

*Surgical Principles  
in colorectal cancer.*



## → Mesorectum Anatomy:

- Connective tissue which contains lymphatics, lymph nodes, blood supply to rectum and perirectal fat.
- surrounded by an envelop of tissue called **Fascia Propria of Rectum**.
- Boundaries of mesorectum.

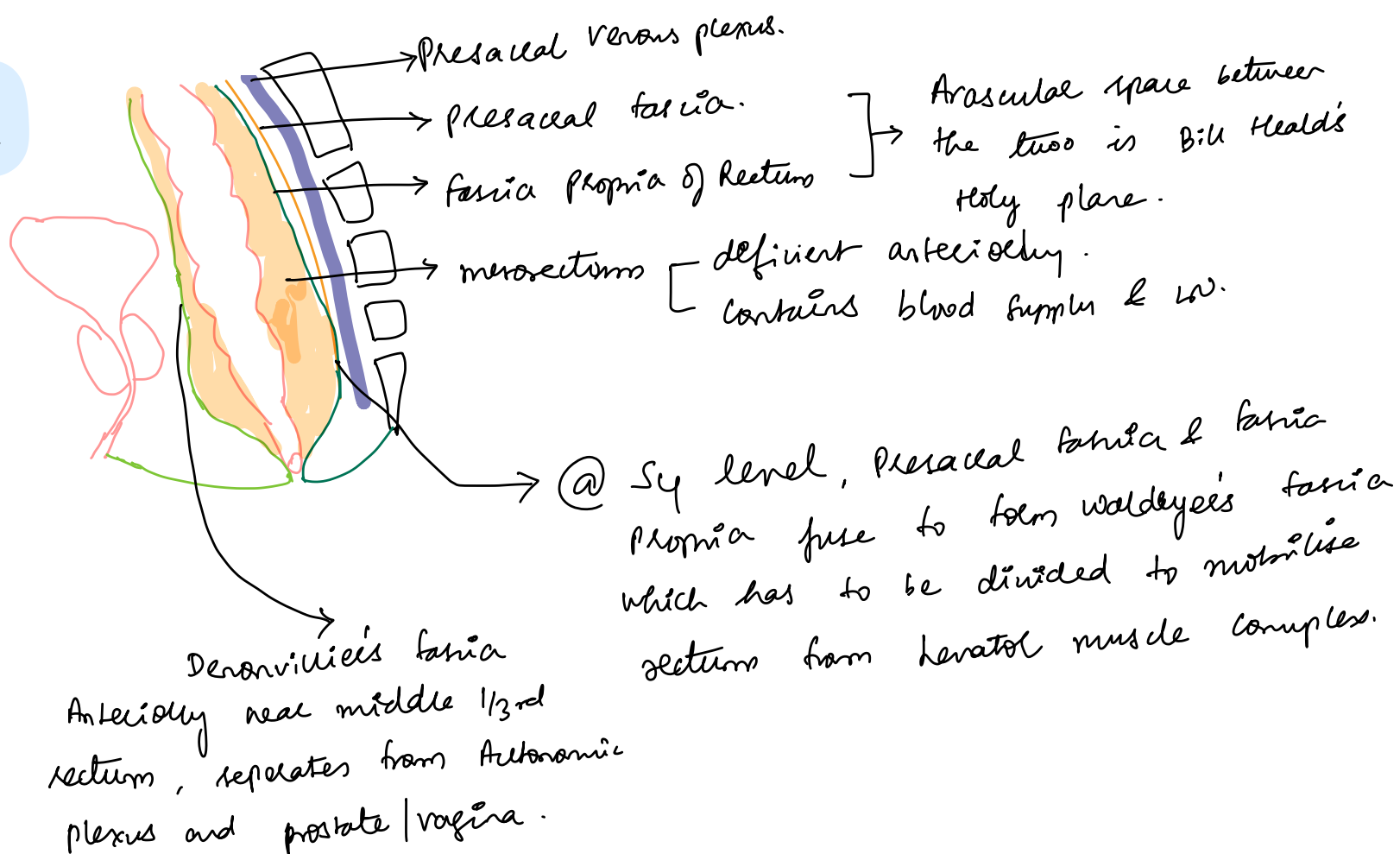
## \* Rate of positive nodes in mesorectum

T<sub>1</sub> - 5-7%.

