# Rectal Cancer
# Location: the Surgical Perspective

WC GCCC Western Canadian Gastrointestinal Cancer Consensus Conference

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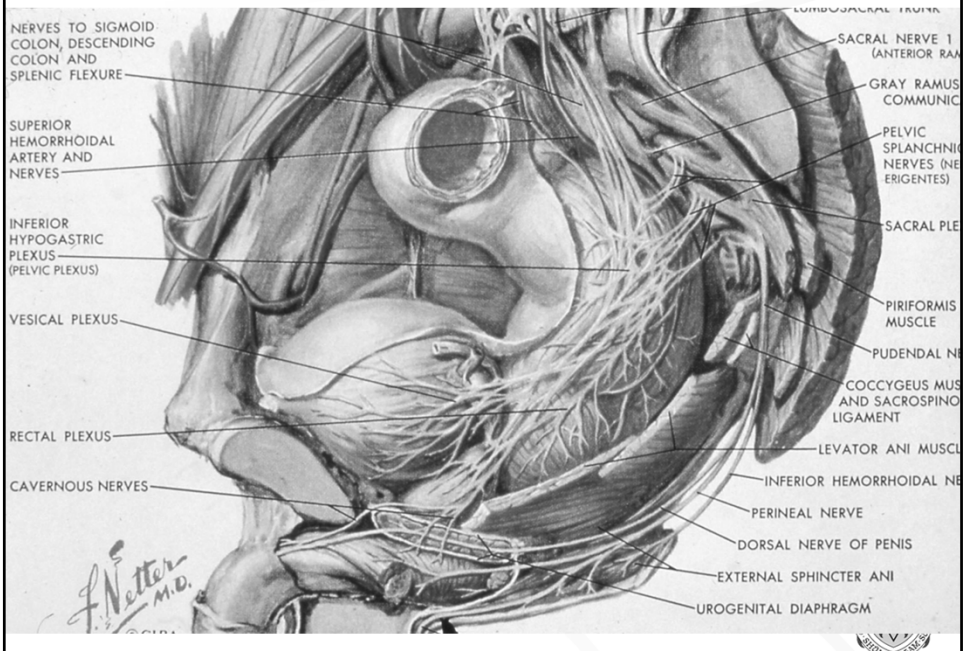
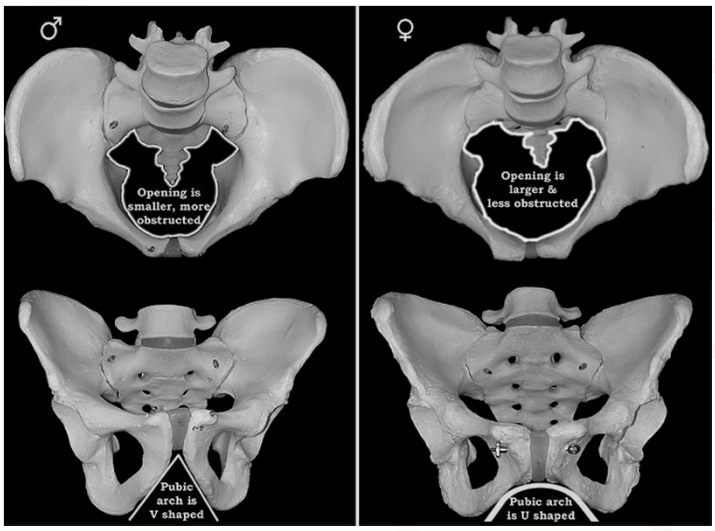
- *I have no disclosures*

# Outline

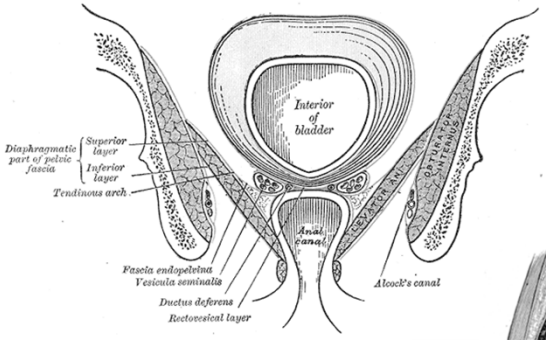
- *Surgical Anatomy review*
- *Location … where is the tumour?*
- *Location and neoadjuvant therapy*
- *Location and surgery; LAR, APR or LE*
- *Location and surgeon experience*

