Disclosures
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Learning Objectives

THE MENU [10 MIN]

• Background
• Indications
• MRI Protocol
• What to look for?
  ✓ Bottom line?
  ✓ What to communicate?
• What’s new?
• Conclusions
Rectal Cancer

BACKGROUND

- **Adenocarcinomas** comprise most (98%) of anorectal malignancies
  - 45,000 new cases/year in the USA
  - 17,000 deaths/year

- **Squamous cell carcinomas** arise at the anorectal transition area & are considered anal CA

- **Other rare cancers** may involve the anorectum
  - lymphoma (1.3%), GIST (0.3%)
  - carcinoid (0.1%), melanoma (0.1%), ...

*American Cancer Society: Cancer facts and figures 2007. Atlanta, GA*
WHY IMAGING?

- Rectal adenocarcinomas are diagnosed by endoscopy and biopsy
  - Imaging done for staging!!
  - Staging determines treatment plan
    - Surgical approach
    - Neo-adjuvant chemo-radiation

- NEW: early treatment effect?

- Other rectal neoplasms
  - Characterization and resectability

Malignant GIST
Anal Melanoma
Rectal Cancer

WHICH IMAGING TEST?

- **Endorectal US** is an alternative imaging tool
  - Tumor staging excellent (69%-97%)
  - Operator dependent, interobserver variability
  - Limited depth of penetration
  - Can’t reach upper rectal tumor
  - Poor sensitivity for detecting & characterizing lymph nodes

Rectal MRI (> 3T)

Rectal Cancer
MRI TECHNIQUES

Pelvic Phased-array Coil MRI

- axial/coronal/sagittal T2-weighted TSE/FSE
  - TR/TE: 4000/85 msec; FOV: 24 cm; M: 512x512
  - 3 mm slice thickness/skip 0; acq time 3-4 minutes

- axial T1-weighted 3D-GR DIXON
  - TR/TE: 5.64/2.45 msec; FOV: 25 cm; M: 320; acq 1.5 min

- 3 plane fat-suppressed 3D-GR w/wo IV
  - 0.1 mmol/kg gadolinium-DTPA (dynamic axial)
    - TR/TE: 4.98/1.72 msec; FOV: 25 cm; M: 320; acq 20 sec

- DWI (0-500-1000) - Perfusion (DCE) MRI
Disadvantages e-MRI?

- Semi-invasive
- Small field-of-view
- Cost of coil ($120)
- Stenotic and high tumors
- Narrows CRM
Endorectal MRI

DID THEY MISS IT?

“E-coil going away party”
Coil in vagina

PERILS
High rectal ca, stenotic
Rectal Cancer
WHAT TO LOOK FOR?

- **TNM classification**
  - **T1**: mucosa & submucosa
  - **T2**: muscularis propria
  - **T3**: mesorectal fat
  - **T4**: adjacent organs

- **N0**: no nodal involvement
- **N1**: 1-3 regional nodes
- **N2**: ≥ 4 regional nodes
Rectal Cancer

TNM STAGING OR CRM?

- **CRM** = circumferential resection margin
- **CRM** = distance of periphery of tumor to mesorectal fascia
- Different recurrence rates for *early* versus *bulky* T3
  - **CRM** distance can be used to select patients who would benefit from additional therapy
  - **CRM** distance is more powerful to predict local recurrence than T stage
  - Crucial distance (2mm): 97% confidence if 6 mm on MRI
Rectal Cancer

TNM STAGING OR CRM?

Rectal Cancer

MRI FEATURES

- intermediate T1 & T2
- **T2-WI best** for T staging
- Gadolinium ?


Atypical Features

- mucinous adenoca
- villous adenoma/adenoca
Villous tumor
T2 – sphincter involvement
Rectal Cancer
WHAT TO LOOK FOR?

Nodal Disease

- strong predictor of survival & local recurrence
- pathways of nodal spread
  - mesorectal lymph nodes
  - superior rectal vessels
- pathologic LN criteria
  - > 5 mm short axis
  - morphologic features
  - DWI ? USPIO ?

DWI: ADC threshold?
Rectal Cancer

STAGING IMPLICATIONS

Operative Choices

- **Total Mesorectal Excision (TME)**
  - LAR: T2/T3 not involving sphincters or levator ani
  - APR: T2/T3 involving sphincters or levator ani
Rectal Cancer
STAGING IMPLICATIONS

 Neo-Adjuvant Therapy

- **United States: Preoperative chemo-XRT**
  - T3/T4 or N disease
  - (45-55 Gy) 6 weeks
  - downstaging, decrease recurrence, sphincter sparing surgery

- **Northern Europe: Preoperative RT**
  - short course (5 doses of 5 Gy)
  - no routine chemo preop unless close (1-2mm) or involved CRM

Minsky BD. Role of adjuvant therapy in rectal cancer. Sem Surg Oncol 1999;336:980-987
Neo-adjuvant chemoradiotherapy rectal cancer: response?

Vandecaveye V. Catholic University Leuven, Belgium

# Neo-adjuvant chemoradiotherapy rectal cancer: response?

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<thead>
<tr>
<th>Perfusion Parameter</th>
<th>Tumors*</th>
<th>Normal Rectum*</th>
<th>P Value</th>
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<tr>
<td>Blood flow (mL/100 g/min)</td>
<td>60.33 ± 29.13</td>
<td>31.02 ± 15.55</td>
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<td>Blood volume (mL/100 g)</td>
<td>3.78 ± 1.01</td>
<td>3.38 ± 1.59</td>
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<td>Mean transit time (sec)</td>
<td>9.51 ± 4.43</td>
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<td>Permeability–surface area product (mL/100 g/min)</td>
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<td>17.33 ± 7.45</td>
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<th>Perfusion Parameter</th>
<th>Responders*</th>
<th>Nonresponders*</th>
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<td>51.48 ± 24.18</td>
<td>95.71 ± 10.28</td>
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<td>Blood volume (mL/100 g)</td>
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<td>Mean transit time (sec)</td>
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<tr>
<td>Permeability–surface area product (mL/100 g/min)</td>
<td>17.64 ± 5.03</td>
<td>16.23 ± 3.05</td>
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Rectal Cancer

WHAT TO COMMUNICATE?

1. T3N2Mx rectal adenocarcinoma.
2. The inferior edge of the cancer is 4 cm from the anorectal junction.
3. Circumferential margin (CRM) of 6.3 mm.
Conclusions
MRI RECTAL CANCER

- Rectal adenocarcinoma
  - Why?
    - T/N staging
    - Choice of therapy
  - How?
    - [endorectal MRI]
    - Pelvic MRI (3T)
  - Pearls/Perils?
    - Gadolinium, DWI, nodal staging?