T<sub>2</sub> - 20%.

T<sub>3</sub> - 65%.

T<sub>4</sub> - 78%.



## → Hypogastric plexus

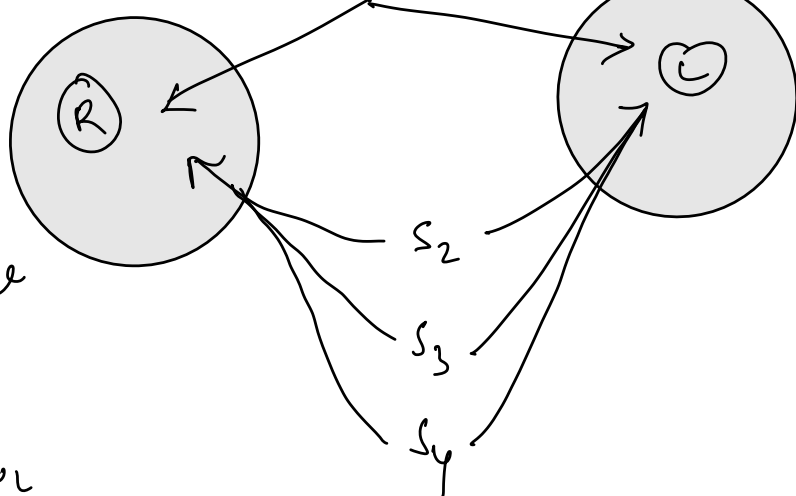
Superior hypogastric plexus (sympathetic)

originates at root of LMA

→ injury causes urinary retention, retrograde ejaculation.

Bifurcates at bifurcation of aorta into (R) and (L) bundles

Fibres intermingle to form inferior hypogastric plexus.



Pelvic splanchnic nerves / nerve efferentes  
Parasympathetic supply.

→ Injury causes loss of erection



→ Grading the quality of TME (Quirke classification / MERCURY classification)

|                     |                 |                                        |                                                                                    |
|---------------------|-----------------|----------------------------------------|------------------------------------------------------------------------------------|
| M.E.R.C.U.R.Y. I°   | Complete        | Mesorectum<br>Defects<br>Coning<br>CRM | Smooth, intact<br>Not deeper than 5mm<br>No coning<br>Smooth, regular              |
| M.E.R.C.U.R.Y. II°  | Nearly complete | Mesorectum<br>Defects<br>Coning<br>CRM | Moderate bulk, irregular<br>No visible muscularis propria<br>Moderate<br>Irregular |
| M.E.R.C.U.R.Y. III° | Incomplete      | Mesorectum<br>Defects<br>Coning<br>CRM | Little bulk<br>Down onto muscularis propria<br>Yes<br>Irregular                    |

→ Oncological benefits of TME:

- Complete TME reduces locoregional recurrence to  $< 10\%$ .
- Local recurrence rate if CRM  $< 1\text{mm}$  (positive margin)  $\rightarrow 50\%$ .
- Local recurrence rate if CRM  $> 1\text{mm}$  (negative margin)  $\rightarrow 17\%$ .

→ Role of minimally invasive TME:

1. COZOR II trial - Lap vs open TME → Non inferiority of lap TME

|                                 | Lap                         | open                                                     |
|---------------------------------|-----------------------------|----------------------------------------------------------|
| morbidity                       | 40.1.                       | 37.1.                                                    |
| mortality                       | 1.1.                        | 2.1.                                                     |
| CRM positive                    | 10.1.                       | 10.1.                                                    |
| Long term results<br>@ 3 years. | longer<br>operating<br>time | more blood loss<br>delay in return of<br>bowel function. |
| Locoregional recurrence         | 5.1.                        | 5.1.                                                     |
| DFS                             | 74.1.                       | 70.1.                                                    |
| OS                              | 86.1.                       | 83.1.                                                    |

\* criticism of the trial:

- Neoadjuvant treatment not given in most patients.
- Large proportion of stage I and upper rectal tumours  
↓  
probably why it favoured lap.

2. COREAN trial — Simultal 3 year DFS data  
79.1% Lap vs 72.1% Open.

3. ACOG 26051

4. ALACART trial

→ Negative trials.  
failed to establish noninferiority of pathological outcomes of lap TME.