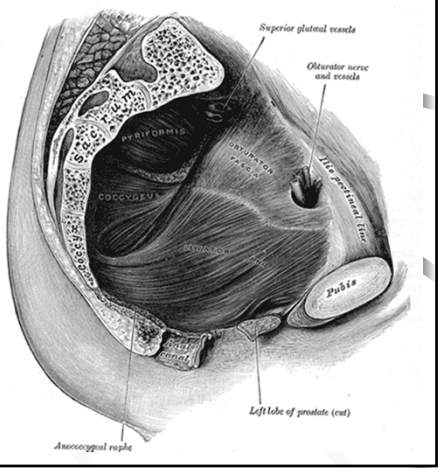


# Male and Female pelvis



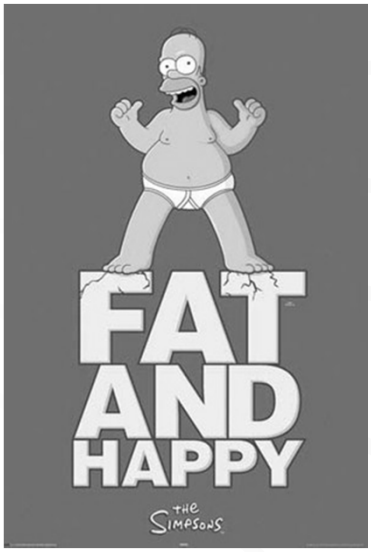

http://radiologypics.com/2013/04/03/differences-between-male-female-pelvis/




Greys Anatomy Fig 402 and 404
http://www.bartleby.com/107/illus404.html

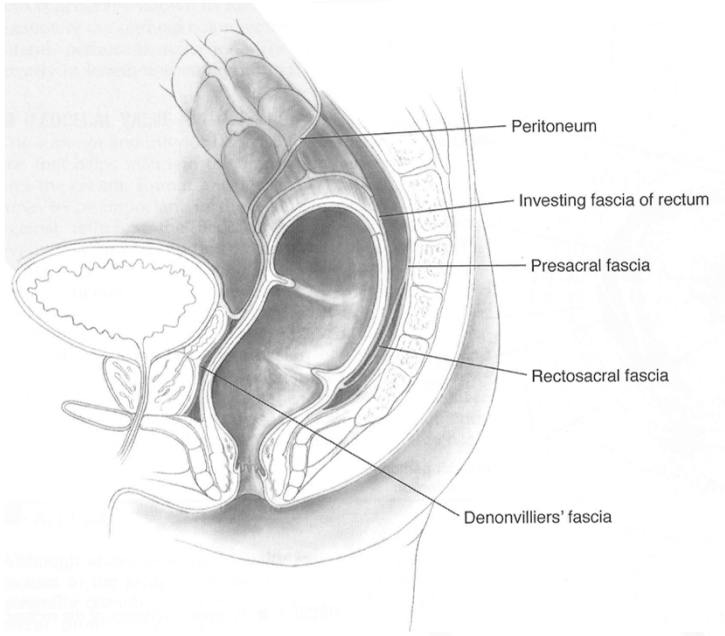
## Body Habitus




http://dgeiu3fz282x5.cloudfront.net/g/l/lghr19125.jpg

## The Mesorectum

- *the rectum and its mesentery are a single fascia-enveloped unit, anatomically separate from surrounding pelvic structures*
- *Contains the blood vessels and lymphatics of the rectum*
- *It tapers down and ends just above the levator hiatus*
- *surgical violation of this anatomic package near a tumour may lead to a positive circumferential margin, a known predictor of local recurrence*




Anterior vs posterior and Intraperitoneal vs extraperitoneal

## Anatomy summary

- *Mesorectum ends just above the levator hiatus.*
- *The Anorectal junction abuts the levator hiatus*
- *Posterior tumours can be mobilized more as the rectal wall is longer*
- *More structures anteriorly*
- *Intraperitoneal vs extraperitoneal location is variable*

## Why is location important?

*Height*

- *The height from the anal verge is of secondary importance …*

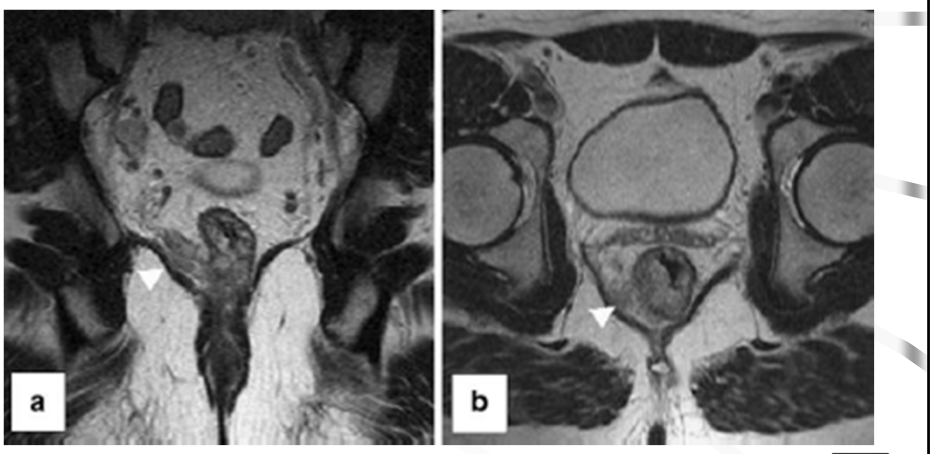
*What we really want to know is ….*

- *proximity to anal sphincter*
- *proximity to pelvic floor levators*

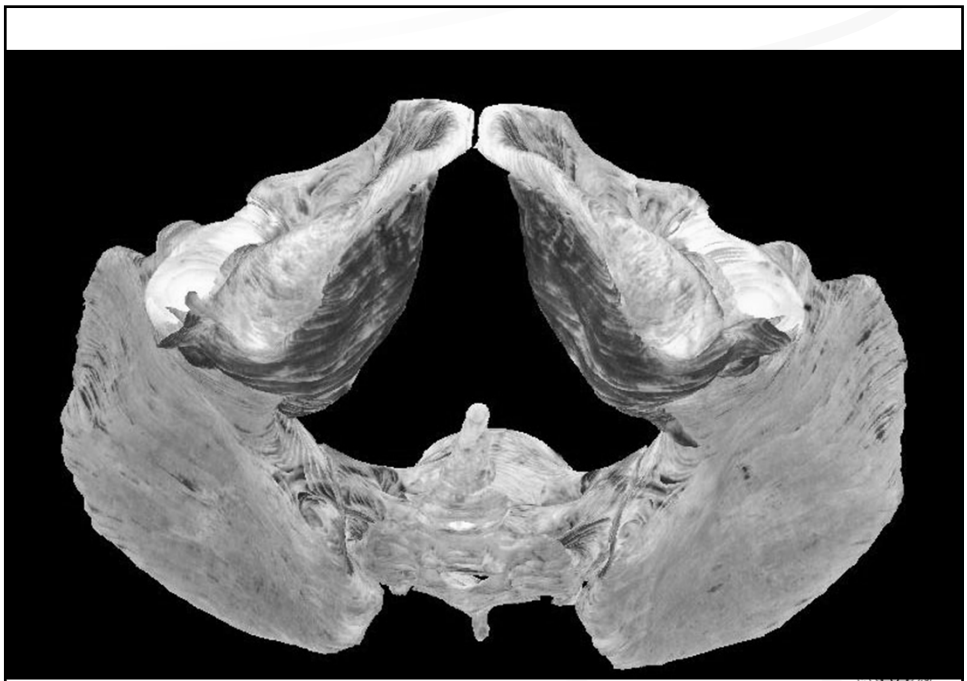
## Tumour height measured from Anal verge vs upper sphincter

Shibab, Moran, Heald, Quirke, Brown. Eur Radiol 2009;19:643-650

# The levator and external sphincter are contiguous structures




Shibab, Moran, Heald, Quirke, Brown. Eur Radiol 2009;19:643-650



The visible human project www.nlm.nih.gov/research/visible/vhpconf2000/AUTHORS/VENUTI/IMAGINDX.HTM

