Pelvic MRI imaging for rectal cancer

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No disclosures

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• General MRI concepts

• Staging

• Surgery

• Assessment of response

• Future developments
Imaging and surgeons

Know your enemy and know yourself and you can fight a hundred battles without disaster.

(Sun Tzu)

izquotes.com
Imaging technology

CT-scan

MRI-scan

[Image of CT and MRI scan controls]
MRI Sequences

- Turbospin, fatsat, dynamic, flair, SWI, stir
- T2w axial, sagittal, coronal
- High definition
- Diffusion
Not required

fat sat

rectal filling
Sagittal, Axial, Coronal

- Scout line

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cor  sag  ax
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Angulation of ’axial plane’

- Perpendicular to long axis bowel/tumor
- ! Follow up – serial imaging
Sagittal, Axial, Coronal

- Sagittal is always the same
- Axial and Coronal are variable
Field of view

- Large enough FOV
MRI terminology

• Hyper-intense
• Iso-intense
• Hypo-intense

• White
  – Water, mucine, fat, bone
• Gray
  – Tumor
• Black
  – Muscle, air, fibrosis
Primary staging: risk factors for local recurrence

- Traditional
  - T stage
  - N stage
- Modern
  - T stage subdivisions
  - MRF
  - EMVI
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MRI PPV 80%
Overstaging 30-40%
Heterogeneity T3 tumours

T3a - 1mm - T3b - 5mm - T3c - 15mm - T3d

Shin 2012 DCR
Mesorectal Fascia involvement

Sens 70 - 90%
Spec 75 - 100%

Beets-Tan, Lancet 2001
Mercury trial 2006
What You See is What You Get
R0 – Resectable?
Primary nodal staging

Lahaye, 2005 et al.
MRI report primary staging

Local tumor status
Morphology: Polypoid
Solid tumor, circular:
Extramural vascular invasion:
Yes
No
MRI report primary staging
cT3cN2dM1c

cN0 (no visible [suspicious] nodes)
cN+ (diameter >= 9 mm)
cN+ (diameter 5-9 mm AND at least 2 of the criteria: round shape/irregular border contour/heterogeneous signal intensity)
cN+ (diameter <5 mm AND round shape AND irregular border contour AND heterogeneous signal intensity)
Lateral nodes uncommon?

- Pooled analyses 1216 pts T3/4 distal rectal ca
- 58% visible lateral nodes
- 16% lateral nodes ≥ 7 mm
- Kusters et al. JCO 2018 in press
Extramural venous invasion

Smith et al. BJS 2008
Extramural venous invasion

Smith et al. Acta Oncol 2008
• Staging

• Surgery

• Assessment of response

• Future developments
MRI: GPS for surgeon
MRI: GPS for surgeon
MRI: GPS for surgeon
Pelvic sidewall – IA vessels - nerves
• Staging

• Surgery

• Assessment of response

• Future developments
Post ChRT: decrease tumor size
Problem of fibrosis

Vliegen et al. Radiology 2008
Mercury  BMJ 2006
Kulkarni  et al. Colorectal Dis 2008
Diffusion MRI increases accuracy pCR

Future MRI developments

- Lymph node contrast agents (?)
- Functional imaging
  - DWI – DCE
- Early prediction of response
- Characterisation of tumor – radiomics
  - Signal - histogram analysis – perfusion mapping...
TAKE HOME MESSAGES - 1

• Get familiar with your radiologist

• T2w MRI  ax/sag/cor
  – High definition
  – Large field of view

• Images in operating room
  – GPS for surgeons
TAKE HOME MESSAGES - 2

• MRI and primary tumor
  – EUS for T1 (expertise)
  – MRI for larger tumours and MRF+

• MRI and lymph nodes
  – good in bulky nodal disease
  – not (yet?) good in small nodal deposits

• MRI restaging: fibrosis!