Rectal cancer management: a team sport
The role of radiology and the multidisciplinary conference

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Disclosures

- I have no disclosures

Outline

- Background
- Role of radiology in rectal cancer care
  - MRI
  - ERUS
- Multidisciplinary Conference

Coming together is a beginning

Keeping together is progress

Working together is success

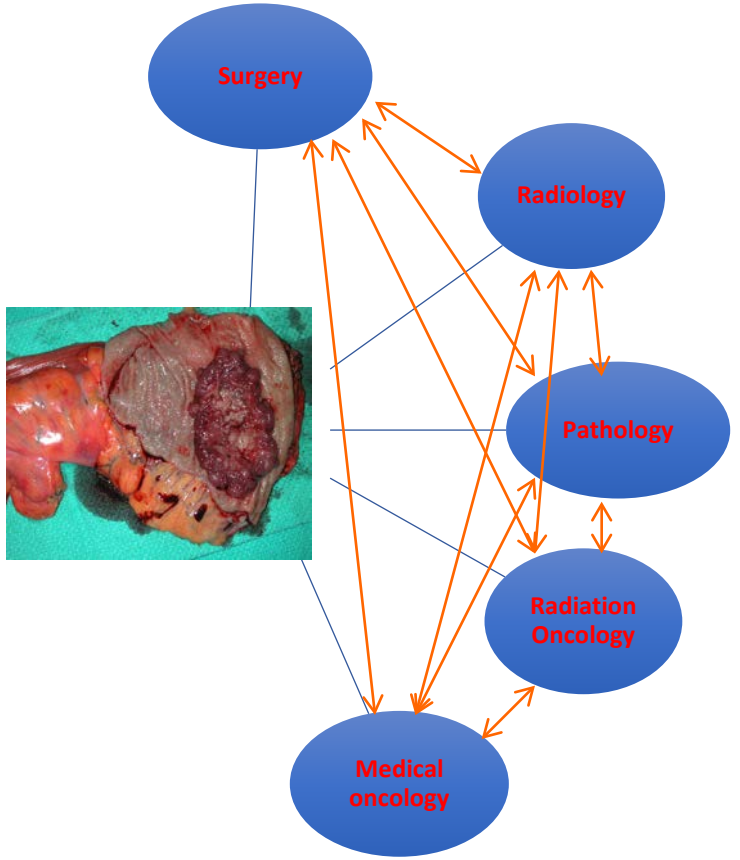
Henry Ford

Courtesy of Dr. Robert Madoff, U of Minnesota

Rectal Cancer Care

Multidisciplinary

Interdisciplinary



Multidisciplinary conference

Rectal Cancer Care

Problem:

Variable practice
Variable reporting

→ Variable outcomes

Local regional staging

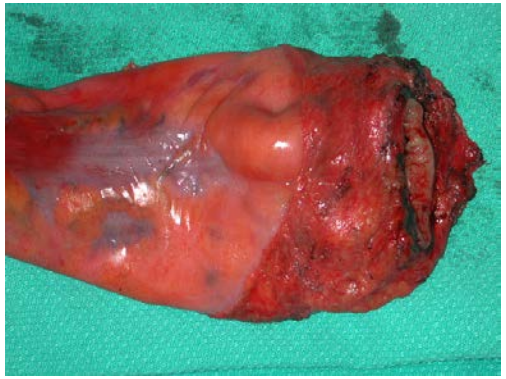
- Improve outcomes by standardizing practice and standardizing reporting

- MRI
  - All rectal cancers should get an MRI
  - All rectal MRIs should use a standardized report

- ERUS
  - ERUS should be used for early lesions prior to local excision

MRI is essential for planning optimal treatment for rectal cancer

- Identification of CRM (negative, at risk, positive)
- Relationship of tumour to levators and sphincter complex
- Identification of locally confined tumour for primary surgery
- Identification of locally advanced requiring neoadjuvant therapy
  - Extrarectal involvement T3, T4
  - Extramural vessel invasion (EMVI)
  - Nodal disease
- Assessment of response to neoadjuvant therapy
- Planning low rectal cancer surgery (dissection planes, reconstruction)



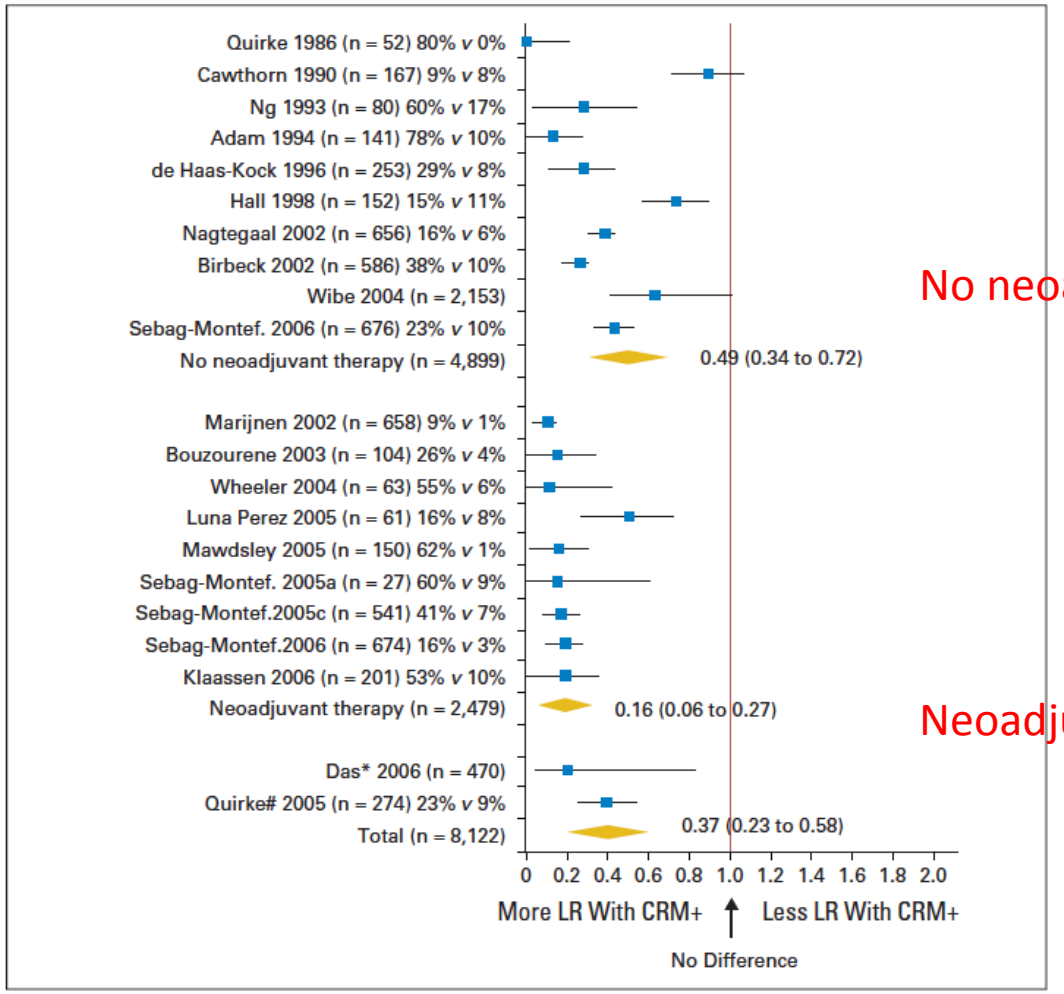
Circumferential resection margin (CRM)

- Surgically created plane produced during the dissection of the mesorectum from the surrounding tissues

Importance

- A positive CRM is an independent predictor of local recurrence and survival (Quirke, Adam)
- Risk for positive CRM increases with more advanced T and N stage (Nategaal/ Quirke)
- Risk for positive CRM increases with violation of the mesorectum (Quirke)