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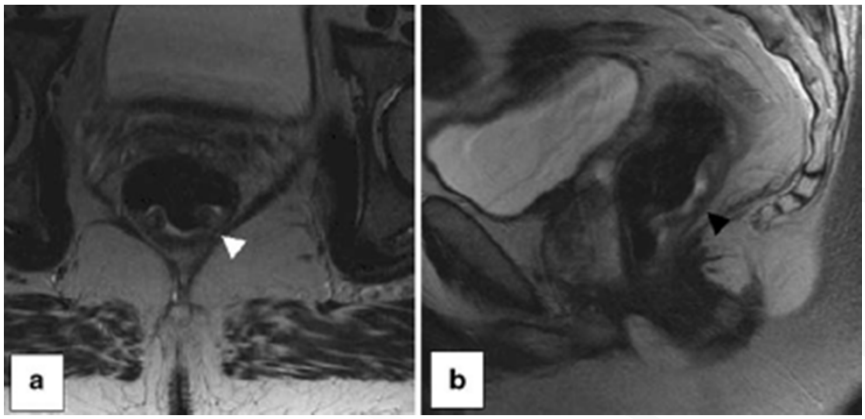
# Tumour Clearance




Shibab, Moran, Heald, Quirke, Brown. Eur Radiol 2009;19:643-650

# Location (Local Regional Staging)

## Staging

*"… if it would be possible to decide the category of the case before operating, this would be very useful information."*

*Cuthbert Dukes, 1932*

## What do we want to know?

*Local regional variables:*

1. *Location of tumour*
2. *Depth of penetration of tumour through intestinal wall*
3. *Presence of regional lymph node metastasis*

## Why do we want to know it?

*Stage dictates THERAPY!*

*Should we consider local excision?*

*Should this patient have Neoadjuvant therapy?*

*Stage dictates PROGNOSIS*

## Local regional staging TRUS

- *Most useful when considering local excision*

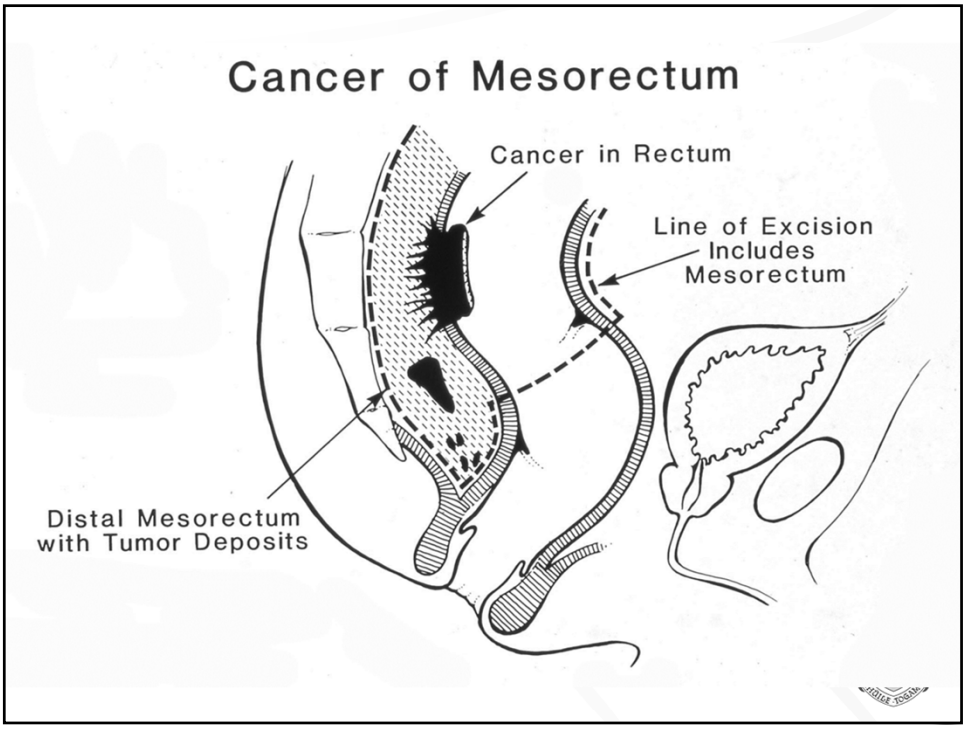
*Limitations:*

- *Does not see mesorectal envelope well*
- *Tumour must be non obstructing*
- *Must be 10 cm or less for best images*

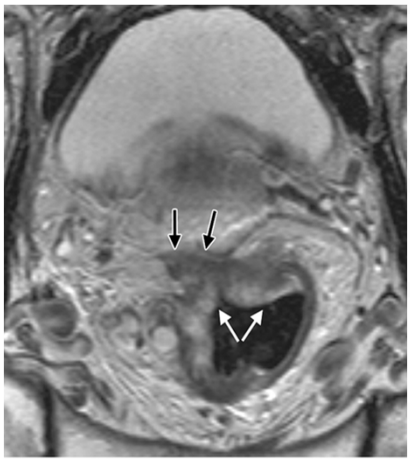
- *T-stage*
  - *Accuracy 85% +*
  - *Problem areas:*
    - *T2 vs. T3*
    - *post radiation - edema vs. tumor*
    - *overstaging (11-18%) and understaging (5-13%)*

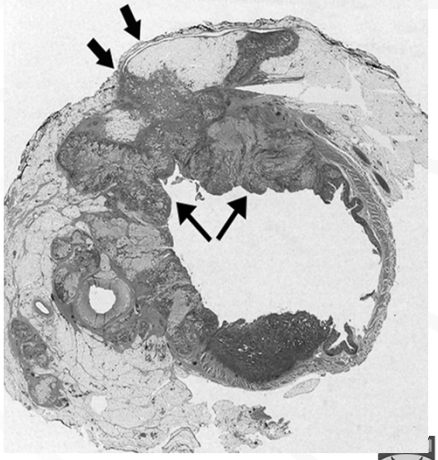
# MRI

- *The Gold Standard*
- *Technology evolving rapidly!*
  - *Intramural staging improving (T1,T2)*
  - *Evaluation of the integrity of the mesorectal envelope (CRM)*
  - *Proximity of tumour to the surgical margin*
  - *Proximity of the tumour to the sphincter/ levators*
  - *Vascular invasion*