- ↓
- Despite this, 2yr DFS, LRR, OS were statistically significant in both arms.
  - Negative prognostic factors were APR, low tumor location, CRM +ve, intraop rectal perforation.

5. ROLARR trial — Robotic vs Lap TME

— Prospective RCT, Superiority trial.

—  $n = 471$

\* Long term quality of life data and oncological outcomes still pending.

|                  | overall | Lap    | Robotic |
|------------------|---------|--------|---------|
| Conversion rate  | 10.1%   | 12.1%  | 8.1%    |
| CRM positivity   | 5.7.1%  | 6.3.1% | 5.1.1%  |
| 30-day mortality | 0.9.1%  | 0.9.1% | 0.8.1%  |

6. Transanal TME TATME:

#### Potential benefits

- \* Reduces the risk of distal margin positivity as distal transection is done under direct vision.
- \* Decreased rate of CRM positivity.
- \* Improved quality of TME

#### Negative Norwegian experience:

- \* risk of CO<sub>2</sub> embolism
- \* increased Anastomotic leak rate
- \* Multifocal local recurrence d/r pelvic insufflation.
- \* Injury to urethra.

2 ongoing RCTs:

- COLOR III trial
- GRECCAR I trial

\* Data from Non randomised case series:

i) Bordeaux trial → TATME vs Lap TME.

- Significantly reduced CRM + (4.0% vs 18.1%)
- Better sexual activity (71.1% vs 39.1%)
- No improvement in LRR / 5yr DFS.

#### Rationale for TATME

- \* To make dissection easy especially in narrow, post radiated, obese pelvis.

## - TAME Surgical procedure:

- \* Abdominal phase → Same as regular TME
- \* Perineal phase → Can be done before, after or simultaneously

- Lithotomy = Trendelenburg
- Lone-star retractor at anal verge
- Anal dilation
- Anal platform placed (helpoint) and local setup.
- distal purse string suture beyond distal margin
- Pneumorectum created
- Posterior plane, (R) & (L) lateral, Anterior plane dissection till abdominal cavity reached.

\* Proximal transection

\* Stapled colorectal anastomosis

\* Inversion ileostomy.

# → Transanal local excision:

## Standard indications:

All criteria fulfilled.

- single T<sub>1</sub> lesion, mobile, not fixed.
- < 3 cm
- involving < 30% of circumference of rectum
- within 8-10 cm from anal verge
- well/moderately well differentiated
- without LVI on biopsy, NO pNI
- without mucinous / signet cell component.
- No on MRI / TRUS.

## Extended indications:

- upper rectal tumours
- T<sub>2</sub> tumours after NACTRT with N=0 status post neoadjuvant therapy.

| Variables                                        | TAE                     | TEM                  | TAMIS                  |
|--------------------------------------------------|-------------------------|----------------------|------------------------|
| Tumor distance in the rectum (from dentate line) | Up to 8 cm              | >4 cm-up to 15 cm    | Up to 15 cm            |
| Bowel preparation                                | Required                | Required             | Required               |
| Patients position                                | Tumor dependent         | Tumor dependent      | Lithotomy              |
| Anesthesia                                       | Spinal or general       | General              | General                |
| Instrument                                       | Rigid                   | Rigid                | Flexible               |
| Cost                                             | Low cost                | Expensive            | Low cost               |
| Learning curve                                   | Moderate learning curve | Steep learning curve | Shallow learning curve |
| View                                             | ~180 degree view        | 220 degree view      | 360 degree view        |

## \* Follow up after local excisions:

- No standardised protocol so far.
- Role of MRI and TRUS in addition to sigmoidoscopy needs to be evaluated.

## Types of Transanal local excision:

TAE -

transanal excision

- using routine open surgical instruments.
- No insufflation.

TEM

transanal endoscopic microsurgery

- specialised TEM set up which is mounted on the patient.
- pneumorectum created.
- expensive.

TAMIS

transanal minimally invasive surgery.

- single Gelfoam access inserted transanally through which laparoscopic ports can be inserted.
- pneumorectum created
- cost effective.

## Outcomes following local excision

Onological

Functional.

Predictors of LN metastasis.

\* Local recurrence associated with Poor histology factors:

- Depth of invasion
- Poor differentiation
- Tumour diameter
- Tumour budding
- Presence of LVI

Sm<sub>1</sub> without LVI → LRR 3-8%.