CRM+ is associated with increased local recurrence

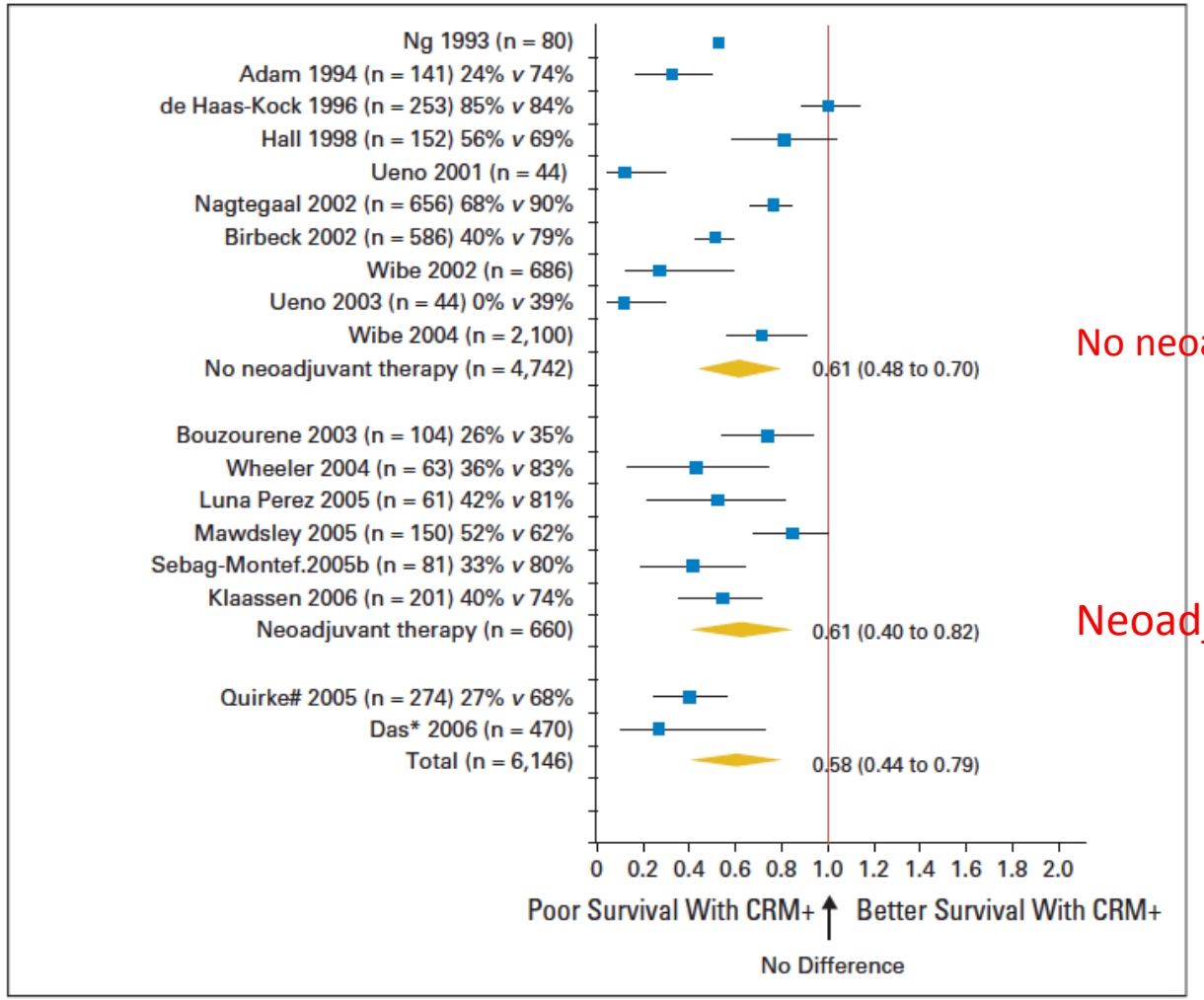


No neoadjuvant therapy

Neoadjuvant therapy

Quirke, Nagtegal, J Clin Oncol 2008;26:303-12

CRM+ is associated with poorer survival

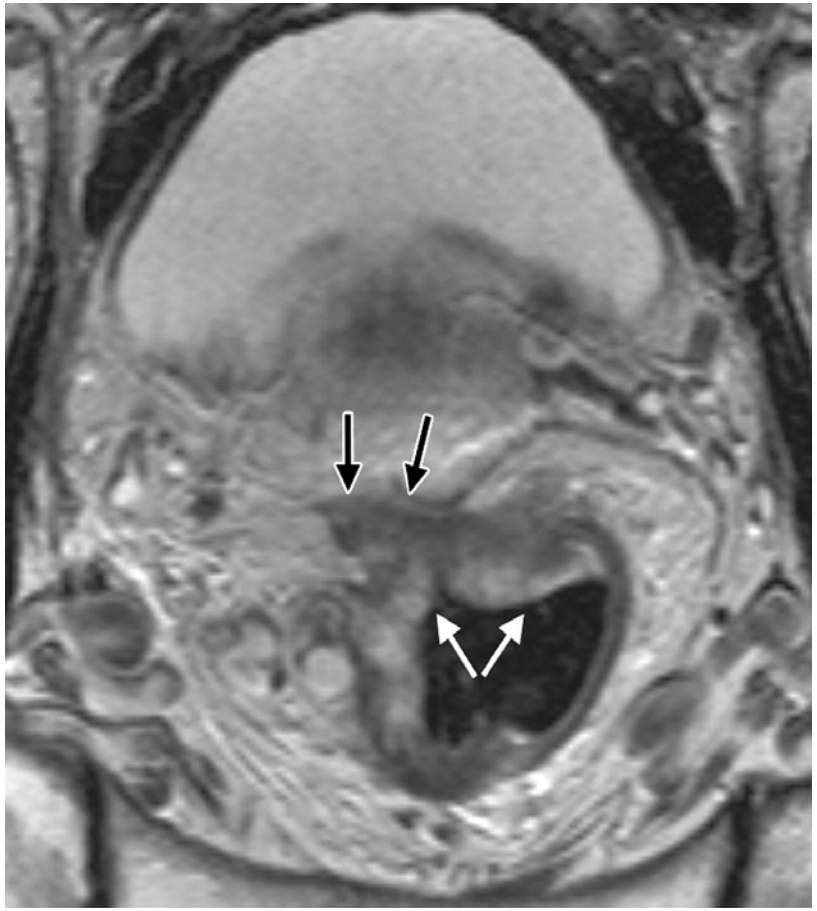


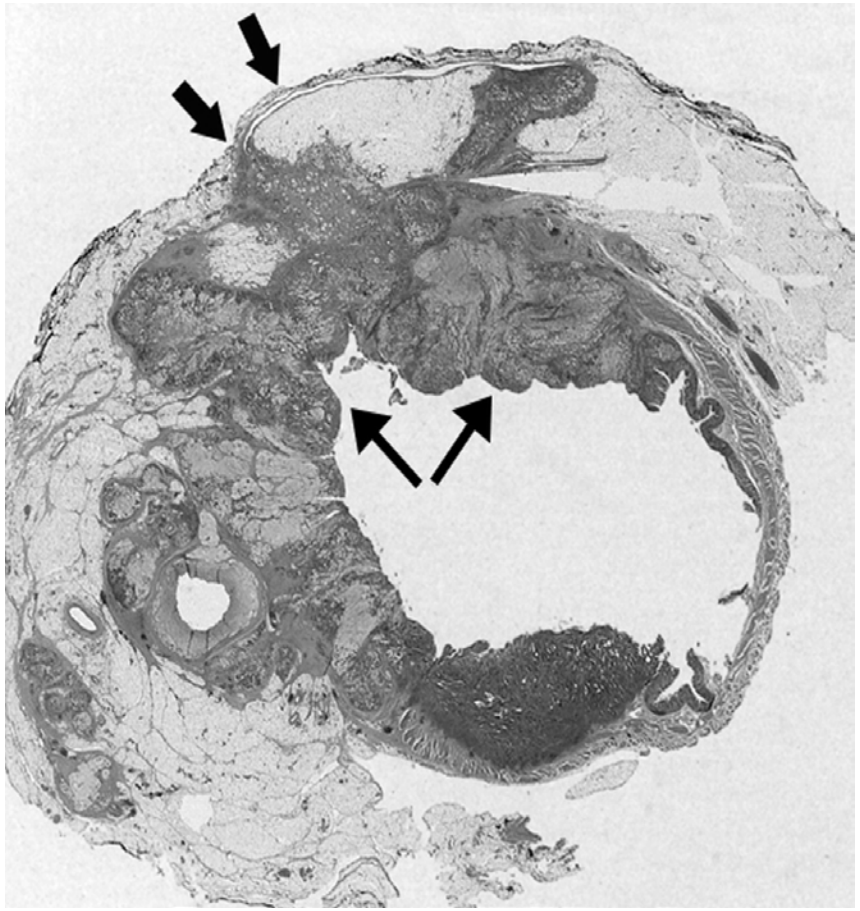
No neoadjuvant therapy

Neoadjuvant therapy

Quirke, Nagtegal, J Clin Oncol 2008;26:303-12

Prediction of involved CRM