# MRI
# Prediction of involved CRM





≥1 mm is considered positive; 1-2 mm borderline Beets-Tan 2004

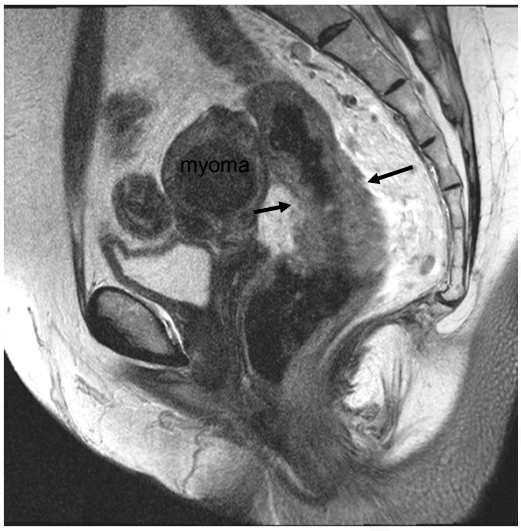
# MRI and Mesorectal Margin

| | *Histopathologic Examination* | | |
|---|---|---|---|
| | *Clear* | *Involved* | *Total* |
| *MRI Prediction:* | | | |
| *Clear* | *215* | *15* | *230* |
| *Involved* | *4* | *11* | *15* |
| *Total* | *219* | *26* | *245* |

*Accuracy = 92% (226/245)*
*Sensitivity = 42% (11/26)*
*PPV = 73% (11/15)*
*Specificity = 98% (215/219)*
*NPV = 93% (215/230)*

MERCURY Study Group. BMJ. 2006;333:779-784

## Proximity of tumour to levators and sphincter complex




## Location and neoadjuvant therapy

# Pre-op Radiation Decreases Local Regional Recurrence and is Additive to Proper Surgical Technique

| Study | Number | Radiation Gy/ fraction | Surgery alone Local Rec (%) | Surgery/XRT Local Rec (%) |
|---|---|---|---|---|
| St. Marks 1994 | 468 | 15 / 3 | 21 | **14*** |
| Bergen, Norway,1990 | 309 | 31.5 / 18 | 23 | 15 |
| Manchester, 1994 | 284 | 20 / 4 | 37 | **13*** |
| EORTC,1988 | 466 | 34.5 / 15 | 30 | **15*** |
| MRC-2, 1996 | 279 | 40 /20 | 46 | 36 |
| Stockholm, 1995 | 849 | 25 / 5 | 28 | **14*** |
| Sw Rectal Ca Trial, 1997 | 1168 | 25 / 5 | 27 | **11*** |
| Dutch TME trial, 2002 (5yr) | 1861 | 25 /5 | 11.4 | **5.8*** |

* Denotes results that are statistically significant

# Pre-op RT is more effective at decreasing local recurrence

| *Study* | *Number* | *Rads* | *5 yr LR* | *5 yr OS* |
|---|---|---|---|---|
| ***Uppsala*** *(SCRT)* | | | | |
| *Pre-op* | *236* | *25 Gy (1 wk)* | *13%* | *47%* |
| *Post-op* | *235* | *60 Gy (8 wk)* | *22%*(p=0.02)* | *40%* |
| ***NSABP – R03 (CRT)*** | | | | |
| *Pre-op* | *130* | *50.4 Gy* | | *74%* |
| *Post-op* | *137* | *50.4 Gy* | | *66%* |
| ***German Trial (LCCRT)*** | | | | |
| *Pre-op* | *405* | *50.4 Gy* | *6%* | *76%* |
| *Post-op* | *394* | *55.8 Gy* | *13%*(p=0.006)* | *74%* |

Note: Complete treatment in 90% of pre-op vs 50% of post-op

Frykholm et al. DCR 1993; 36: 564-572
Hyams et al. DCR 1997; 40: 131-139
Sauer et al. N Engl J Med. 2004; 351: 1731-1740

# What are the surgical advantages of Neoadjuvant Chemoradiation?

*Neoadjuvant LCCRT :*

- *Improve mobility - fixed / tethered tumours*
- *Improve circumferential margins*
- *Decrease tumour size (Bulky lesions)**
  - *Borderline reconstructable*
  - *Large tumours small pelvis*
  - *Male or obese*
  - *Tumour regression may permit reanastomosis by improving technical issues (Sphincter sparing)*

- *We do not rely on neoadjuvant chemoradiation to sterilize the distal intramural margin*

# How is MRI used to determine neoadjuvant therapy?

- *Predicted CRM negative*
  - *T1, T2,*
  - *Early T3 < 5mm depth, N0 or N1;*

Consider primary surgery

- *Predicted CRM negative but*
  - *T3 > 5mm depth invasion*
  - *T4, N2;*

neoadjuvant short course RT or long course CRT

- *Predicted CRM positive (≤ 1mm)*
  - *includes all T2,T3,T4 below levators*

  *Requires an APR*
  - *Lymph nodes near CRM*

neoadjuvant long course CRT

# Local Recurrence vs. Radial Margin in Rectal Cancer

Adam, 1994 - 190 pt, 141 curative surgery

| | Local Recurrence | Local Recurrence Hazard ratio | Survival Hazard ratio |
|---|---|---|---|
| Positive | 78 %<br>CI (62-94) | 12.2<br>CI (4.4-34.6) | 3.2<br>CI (1.6-6.5) |
| Negative | 10%<br>CI (4-16) | 1 | 1 |

# What is the Cost?
## Long term function following adjuvant radiotherapy

| | Uppsala (Mean F/U 6.7 yrs) | | Stockholm I & II (mean F/U 15 yrs) | |
|---|---|---|---|---|
| Symptoms | Sx (%) | Sx/XRT (%) | Sx (%) | Sx/XRT (%) |
| | n=44 | n=49 | N=74 | N=65 |
| Frequency ( >5/d) | 2 | 18 | | |
| Loose liquid stool | 2 | 25 | | |
| Fecal urgency | 12 | 41 | | |
| Fecal incontinence | 5 | 49 | 26% | 57% |
| Use of pads | 0 | 26 | | |
| Differ. Stool/gas | 95 | 77 | | |
| Social impact | 15 | 29 | | |
| Antidiarrheal use | 11 | 25 | | |
| Abdominal pain | 14 | 27 | | |
| Tenesmus | 3 | 13 | | |