Sm<sub>2</sub> / Sm<sub>3</sub> } LRR 18-42%  
LVI positive }

\* Study by Tenzinger et al - long term onological outcomes

|           | 5yr LRR | 10yr LRR | 5yr CSS | 10yr CSS |
|-----------|---------|----------|---------|----------|
| Low risk  | 7%.     | 12%.     | 98%.    | 91%.     |
| High risk | 32%.    | 35%.     | 84%.    | 74%.     |

\* High risk on final histopathology report warrants completion TME surgery.

\* Role of adjuvant CRT for high risk after local excision studied by CALGB 8984 trial.

showed worse outcomes even with adjuvant CRT. Hence, NOT Recommended.

## \* Functional outcomes after local excision:

- CARTS study → Better quality of life than radical Sp
- Pucciarelli et al → Better bowel, bladder & sexual function.

## \* Complications after local excisions:

- Post op urinary retention - mc
- Bleeding
- Rectal defect
  - Partial thickness → heal by secondary intention
  - Primary closure transversely to prevent stricture.
  - Full thickness → laparoscopy assisted full thickness repair.
- incomplete resection
- conversion to other modality
- pelvic abscess

## - Role of local excision after NACTRT - Extended indications:

### \* ACOSOG Z6041 trial

- N = 77 patients - T2 N0 who received Neoadjuvant CAPOX + RT.
- Single arm study
- 64% downstaged, 44% achieved pCR.
  - 1- positive margin
  - 1- positive Node
- 3yr DFS - 88%    3yr OS - 95%.

### \* Lezoche et al

- N = 100 patients, T2 N0 ± NACTRT
- Double arm - local excision (or) lap/open TME.

- @ 9.6 years follow up
- LRR - 8% vs 6%
  - distant mets 4% vs 4%
  - No difference in DFS

### \* GRECCAR 2 trial

T2, T3 N0 post NACTRT ± CAPOX



Clinical Responders (Residual Size < 2cm)



Local excision



Completion TME



- Study failed to show superiority of LE over TME
- No difference in 5yr LRR, DFS.

## \* Criticisms of this approach

1. Localisation of tumour after NACTRT
  - pre treatment tattooing must be done.
2. wound healing complications in radiated field.
3. whether local excision is even necessary in complete responders -? OPRA trial.



## → Sphincter preservation strategies in Rectal Cancer:

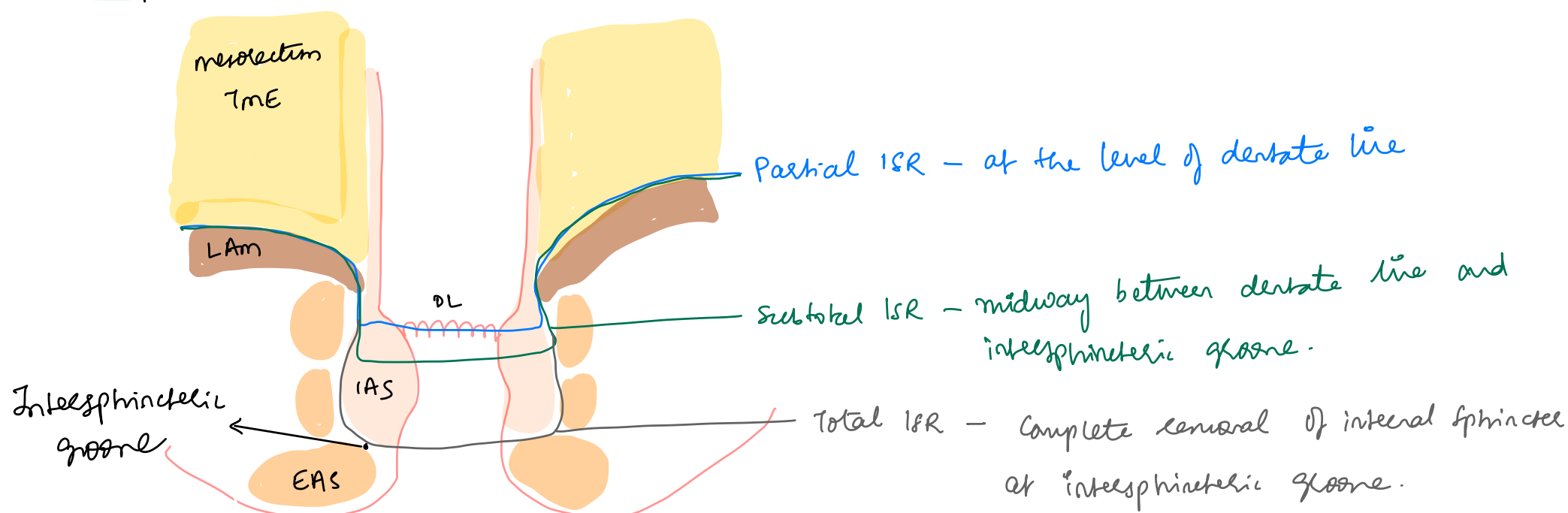
- First described by Schiessel et al.