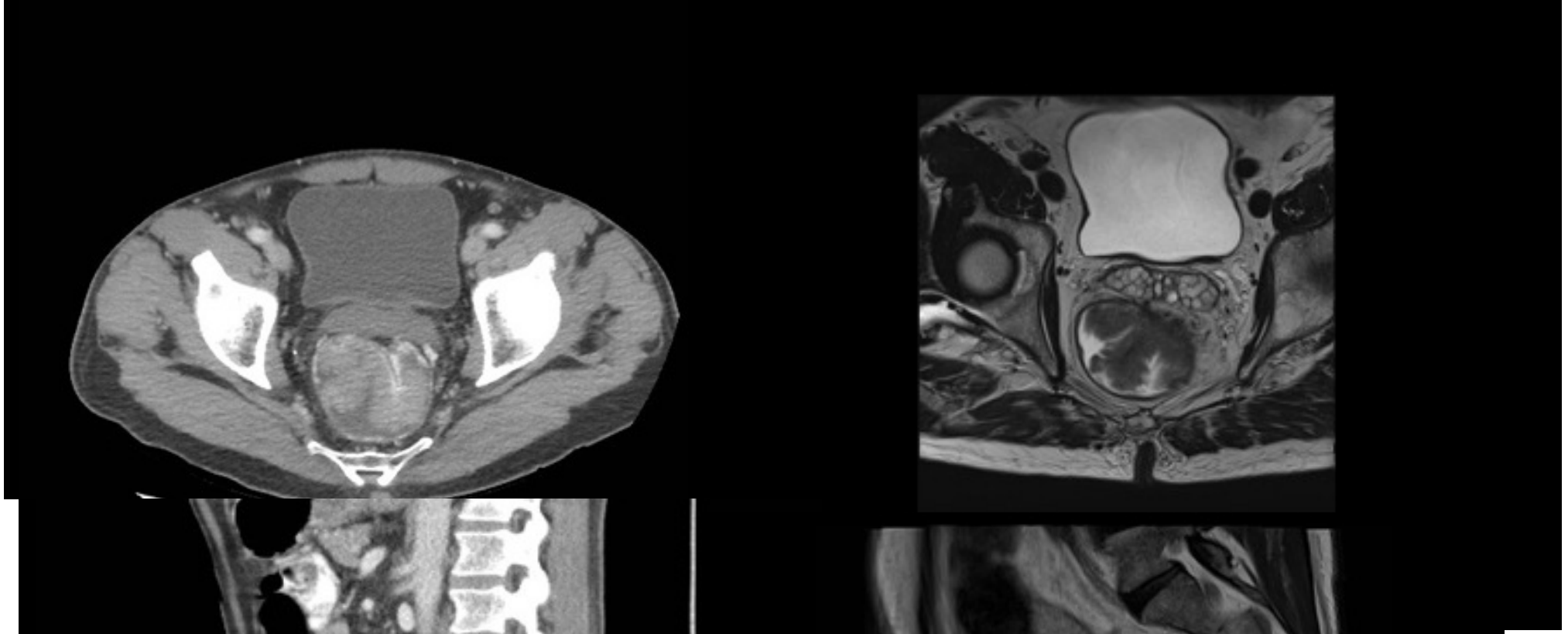


Beets-Tan 2004

MRI is most accurate for CRM

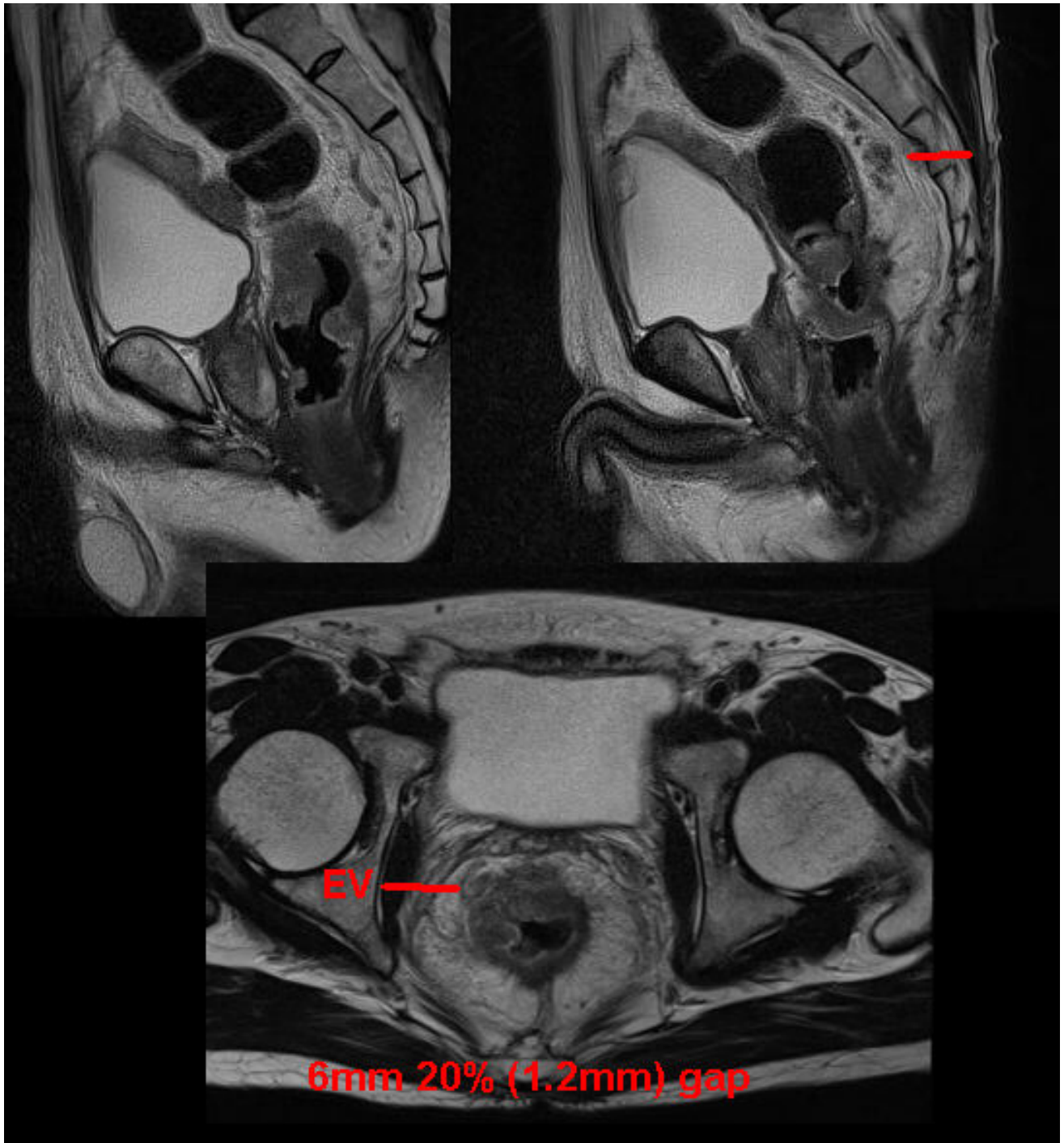
Case #1 Good risk tumour

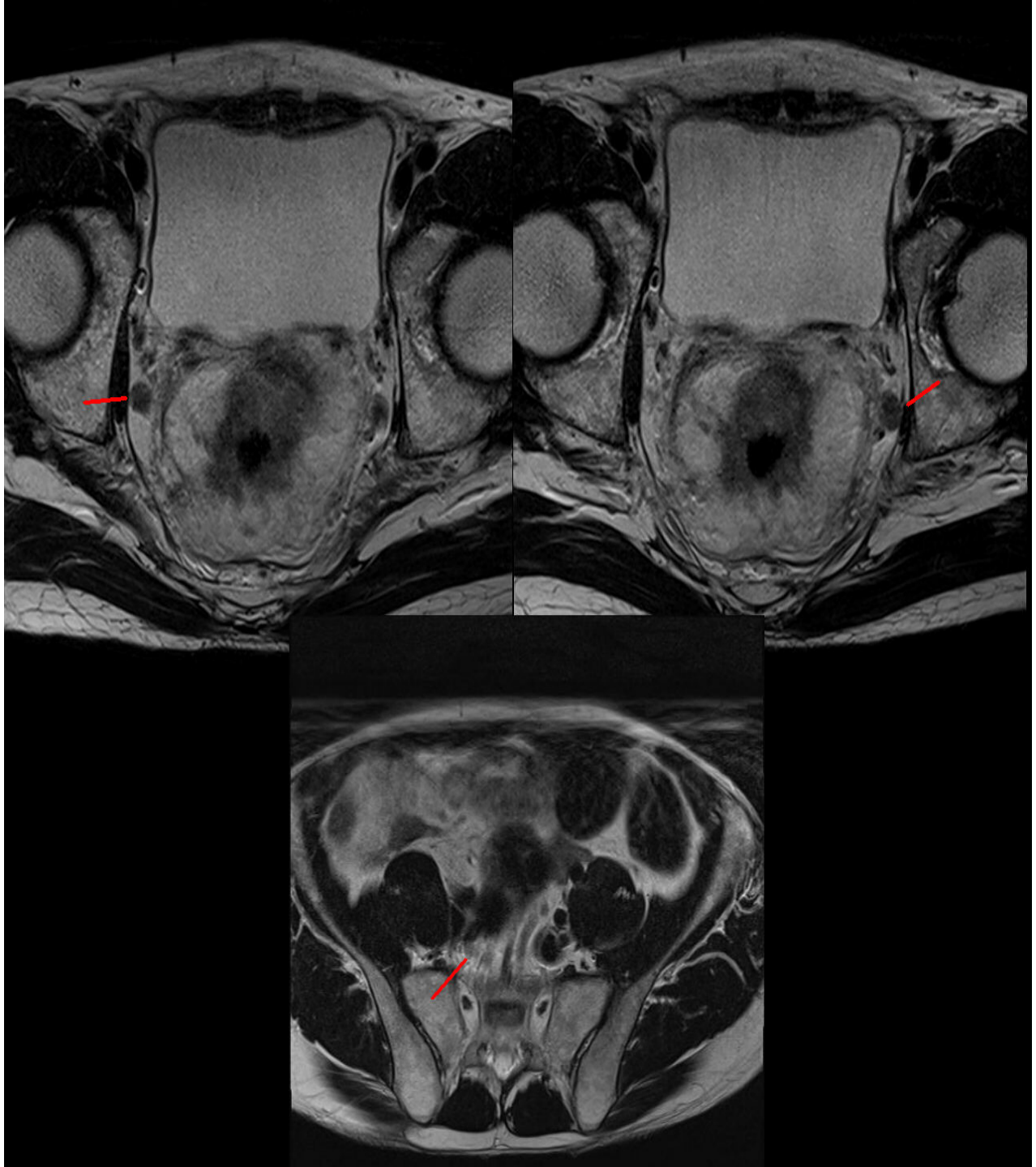
- A 65 year old male presents with bright red rectal bleeding for 6 months. Comorbidities include hypertension. Colonoscopy demonstrates a large anterior polypoid tumour at 5 cm. CT scan does not demonstrate any metastases and MRI was ordered.