Dahlberg et.al. DCR. 1998; 41: 543-549
Pollack et.al. Br J Surg. 2006; 93: 1519-1525

## Location and Surgery

- *Should we consider local excision?*
- *Should this patient have a low anterior resection or an APR?*

## Transanal Excision

- *Suitable in 3-5% of pts.*
- *Criteria not well defined, but ideally:*
  - *Distal 1/3 of rectum (except with TEM)*
  - *Mobile (generally T1)*
  - *< 1/3 circumference*
  - *Polypoid > ulcerated*
  - *Well / moderately well differentiated*
  - *< 4cm in size*
  - *No lymphovascular invasion*
  - *No evidence of nodal metastases*

# RECTAL CANCER
# LOCAL EXCISION (trans anal excision)

*pro*

- *low morbidity/mortality*
- *avoids sexual/urinary/bowel dysfunction*
- *avoids colostomy*

*con*

- *nodal status not pathologically assessed*
- *involved nodes not excised*

TMN - Total mesorectal neglect

R Madoff

# Transanal Excision
# Local Recurrence

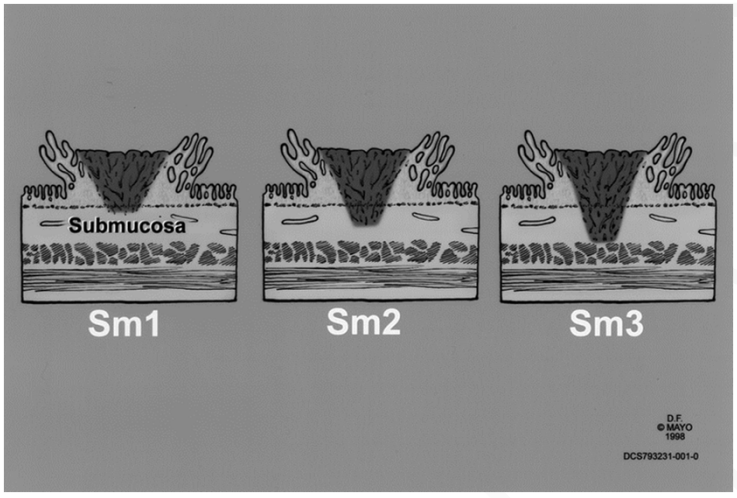
| Study / year | No. of patients | T1 Local Rec. | T2 Local Rec. |
|---|---|---|---|
| Stipa et.al. 2004 | 47 | 16% | 20% |
| Maeda et.al. 2004 | 91 | 2% | 15% |
| Gopaul et.al. 2004 | 64 | 13% | 24% |
| Gao et.al. 2003 | 47 | 11% | 27% |
| Patty et.al. 2002 | 94 | 14% | 28% |
| Garcia-Aguilar 2000 | 82 | 18% | 37% |
| Mellgren et.al. 2000 | 108 | 18% | 47% |
| Chakravarti 1999 | 52 | 11% | |
| Sticca et.al. 1996 | 71 | 0% | 10% |
| Baron et.al. 1995 | 76 | 19% | 21% |
| | | | |
| **Total** | **732** | **12%** | **28%** |

Compare to Dutch Rectal Cancer Trial - <1% in stage 1 pts

# Total mesorectal neglect
# Risk of lymph node metastases

- *Increased by:*
  - *Lower 1/3 of rectum*
  - *Poor differentiation**
  - *Lymphovascular invasion**
  - *Sm level 3 T1 sub staging* *(Kudo et al. Endoscopy. 1993;25:455-461)*

# T1 Sub-staging

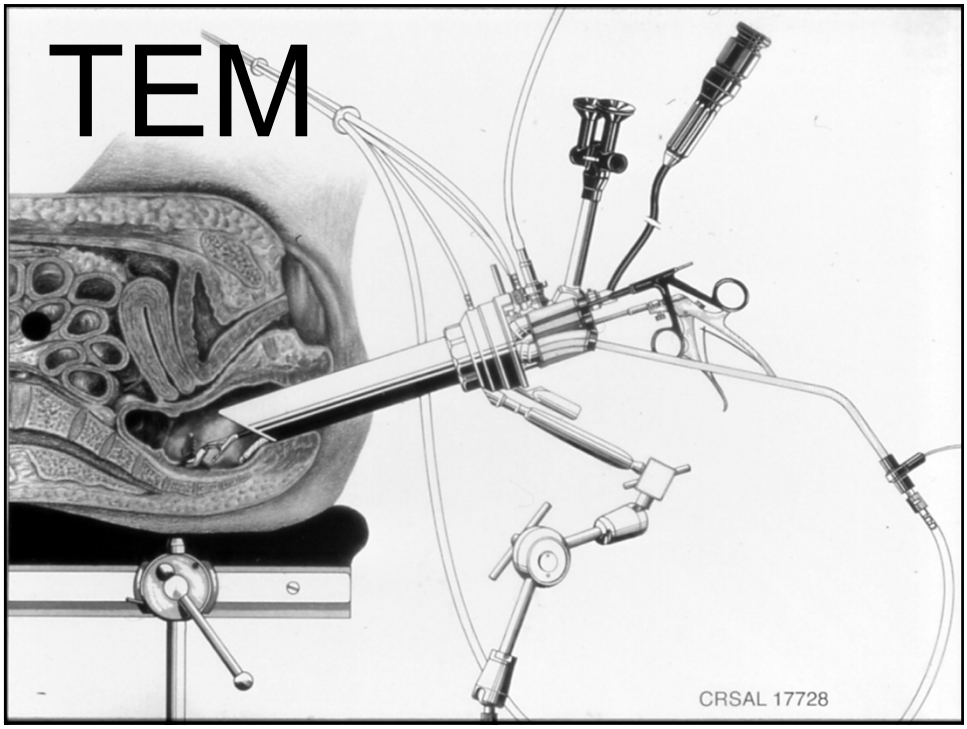


## Sm Level and LNM

- *Sm1 = 0%, Sm2 = 10%, Sm3 = 25%*
  - » *Kikuchi et al.DCR. 1995;38:1286-1295*
- *Sm1 = 3%, Sm2 = 11%, Sm3 = 34%*
  - *– Odds ratio Sm3 vs. Sm1 = 5*
    - » *Nascimbeni et al. 2002;45:200-206*