- Anus preserving strategy for rectal cancer → Removing tumor = internal sphincter.  
→ Preserving external sphincter & levator muscle complex

- classification of ISR:

- Based on extent of distal dissection.

- Japanese classification:



- Patient selection criteria:

### Indication

- well/moderately differentiated
- T<sub>1</sub>-T<sub>3</sub> tumors within 5 cm from anal verge,
- irrespective of internal sphincter involvement.

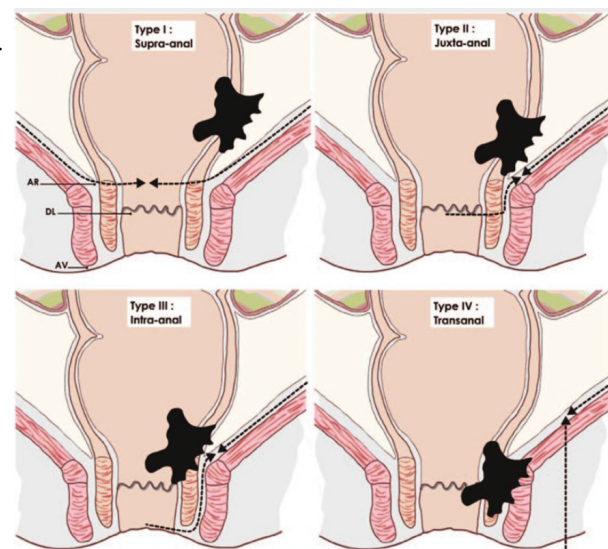
### Contraindication

- poorly differentiated
- T<sub>4</sub> tumor
- poor anal tone
- levator invasion
- distant mets
- poor ECOG
- psychiatric disease
- External sphincter involvement  
↓  
Selective sphincter resection may be done.