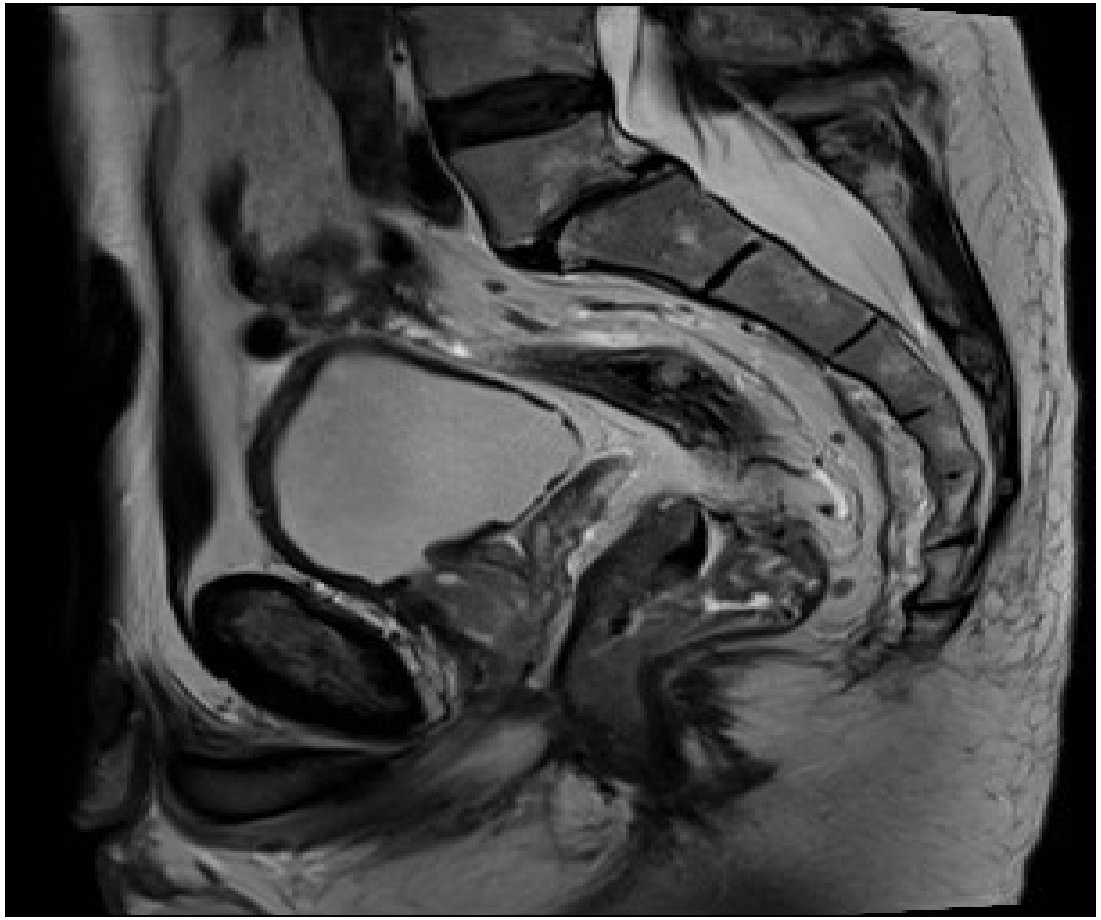


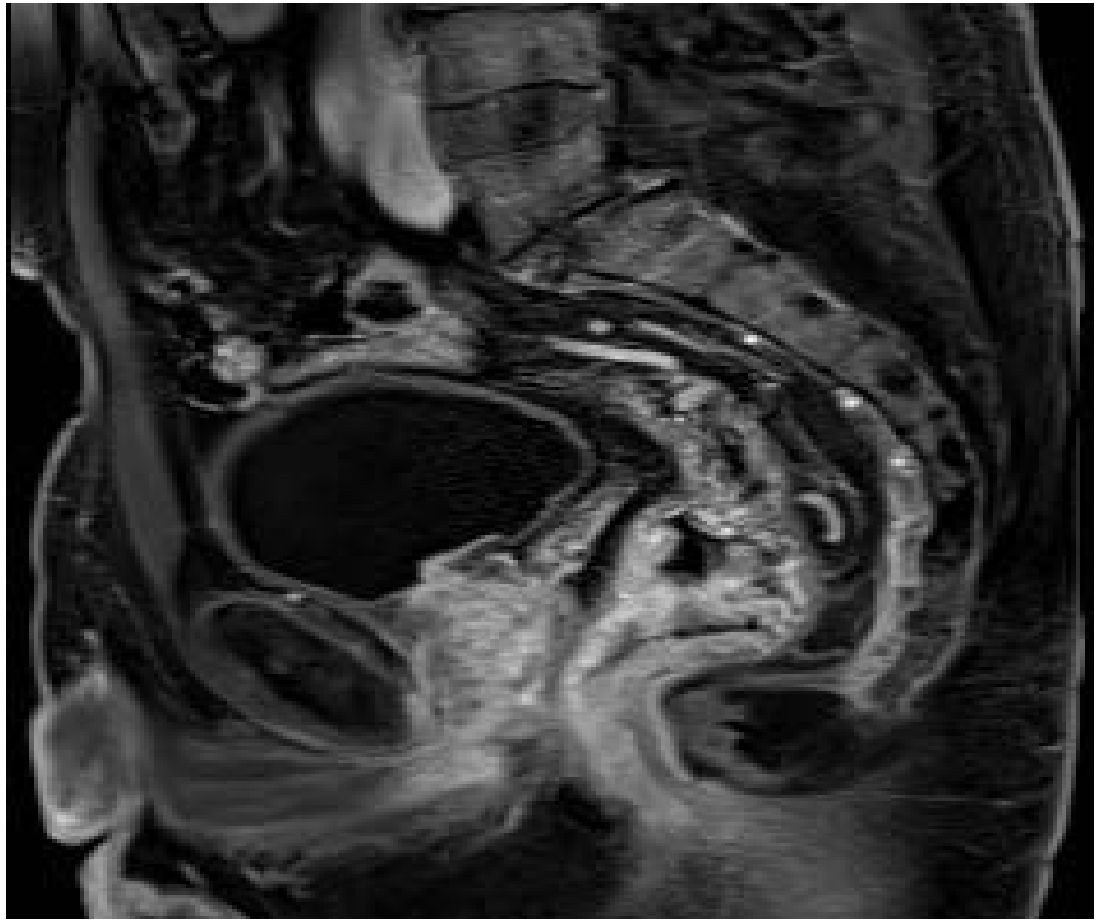
Case # 2

- 56 year old male
- 3-5 months history of altering bowel habits
- Circumferential rectal tumor 2-3 cm above the dentate; ≈6 cm from verge
- CT no mets, incidental finding of liver cirrhosis


EV
6mm 20% (1.2mm) gap



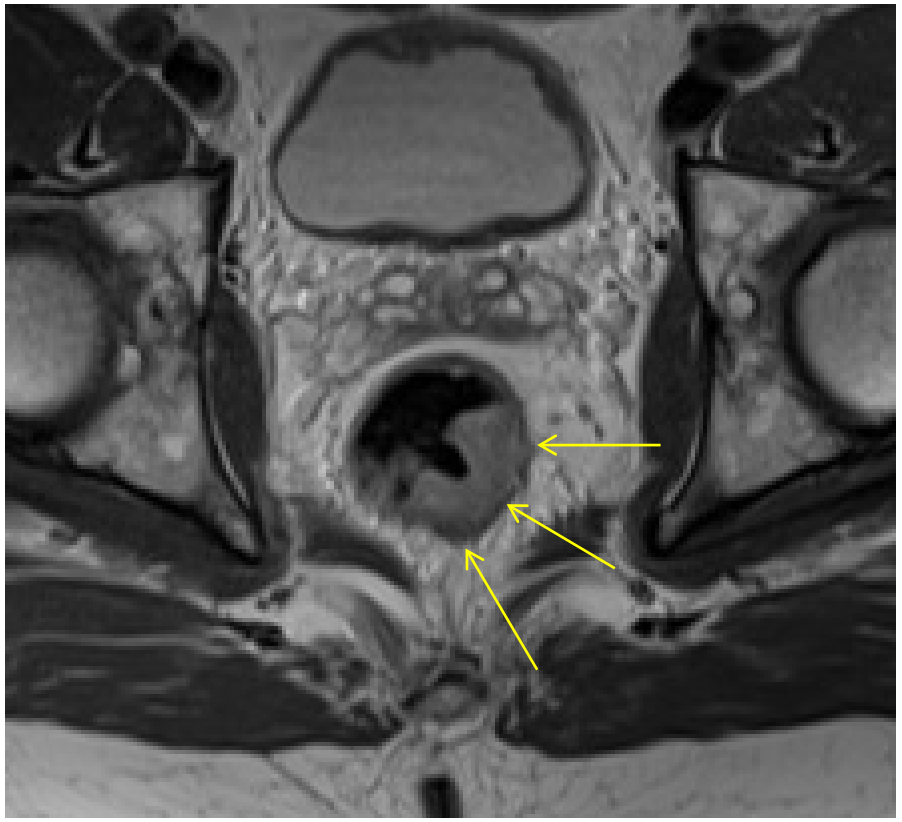




Do all T3s need to be treated with neoadjuvant therapy?