## Transanal Excision Bottom Line

- *Think this out carefully!*
- *Discuss with patient ahead of time!*
- *Use very selectively!*
- *Treat as an excisional biopsy*

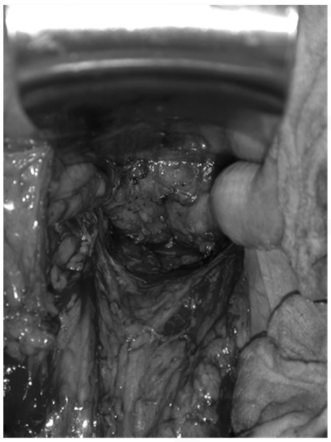



## Advantages of TEM TransEndoscopic Microsurgery

- *Improved visibility*
- *Larger lesions can be taken out intact (not piecemeal)*
- *Access to mid and upper rectal lesions*
- *Potential sampling of lymph nodes*

- *Very good for large villous tumours*
- *Good for select T1 cancers with low risk of lymph node metastases*
- *Possibility for mesorectal excision ??*

# Radical excision



1. *Rectal cancer surgery is technically driven*
2. *The surgical procedure (surgeon) may be the most significant intervention in resectable rectal cancer*
3. *The principles of rectal cancer surgery can be learned but …. it requires practice / practise*

# Outcome by Specialization Rectal subset

| | Specialist | Non-specialist | P-value |
|---|---|---|---|
| Patients | 531 | 1655 | |
| 5 yr overall Survival Rectum | 58.6% | 47.0% | 0.009 |
| 5 yr cancer specific survival Rectum | 72.0% | 60.6% | 0.047 |

McArdle & Hole. Br J Surg. 2004; 91: 610-617

# Outcomes by Training and Volume

| | *>21 resections* | *<21 resections* |
|---|---|---|
| ***Local Recurrence*** | | |
| *Colorectal trained* | *10.4%* | *21.1%* |
| *non-colorectal trained* | *27.8%* | *44.6%* |
| ***Disease-specific survival*** | | |
| *Colorectal Trained* | *67.3%* | *54.5%* |
| *Non-colorectal trained* | *49.0%* | *39.2%* |

Porter et.al. Ann Surg. 1998;227:157-167

## *Know your surgeon!*

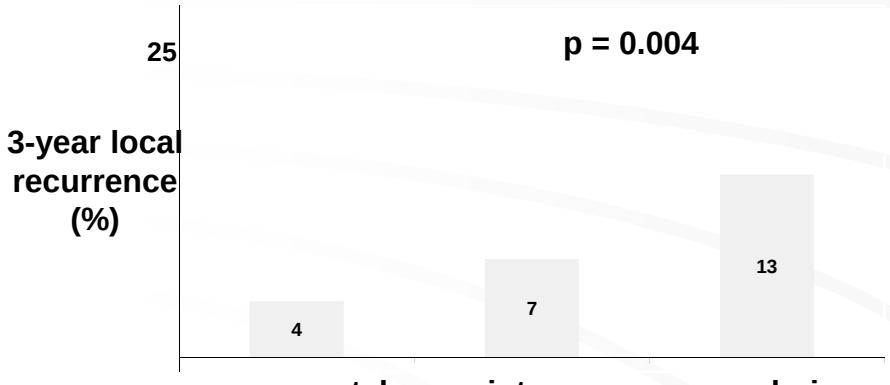

## Total Mesorectal Excision

- *the rectum and its mesentery are a single fascia-enveloped unit, anatomically separate from surrounding pelvic structures*
- *surgical violation of this anatomic package leads to a positive circumferential margin*

## Summary of the importance of Circumferential resection margin (CRM)

- *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)*

## Plane of Surgery Dictates local recurrence rates!




Quirke 2009

## Can Adjuvant Radiation Compensate for Surgical Technique?

*NO!!*

- *Radiation can decrease local recurrence by 50% from **base line levels*** *Pahlman. 1997*
- *Thus surgical technique is the most important variable!!*

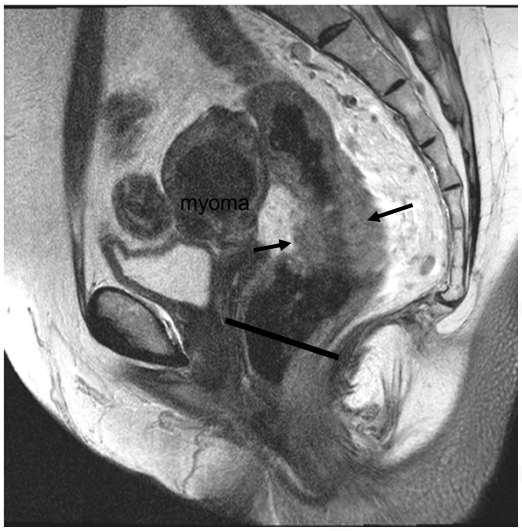
## Mesorectal Excision

*Total mesorectal excision refers to removal of the rectum and mesorectum down to the pelvic floor and the levator hiatus*

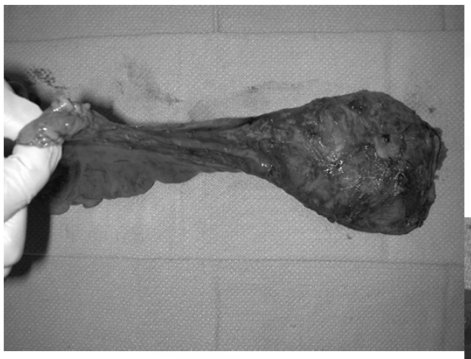
- *appropriate for tumors of the mid and lower rectum*