\* Rullier et al Patient selection criteria based on MRI

Tumor > 1 cm away from Ano-rectal angle  
- UAR

Involves internal anal sphincter  
- ISR



→ Tumor within 1 cm of Ano-rectal angle  
- ISR

→ Involves external anal sphincter.  
ISR = Selective resection

of External

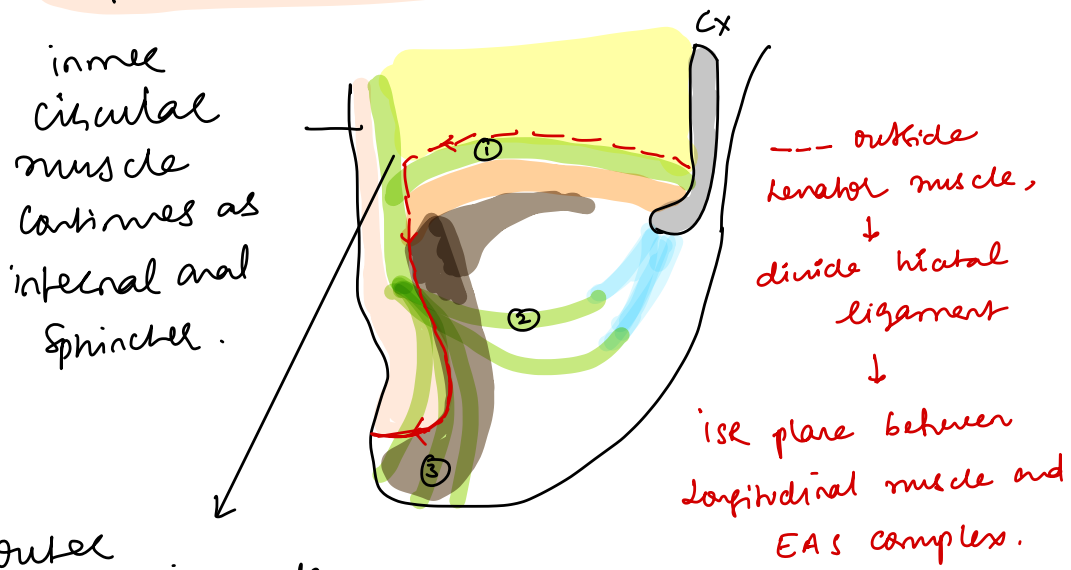
anal sphincter complex in selected

patients if they are downstaged after NACTRT

Park et al.

## ISR Anatomy and limits of dissection:

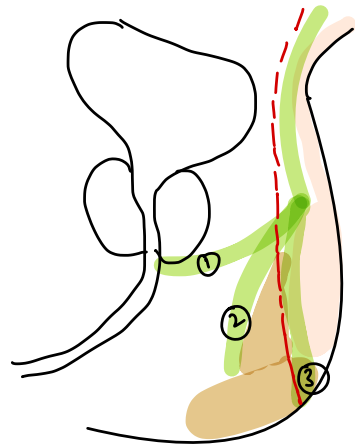
\* **Posterior limit** → Same as TME



- Outer longitudinal muscle gives 3 extensions
- ① - Hiatal ligament to coccyx.
  - ② - to anococcygeal ligament.
  - ③ - to subcutaneous tissue of anal skin

\* **Anterior limit** vaguely defined in both males & females.

- **Males**

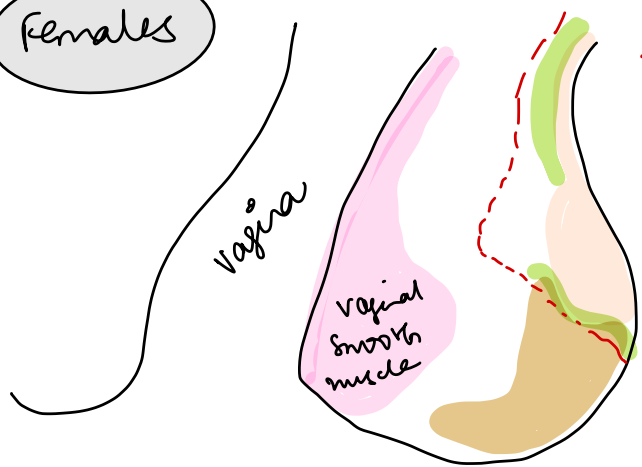


- No well defined plane.
- Have to divide Recto urethralis muscle to enter ISR plane.
- Dissection along Denonville's fossa.

Anteriorly longitudinal muscle gives 3 extensions in males

- ① to bulbar urethra
- ② in front of EAS
- ③ to subcutaneous tissue.

- **Females**



- ill defined plane
- along Recto vaginal septum.

## \* Lateral limit

Plane between medial edge of EAS and Longitudinal muscle.

## Surgical approach:

\* Robotic approach allows to extend abdominal phase till interphincteric plane.

|             |         |         |
|-------------|---------|---------|
| * Kim et al | 54r LRR | - 2.5%  |
|             | 54r OS  | - 86.1% |
|             | 54r DFS | - 80.1% |

steep learning curve.

} Comparable to open & lap approach.

- Lower conversion rate.
- Larger operating time.
- Perioperative outcomes (blood loss, pain, fecal incontinence, permanent stoma retention) are superior in Robotic ISR.

## Oncolytic outcomes:

\* Basis of ISR - why distal margin of 1cm is enough?

Holiglier et al → Lymphatic spread limited to the level of tumour or higher up within mesorectum. Local spread present only in few millimeters.

- Moore et al → DRM cut off 1cm with or without NACTRT.
- Norwegian CRC registry

\* DRM to be reported on fresh specimen. as it shrinks by 51% after 12-18 hrs in formaldehyde.

\* CRM is same in ISR = > 1mm is considered negative.

\* TILME → Total internal longitudinal muscle excision.