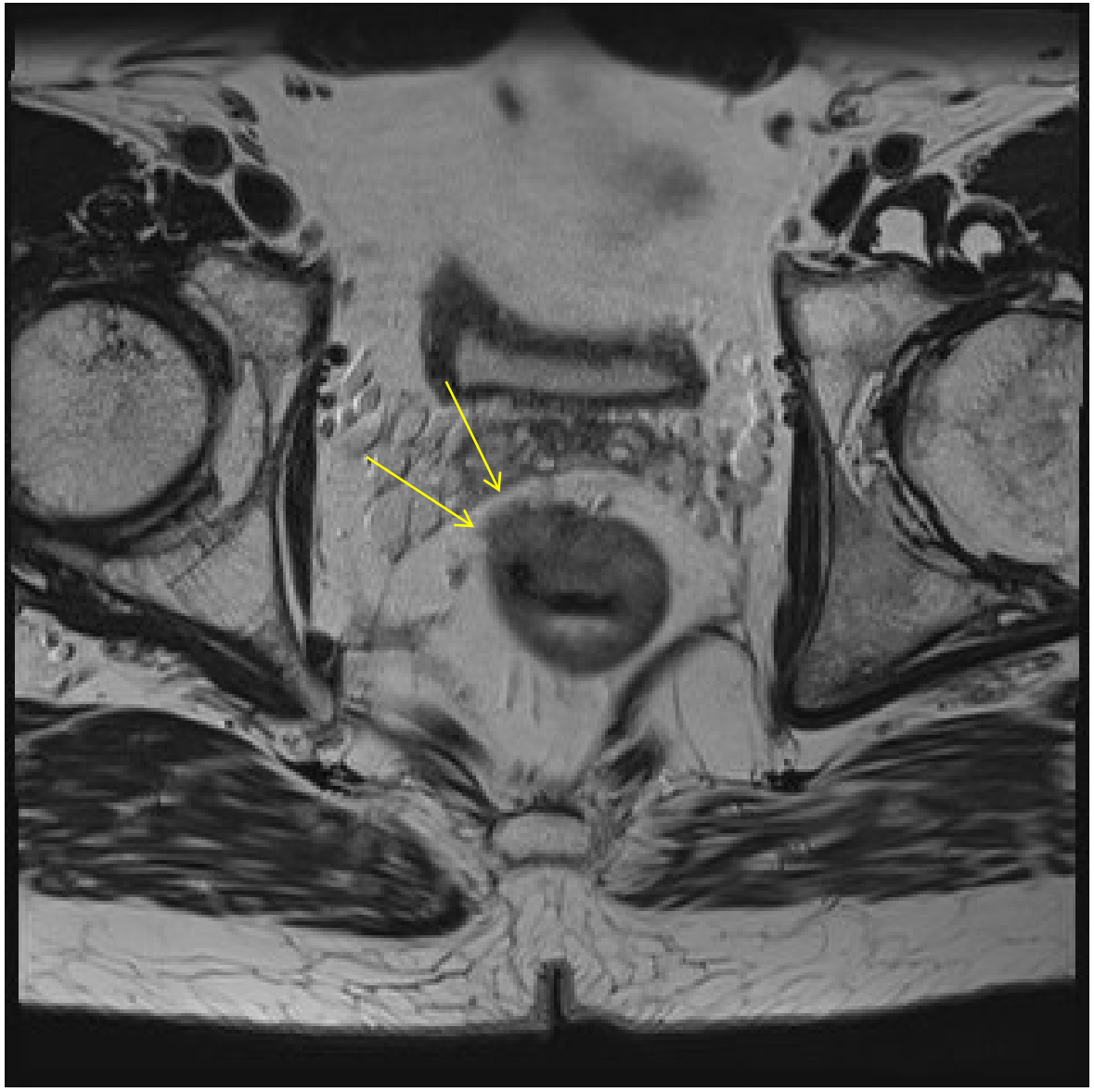
Can we save function without compromising cure?

T2 Low Rectal Tumor

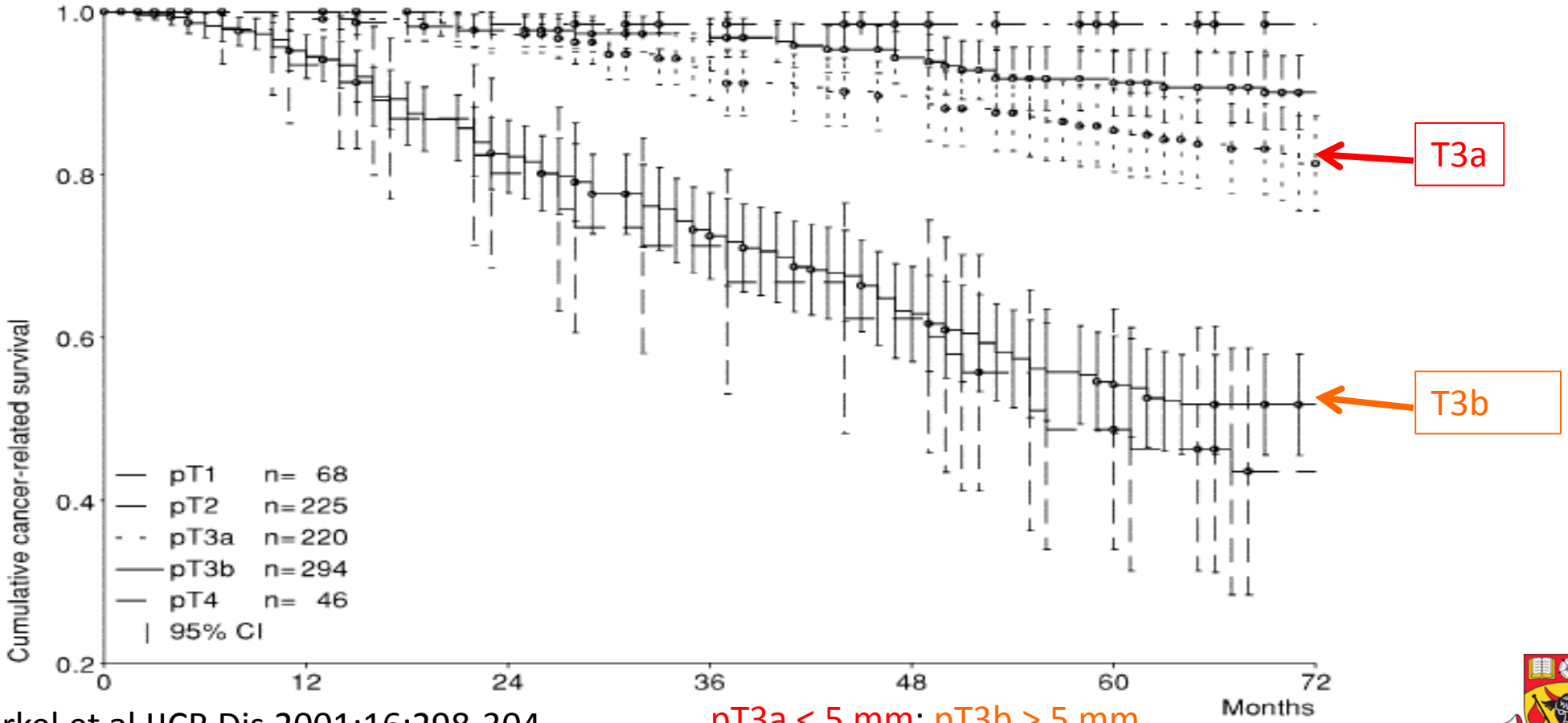


Preservation of the T2 hypointense outer muscularis propria wall layer = T2 disease

T2 or early T3?



pT3a (< 5mm invasion) tumours have a good 5 year survival



Merkel et al IJCR Dis 2001;16:298-304

pT3a < 5 mm; pT3b ≥ 5 mm

Minimally invasive T3 without extramural vascular invasion (EMVI)

- T2 and T3 tumour < 5 mm without EMVI have an 85-90% 5 yr cancer specific survival

- Mercury trial suggests that MRI can reliably identify EMVI preoperatively

- At the present time these patient should be discussed at Multidisciplinary Tumour Conference prior to a decision to omit neoadjuvant therapy

cT4 invading the levator ani and the sphincter

Does MRI usage affect the uptake of neoadjuvant therapy?

