumour
- M2: Presence of ascites
- M3: At least four papillary structures
- M4: Irregular multilocular solid tumour with largest diameter > 100 mm
- M5: Very strong blood flow (colour score 4)

Disseminated malignancy with pelvic tumor

- Pelvis/ovaries often the site of metastases
- Most commonly gastrointestinal tract or breast cancer
- Optimal treatment dependent on tumor primary, extension, and patient performance
- Avoid explorative laparotomies when optimal cytoreductive surgery cannot be performed
- Minimally invasive techniques to establish the diagnosis
- Tru-cut biopsy allows for a histological diagnosis rather than a cytological evaluation (fine-needle aspiration)
4/ Sonographic assessment: Key point to decide tumor primary – tru-cut biopsy

When to perform tru-cut biopsy
• Disseminated malignancy, unknown primary
• Primary ovarian cancer? Non-ovarian cancer? Synchronous tumours?
• Inoperable patients prior to chemotherapy
• Suspected recurrence of malignancy
• Follow-up of treatment
• Selected cases with uncertain diagnosis (Deep endometriosis/Malignancy?)

When not to perform tru-cut biopsy
• Suspected malignancy without signs of dissemination – you may infact disseminate the tumor
• Unsuitable tumor location: Tumors that can not be punctured without major risk of injury to vessels and bowel => laparoscopic biopsy? fine needle cytology?

How to perform tru-cut biopsy?
Disposable needles
Biopsy gun

Puncture sites
Omental cake
Carcinosis – pouch of Douglas
Lymphnode metastasis
Solid tumor

Sonographic features suggesting metastatic ovarian cancer
Liver metastasis
Signs of necrosis
Lead vessel
Absence of omental cake
Middle tumor

Sonographic fetures of metastatic ovarian tumors
Breast cancer met.
Gastric “Krukenberg”
Colon cancer met.
Pancreatic met.

3/ Endometrial cancer
• Often diagnosed in stage I: only 4% die from their cancer
• High risk’ cancer: worse prognosis
• Grade 3/ Non-endometroid histotype
• Myometrial invasion > 50%
• Cervical invasion
• Women with ‘high risk cancer’ = at high risk of recurrence – lymphadenectomy might be indicated
• 70-75% will be low risk based on endometrial biopsy (Grade 1&2)
• Of these up to 40% will be high risk according to final histology – will need additional surgery or radio-chemo therapy
• Imaging can improve preoperatively identification of women with high risk cancer in need for more extensive surgery
Key points: US assessment of endometrial cancer

- Myometrial invasion
  - <50% or ≥ 50%
- Cervical stromal invasion
  - Yes or No
- Primary cervical cancer?

Cervical stromal invasion assessment

- Dynamic examination technique helps to determine if a tumour is truly invading the cervix or only bulging down.

Largest tumor engagement in the isthmus region - Primary endometrial or endocervical adenocarcinoma?

Immunohistochemistry helps in the differential diagnosis

Cervical cancer with parametrial invasion or tumor > 4cm should not primarily undergo surgery

Scanning technique – myometrial invasion assessment

- Systematically scan the whole uterine body in sagittal and transversal plane.

Endometrial cancer - Tumor measurements

- Uterine anterio/posterior and lateral diameter
- Tumor in 3 dimensions
- Minimal tumor free margin
- Distance tumor to outer cervical oss
Subjective: Myometrial invasion assessment

- Myometrial invasion > 50%
- Myometrial invasion < 50%

Look at the:
- Endometrial/myometrial border
- Tumor/uterine proportion

Don’t forget to examine the whole pelvis!

- Endometrial cancer may be caused by a hormonproducing ovarian tumor
- Look for extrauterine spread: vagina, peritoneum, pelvic/paraortic nodes, ovaries?
- Disseminated tumor: Tru-cut biopsy may determine the tumor primary: endometrial or ovarian or synchronous tumors?
- Other factors: Adhesions? Big fibroids?

4/ Staging of cervical cancer

- Management is dependent on tumor size and extension:
  - < 2 cm, > 1 cm free margin: ICN (if high risk: opening surgery)
  - < 4 cm, no parametrial invasion => radical hysterectomy
  - > 4 cm, parametrial invasion => radical hysterectomy
- Ultrasound is as good as MRI for the staging of cervical tumors
  - Tumor detection sens 90%, spec 97%
  - Parametrial invasion sens 77%, spec 98%
- Tumors often iso (adenocarcinoma) or hypoechoic (squamous cell carcinoma), richly vascularized.

Adenocarcinoma most often isoechoic
Squamous cell carcinoma often hypoechoic

Key Points: US assessment of cervical cancer

- Tumor size in 3 dimensions
- Small tumors: distance from upper margin of tumor to inner cervical os
- Tumor location
- Deep stromal or parametrial invasion?
- Other spread?
  - bulky lymphnodes
  - hydronephrosis

Tumor measurements & assessment

- Longitudinal plane: Anterio-posterior (AP), Cervical fundal (CF)
- Transversal plane: lateral-lateral (LL)
- Note if maximal tumor diameter > 4 cm

Assessment of: minimal distance upper margin of tumor to inner cervical os

- Small isoechoic tumor anterior lip
- Distance highest margin of tumor to inner cervical os (at arrival of uterine arteries)
- Trachelectomy:
  - Tumors < 2 cm, Distance tumor to inner cervical os ≥ 1 cm
3D multiplanar assessment

- Coronal view
- Transversal view
- Longitudinal view

- Point of inner cervical os

You may want to take a look at the kidneys and ureters in case of bulky tumors.

Lateral parametria – transverse section

- Right lateral parametria
- Left lateral parametria
- Parametrial invasion
- Parametrial invasion

- Lateral parametria