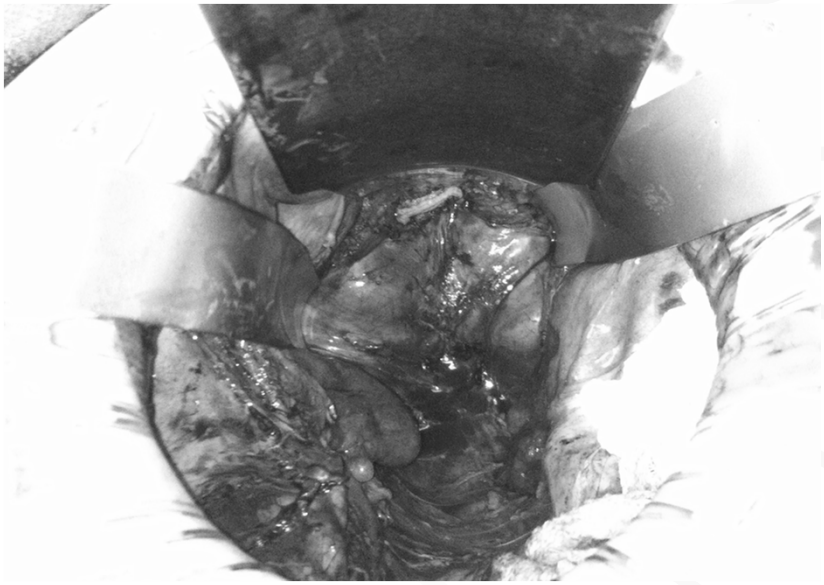
*Tumour specific mesorectal excision refers to the removal of the rectum and mesorectum for a distance of 5 cm below the tumour (no coning) ( leave lower rectum with its mesorectum)*

- *appropriate for tumors of the upper rectum (> 10 cm)*




## *Surgical Technique*

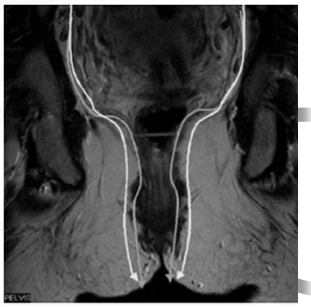




## Tumour specific mesorectal excision

Tumour at 11 cm female deep cul de  sac

## How low can we go?



- *Coloanal stapled*
  - *To the level of the levators*
- *Coloanal hand sewn*
  - *Just above the dentate*
- *Intersphincteric*
  - *To the level of the dentate removing a portion of the internal sphincter*

*For an extended low resection below the mesorectum, a 1 cm margin is optimal, may accept less < 1 cm if post neoadjuvant*

## Abdominoperineal resection and TME

- *Indications for APR*
  - *Invasion of the levator ani or sphincter complex*
  - *Inability to obtain proper distal margin without resecting the sphincter*
  - *Preoperative incontinence*
  - *Technical morbid obesity*
- *Issues with APR*
  - *Tumours located at the level of the levator hiatus*
  - *Significantly more positive CRMs*
  - *Significantly more perforations*

## Alberta Rectal Cancer Initiative (ARCI)

*Location and surgeon experience*

## Rectal Cancer and Surgeon Volume

*Surgery is performed at 22 hospitals across Alberta*

- *8 hospitals perform a mean of ≤ 3 cases per year*

*Surgeon Volume*

- *top quintile = High volume (HV) Surgeons*
  *≥ 9 surgeries/year*
  *(range 9-31 cases/yr)*

## What needs to be done?

- *Increase the number of high volume surgeons and provide them with the tools to do quality work.*
- *HV surgeons:*
  - *completed 68% of rectal cancer surgeries in Alberta in 2011, up from 32% in 1997; we need to do better!*

  *Why?*
  - *higher rates of grade 3 TME specimens*
  - *lower rates of CRM positivity*
  - *higher sphincter preservation rates*
  - *lower 5-year local recurrence*
  - *higher 5-year disease-specific survival*

## How? Education (AHS PRIHS Grant)

*Surgeons want to do the right thing*

*Rectal Cancer School:*

- *Proper operative (TME) techniques*
- *Appropriate staging and interpretation of MRI*
- *Use of Multidisciplinary Tumour Boards*
- *Appropriate use of neo adjuvant therapy*
- *Centralization of rectal cancer surgery to high-volume surgeons (location, location, location …)*
  - *May be at the local level*
  - *Central referral of difficult cases*

## Need for a Clinical Pathway

*Radiologists*

- *Goal*
  - *Dedicated high resolution imaging (MRI) for all patients undergoing curative surgery for rectal cancer in a timely manner using a synoptic report*
  - *MRI performed according to the Mercury protocol for T2 and T3 tumours*
  - *Correlation of test results and management plan*
  - *Ensure access within accepted timelines*

## Need for a Clinical Pathway

*Medical and Radiation oncologists*

*Neoadjuvant therapy*

- ***Goal -*** *All patients with locally advanced operable rectal cancer have the opportunity to be discussed at a multidisciplinary conference (MDC) and offered Neoadjuvant therapy when appropriate*
  - *Care plan based on preoperative staging*
  - *Current guidelines in Alberta include neoadjuvant long course chemoradiation or short course radiation*
  - *Only 50% of Alberta patients with stage II and 66% of stage III rectal cancer received neoadjuvant therapy (2011)*

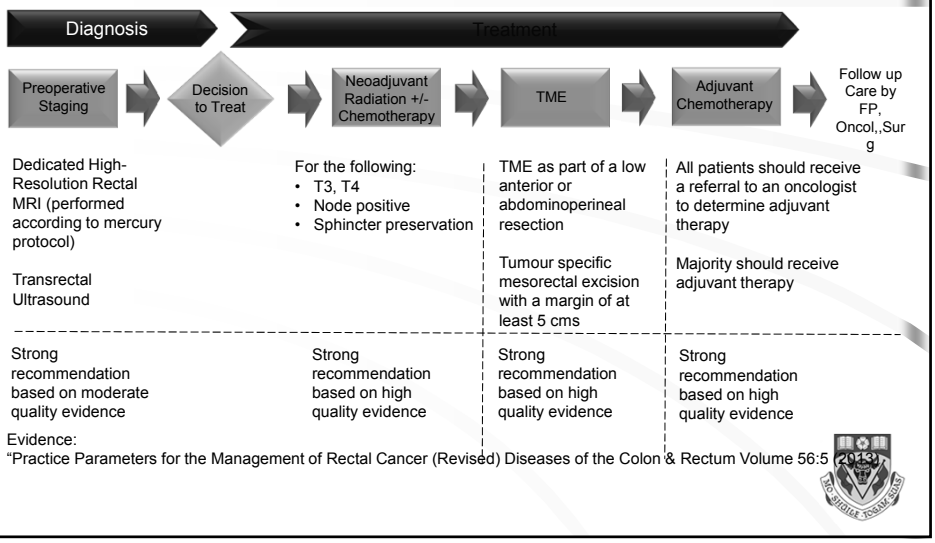
## Pathologists

*Continuous Quality Improvement*

- *Goal*
- *Complete TME evaluation of every rectal cancer specimen based on Quirke methodology*