Use of Neoadjuvant chemoradiation/radiation in locally advanced rectal cancer Alberta (2015)

- 325 patients radical resection for rectal cancer; complete data in 321

- MRI obtained in 246 (76.6%); 170 were classified as Stage II or III*
  - 135 (79.4%) received nCRT (114) or nRT (21)
  - 35 (20.6%) did not receive
    - 19 (54%) patient factors, 3 (8.6%) system factors 13 (37%) unknown

A large proportion of patients who did not receive nCRT/RT did so because of patient factors

*20 (8%) were understaged

Use of Neoadjuvant chemoradiation in locally advanced rectal cancer Alberta (2015)

- No MRI in 75 (23.4%) patients;
  - 15 (20%) tumours above peritoneal reflection
  - 8 (13.3%) of the remaining 60 received neoadjuvant treatment
  - 26 (43.3%) were stage II or III on final pathology; should have been offered/received nCRT/nRT

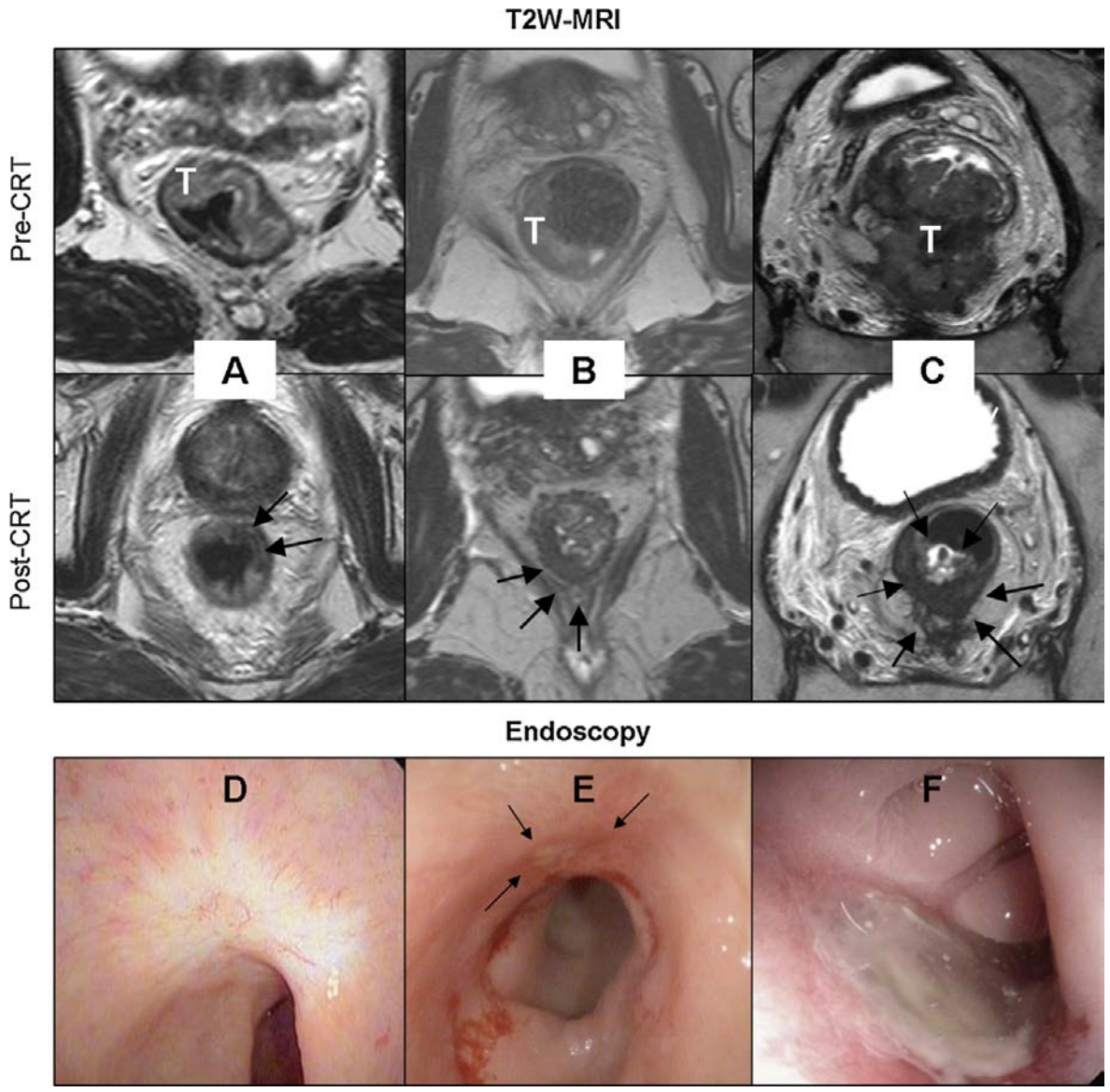
- *A significant proportion of those that did not get properly staged missed out on neoadjuvant therapy*

Measuring the response to neoadjuvant therapy

TABLE 30-3. MRI tumor regression grade (mrTRG) [54]

mrTRG	Description
1	Tumor bed with low signal intensity signaling fibrosis with no residual intermediate tumor signal
2	Tumor bed with predominance of fibrosis with minimal residual intermediate tumor signal
3	Substantial intermediate intensity tumor signal present, but does not predominate over low intensity fibrosis
4	Minimal fibrosis
5	No change from baseline

Mercury study group, Patel Am J Roentgenol. 2012



A. Complete response
B. Equivocal response
C. Residual tumour
D. Smooth scar
E. Small ulcer
F. Residual tumour

Mass et al. Ann Surg Oncol (2015)22:3878-3880

What are the limitations of MRI?

- Technique dependent planning; reader dependent
- Susceptible to motion artifact
- Nodal status based on size homogeneity, shape
  - Micro-metastases may be missed
- T2 T3 interface sometimes difficult (experienced radiologist, good rapport)
- Contraindicated in patients with some cardiac pacemakers, orthopedic hardware

Synoptic reporting of MRI

- Improves completeness of reporting
- Ensures that all important information required for decisions is gathered

Alberta

- Provincial plan for synoptic reporting for all rectal MRI
- Standardizing technique as much as possible
- Standardized outcome measures
- Provide feedback to radiologists based on pathologic evaluation

Synoptic report

APPENDIX A: MRI SYNOPTIC REPORT

Cancer Care Ontario
Action Cancer Ontario

Canadian Cancer Society / Société canadienne du cancer

This document was developed by Drs Eisar Al-Sukhni, Laurent Milot, Mark Fruitman, Gina Brown, Selina Schmocker and Erin Kennedy for the Cancer Services Innovation Partnership – a joint initiative of Cancer Care Ontario and the Canadian Cancer Society

1. MRI PROTOCOL

Overall image quality: ☐ Adequate ☐ Suboptimal ☐ Non-diagnostic

2. TUMOUR LOCATION

Tumour location (from anal verge): ☐ Low (0-5.0 cm) ☐ Mid (5.1-10.0 cm) ☐ High (10.1-15.0 cm)

Distance of the lowest extent of tumour from anal verge: _____ cm

Distance of lowest extent of tumour from top of the anal sphincter: _____ cm

Relationship to anterior peritoneal reflection: ☐ Above ☐ At or straddles ☐ Below ☐ Not able to assess

3. TUMOUR CHARACTERISTICS

Circumferential extent/location (clock face): _____

Craniocaudad extent: _____ cm

Mucinous: ☐ No ☐ Yes

4. T-CATEGORY

i) T-category:

☐ T1 or T2
☐ T2/early T3 [includes spiculation of the perirectal fat]
☐ T3
☐ T3/possible T4*
☐ T4*

*Please indicate structures with possible invasion: _____ (see list below)

GU	PELVIC SIDE WALL	BONE/VASCULAR	OTHER
bladder	Obturator internus	sacrum (specify level)	Anterior peritoneal reflection
left ureter; right ureter	Piriformis	left internal iliac vessels; right internal iliac vessels	
prostate		left external iliac vessels; right external iliac vessels	
uterus	LEVATOR ANI		
vagina	Pubococcygeus		
	Ileococcygeus		
	Coccygeus		

ii. *For low rectal tumours (0 - 5 cm) only:*

Is the lower extent of the tumour at or below the top border of the puborectalis? ☐ No ☐ Yes*

*If yes, please complete the following section for the most penetrating component of the tumour below the top border of puborectalis:

☐ Possible confinement to the submucosa; no definite involvement of internal sphincter (suspected T1)
☐ Confined to the internal sphincter; no involvement of intersphincteric fat or external sphincter (early T2)
☐ Through the internal sphincter and intersphincteric fat; possible or definite involvement of the external sphincter (advanced T2)
☐ Through the external sphincter and into surrounding soft tissue; no organ involvement (T3)
☐ Through external sphincter and possible involvement of the adjacent organs (i.e., prostate, vagina) (T3/T4)
☐ Through external sphincter and definite involvement of adjacent organs (i.e., prostate, vagina) (T4)

5. DISTANCE TO THE MRF AND EXTRAMURAL DEPTH OF INVASION (EMD)

i) Shortest distance of the definitive tumour border to the MRF = _____ mm
[or ☐ unable to estimate or ☐ not applicable (involving the peritonealized portion of the rectum or T4a)]

ii) Extramural depth of invasion (EMD) at this level = _____ mm
[Record *0 mm for T1 and T2 tumours*]

iii) Are there any tumour spiculations closer to the MRF? ☐ No ☐ Yes*

*If yes, please specify distance = _____ mm and location _____ (on clock face)

iv) Is there any other component of the tumour (any T1-3) closer to the MRF? ☐ No ☐ Yes*

*If yes, please specify distance = _____ mm and location _____ (on clock face)

6. EXTRAMURAL VASCULAR INVASION (EMVI)

EMVI: ☐ Absent ☐ Equivocal ☐ Present

7. MESORECTAL LYMPH NODES AND TUMOUR DEPOSITS

Any suspicious mesorectal lymph nodes and/or tumour deposits? ☐ No ☐ Yes*
(suspicious = irregular border, mixed signal intensity and/or ≥ 8 mm)

*If yes: (please complete a and b)

(a) Shortest distance of any suspicious mesorectal lymph node/tumour deposit to MRF = _____
(b) Please indicate location of the lymph node/deposit closest to the MRF:

☐ At level of tumour; at _____ o'clock
☐ Above tumour; at _____ o'clock
☐ Below tumour; at _____ o'clock

8. EXTRAMESORECTAL LYMPH NODES

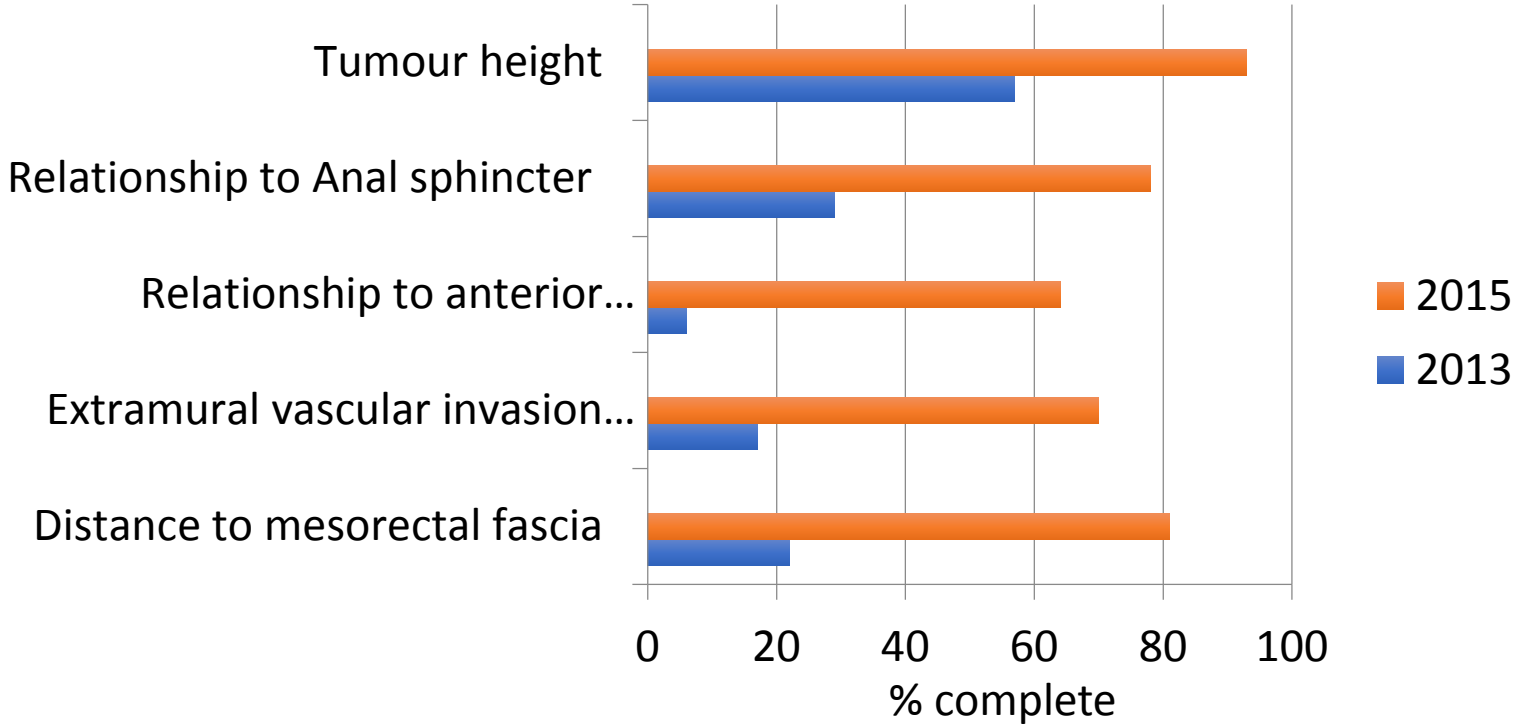
Any extramesorectal lymph node(s) with suspicious morphology or signal? ☐ No ☐ Yes*
(suspicious = irregular border, mixed signal intensity and/or ≥ 1 cm)

* If yes, please specific location (free text):

9. FREE TEXT/ADDITIONAL COMMENTS

Use of Staging MRI and Completeness of MRI reports 2013 - 2015

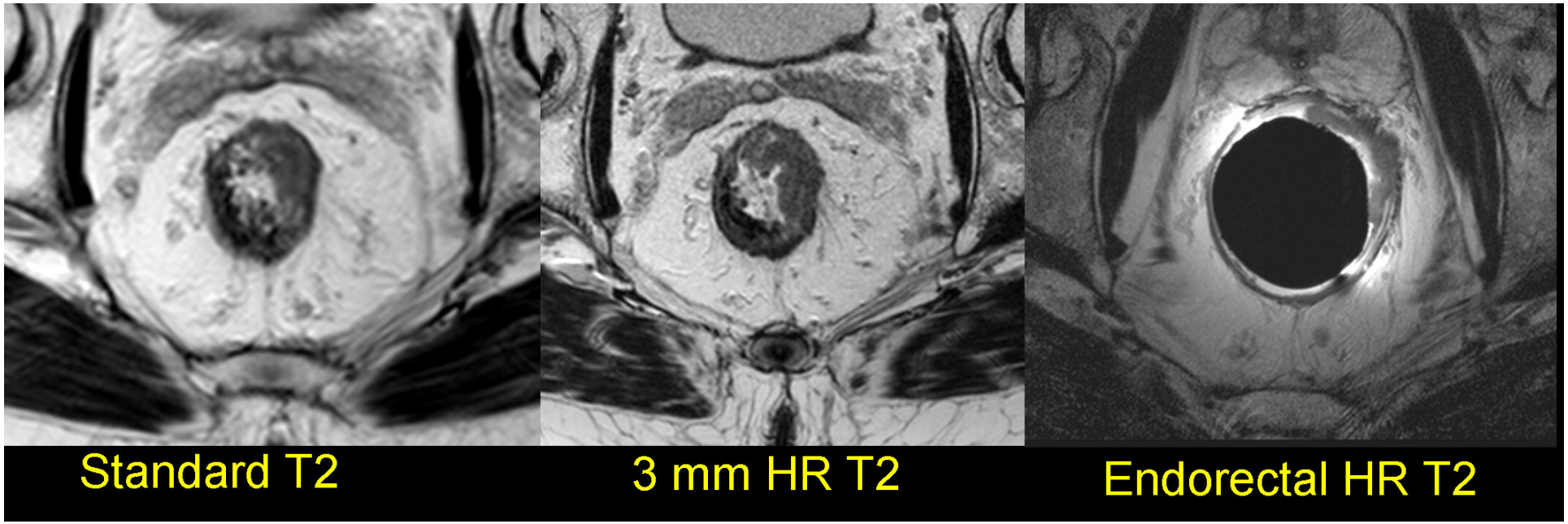
Use of preoperative staging MRI has increased from 53% to 67% to 75%



MRI - Meticulous attention to technique (Mercury trial)

- MR definitive sequence
  - high resolution
  - small FOV
  - 3 mm thick non fat suppressed T2 sections
  - orthogonal to lumen and no gap.
- Failure to image perpendicular to lumen attributed to 11/22 overestimation errors on review of data.
- All 18 interpreting GI radiologists went to workshops on technique and reporting.

Same case – slightly different angles



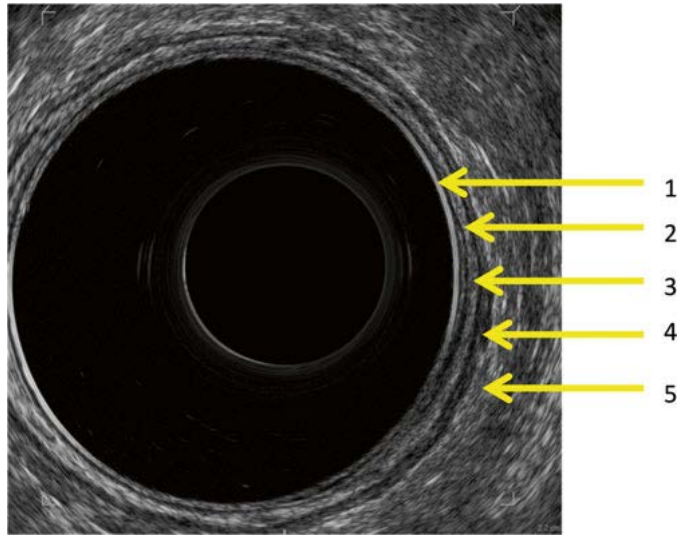
There are no publications demonstrating superiority of Endorectal in staging

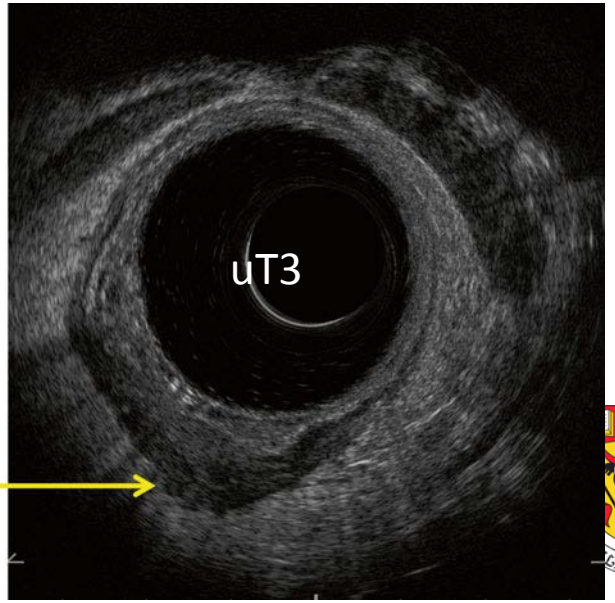
Endorectal Ultrasound

ERUS Useful for staging prior to local excision

- Advantages
  - Simple to perform
  - Inexpensive compared to MRI
  - Accurate for T stage not for N stage
- Disadvantages
  - Inaccurate with obstructing lesions
  - Operator dependent
  - Experience dependent
  - Better with staging locally advanced lesions

- Prior to local excision I will obtain an MRI and an ERUS


1
2
3
4
5


uT3

ERUS accuracy

TABLE 27-1. ERUS accuracy compared to histological stage.