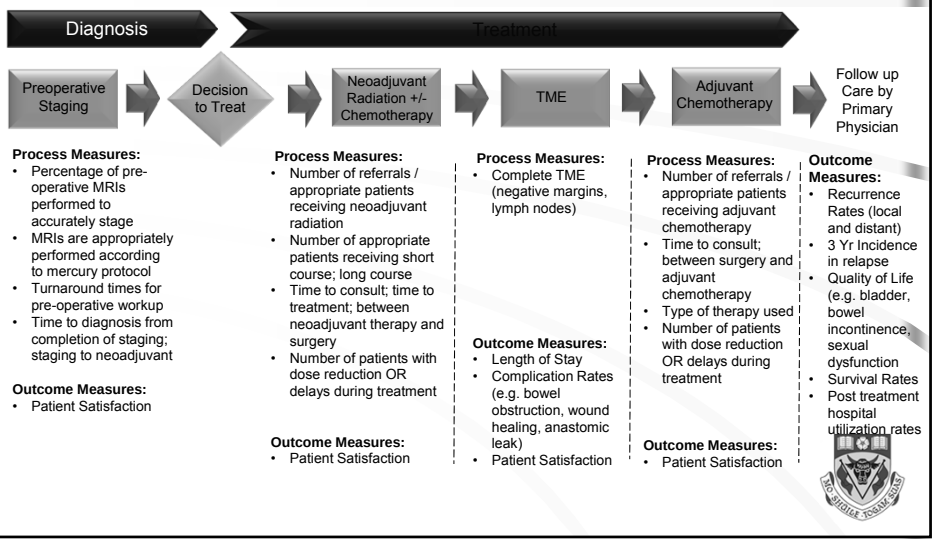
- *22% of cases were not graded for TME*
- *CRM positivity reported 78% of the time*
- *Lymph node harvest mean 17 nodes*
- *Lymph node status not reported in 4%*

# Proposed Rectal Cancer Pathway (Stage II/III)




Evidence:
"Practice Parameters for the Management of Rectal Cancer (Revised) Diseases of the Colon & Rectum Volume 56:5 (2013)

# Proposed Rectal Cancer Measures (Stage II/III)



# Pathway is based on accepted standards of care

PRACTICE PARAMETERS

**Practice Parameters for the Management of Rectal Cancer (Revised)**

J. R. T. Monson, M.D. • M. R. Weiser, M.D. • W. D. Buie, M.D. • G. J. Chang, M.D.
J. F. Rafferty, M.D.; Prepared by the Standards Practice Task Force of the American Society of Colon and Rectal Surgeons

Diseases of the Colon & Rectum Volume 56:5 (2013)

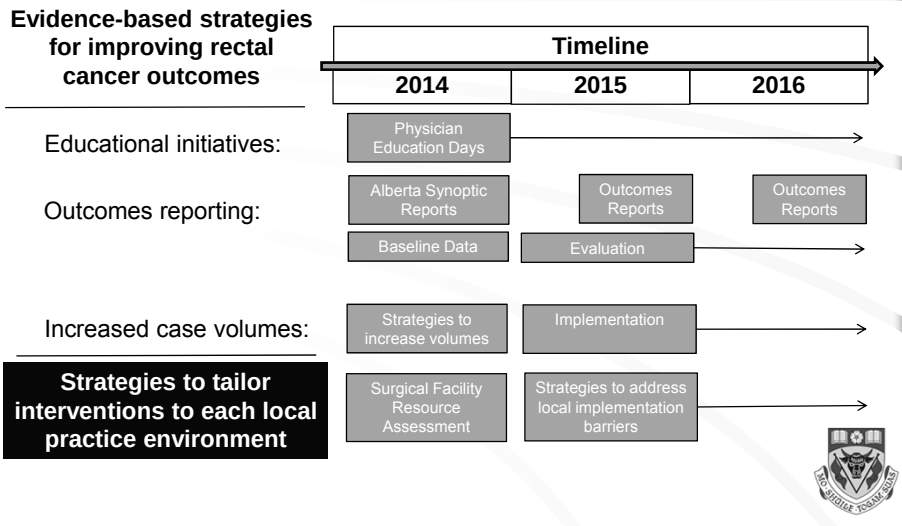
# What can we expect?

- *Better more efficient care*
- *Major impact on immediate and long-term patient outcomes*
- *Impact on survival rates*
- *Decreased local recurrence rates*
- *Potential reduction in repeat surgeries*

# How will we accomplish this?

- *Design and implement a knowledge translation strategy to promote uptake of a rectal cancer clinical pathway that can be tailored to each local practice environment*
- *Evidence-based strategies for improving rectal cancer outcomes:*
  - *Physician education initiatives*
  - *Outcomes reporting*
  - *Centralized Care*

# Project Overview



# Overall Goal

*Optimal safe effective patient centered care for every rectal cancer patient in Alberta*

# Summary

- *Rectal cancer surgery has undergone a technical evolution*
  - *Anatomic basis for resection (Location)*
  - *Cross sectional imaging (Location)*
  - *Concentration of surgical care (Location)*
  - *Extension of transanal methods*
- *Integration of multidisciplinary care*
  - *Standardized Care Pathways*
  - *Appropriate use of neoadjuvant therapy*

*Future*

- *Chemoradiation, transanal excision of residual tumour followed by observation*

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## Questions