Meta-analysis of 42 studies, $N=5039$ patients		
T stage	Pooled sensitivity	Pooled specificity
T1	87.8 % (95 % CI 85.3–90.0 %)	98.3 % (95 % CI 97.8–98.7 %)
T2	80.5 % (95 % CI 77.9–82.9 %)	95.6 % (95 % CI 94.9–96.3 %)
T3	96.4 % (95 % CI 95.4–97.2 %)	90.6 % (95 % CI 89.5–91.7 %)
T4	95.4 % (95 % CI 92.4–97.5 %)	98 % (95% CI 97.8–98.7 %)

Adapted from Puli S, Bechtold M, Reddy J, Choudhary A, Antillon M, Brugge W. How good is endoscopic ultrasound in differentiating various T stages of rectal cancer? Meta-analysis and systematic review. Ann Surg Oncol 2009; 16:254–265 [7]

Higher sensitivity for locally advanced cancer 95%
Lower accuracy for detecting T2 tumours compared to T1 T3 T4

ERUS N stage

- N-stage
  - Accuracy ~ 75% (64-83%)
  - Problem areas:
    - Blood vessel vs. lymph node (use Doppler)
    - Overstaging (5-22%) – secondary to inflammation
    - Understaging (2-25%) – nodes too small or beyond the range of the probe
      - 50-75% of +’ve nodes are normal size (<5mm)

Overstaging and understaging…

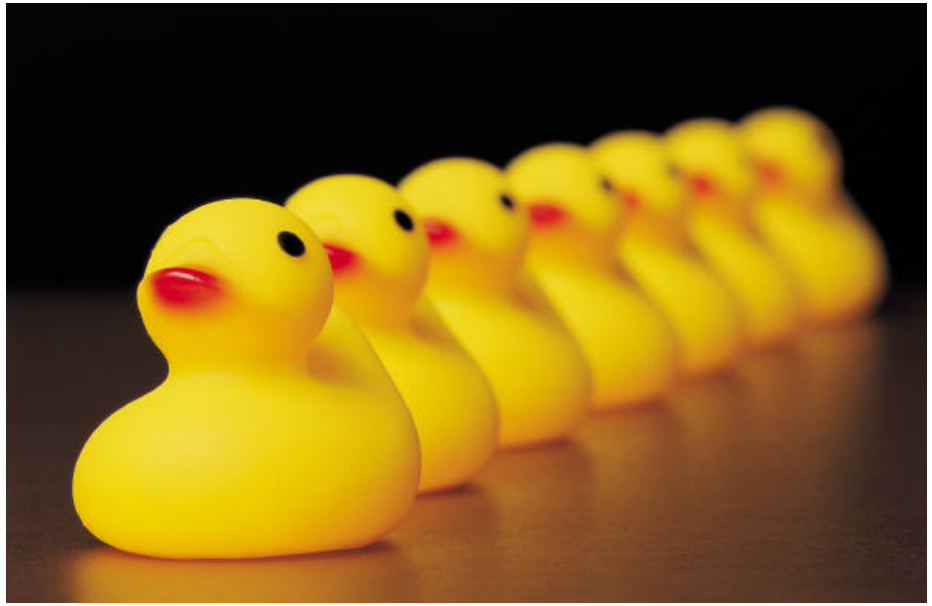
- UK study, multicenter
  - 91 T1 cancers
    - Understaged as T0 – 24%
    - Correctly staged as T1 - 57%
    - Overstaged as T2 - 16%, and as T3 in 2%

Ashraf et.al. Colorectal Disease.2012;14:821-826

Summary: Role of Radiology

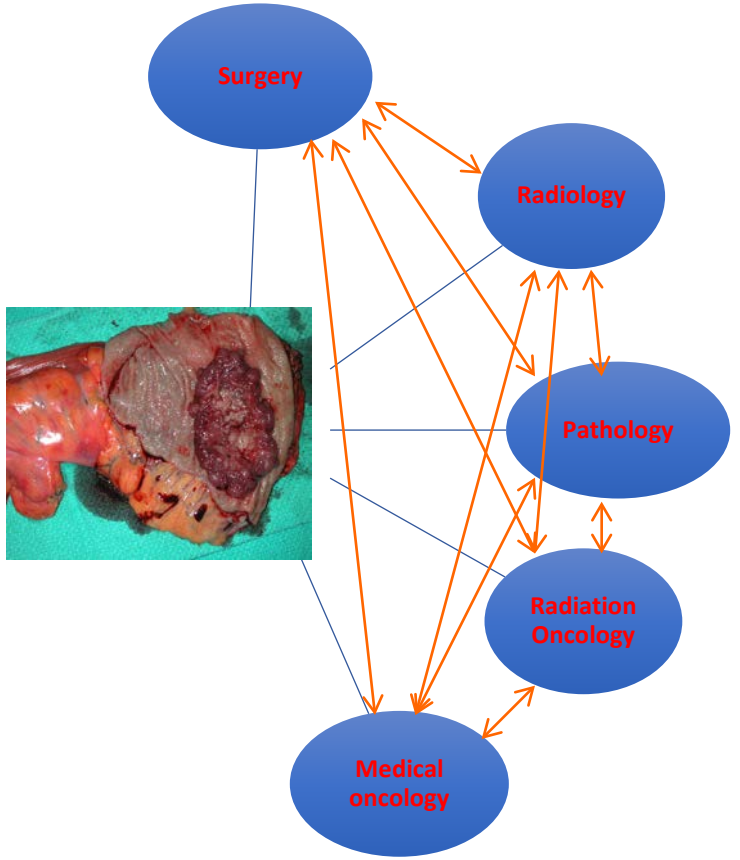
- Treatment planning depends on accurate preoperative staging
- Accurate staging predicts surgical and pathologic findings
- MRI plays a central role in assessing response to neoadjuvant therapy
- Quality reporting is essential

Multidisciplinary Conference (MDC)



Rectal Cancer Care

Multidisciplinary



Interdisciplinary

Multidisciplinary conference

Advantages of Multidisciplinary conference (MDC)

- Multidisciplinary team management is associated with
  - improved clinical decision making
  - Superior outcomes
  - Better patient experience
- Improved communication
  - More timely
- Consensus decisions
  - Multiple viewpoints; ownership
- Education – from other specialties (i.e.)
  - MRI
  - Surgical margins
  - Tumour location
  - Chemoradiation risk and benefit for the individual

Structure, Membership of MDC

- Structure
  - Meeting time that everyone can attend
    - Thursday at 4:30 pm TBCC/FMC
    - Cases are identified in advance and sent out on a locked email to the members
    - Radiology and pathology are notified of the cases for review in advance
    - The essential specialty must be represented for a case to be discussed (i.e. if the question is primarily surgical then at least one surgeon must be present)
  - Membership
    - Surgeons (CR SO HPB), med oncologists, rad oncologists, radiologists, pathologists (case specific)
    - Open to physicians and surgeons from Calgary, Lethbridge, Medicine Hat and Red Deer
    - Attendance credit for MAINPORT

MDC Process

- Chair is at TBCC/FMC
- All other sites are linked by Telehealth
- Individuals can attend by phone
- Case presented by the primary physician/surgeon
- Films are reviewed by radiology
- Discussion regarding question at hand
- Consensus is reached
- Treatment plan set; consults are booked (surgery, chemo, rads)
- Report is generated immediately and distributed the next day to the physicians and surgeons involved with the case

Referral

- Anyone who participates in rectal cancer care can refer a patient to MDC for discussion
- Appropriate referrals:
  - Re-reading MRI and other modalities
  - Surgical management
  - Organizing a second opinion (surgical or medical)
  - Use of neoadjuvant therapy; SCRT vs LCCRT
  - Use of adjuvant chemotherapy
  - Recurrent disease – treatment or palliation
  - Assessment for enrollment in current trials

- Our goal is to have all rectal cancer cases discussed

The Value of Multidisciplinary Teams (Mercury study)

- Rectal cancer MDT
- 2% (4/182) CRM positive rate in resected patients discussed at MDT
- 8% (16/194) CRM positive rate in all discussed patients including unresectable disease
- 28% (16/162) CRM positive rate in patients not discussed
- CRM positive rate in all cases discussed by MDT was significantly lower than in cases not discussed ($p < 0.001$)

Burton et al Br J Cancer 2006;94:351-57

Following this paper the Royal Marsden Hospital made MDT and MRI mandatory for all rectal cancers
There was a reduction of the overall CRM+ to 3% !!

Team effort

Summary

- Cross sectional imaging is an essential component of comprehensive care of rectal cancer patients

- Accurate local regional staging guides treatment decision
  - MRI should be performed for all rectal cancers
  - ERUS prior to local excision

- MDC is essential to support multidisciplinary and interdisciplinary care
  - It is the foundation for good decision making and excellent comphensive care


MO SHÚILE · TOGAM SUAS