Complete TILME criteria by Kim et al:

- longitudinal muscle defect < 5mm
- CRM > 1mm

\* APR vs ISR

- Similar LRR → 11% } Japanese studies
- Similar DFS → 70% }
- GRECCAR-1 trial → long term results awaited.

- Functional outcomes:

- Kim et al -

- \* No diff. in fecal incontinence score in Partial & Subtotal ISR.
- \* incontinence score worse for total ISR.
- \* Partial excision of EAS did not influence manometry values.

→ Different surgical approaches to rectum:

| Anterior Resection                                                                                             | Posterior Resection                                                                                          | High AR                                                                                                           | Low AR                                                                                                                                                              | ULAR                                                                                                                                                                                | ISR                                                                              |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Trans abdominal route</li> <li>Anterior to presacral fascia.</li> </ul> | <ul style="list-style-type: none"> <li>Trans sacral route</li> <li>Posterior to presacral fascia.</li> </ul> | <ul style="list-style-type: none"> <li>Above peritoneal reflection.</li> <li>For upper rectal tumours.</li> </ul> | <ul style="list-style-type: none"> <li>Below peritoneal reflection, but above pelvic floor.</li> <li>- Rectal stump ⊕</li> <li>- Colo-rectal anastomosis</li> </ul> | <ul style="list-style-type: none"> <li>Complete excision of Rectum and mesorectum.</li> <li>Coloanal anastomosis at pelvic floor.</li> <li>- without breaching ISR plane</li> </ul> | <ul style="list-style-type: none"> <li>in the intersphincteric plane.</li> </ul> |

\* ELAPE

Extra Levator Abdomino-perineal Excision

- Levator muscle complex also excised to produce a cylindrical TME / cylindrical APR.

Advantage

- decreased CRM +ve
- decrease rate of specimen perforation.

Disadvantage

- perineal defect is larger than conventional APR and needs reconstruction

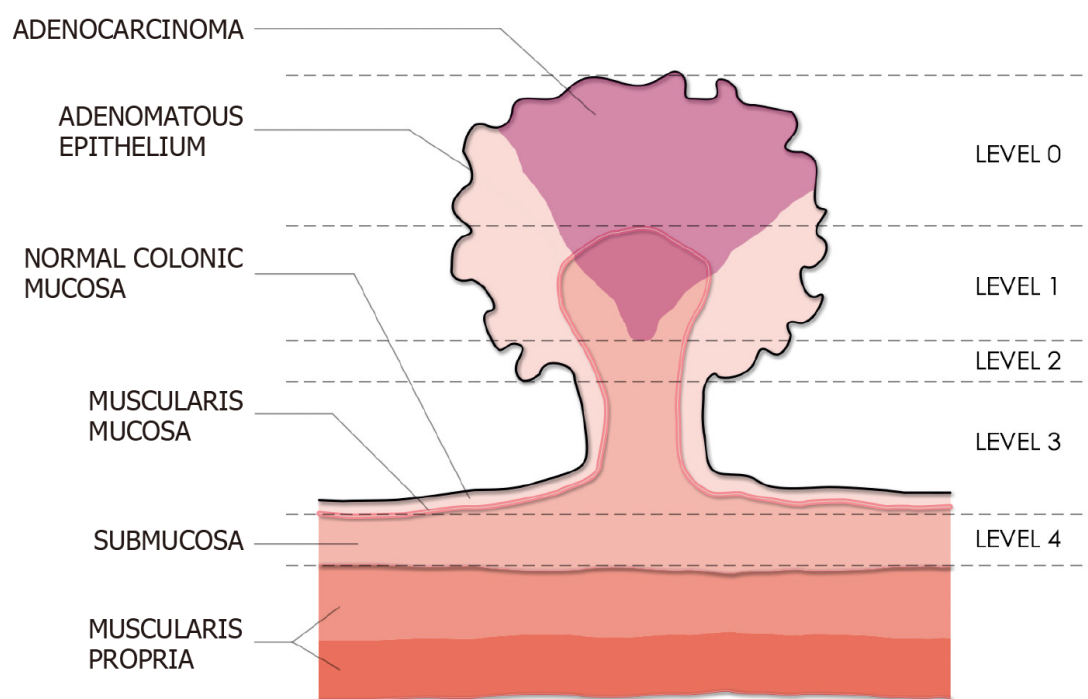
→ nationwide database studies have not shown any benefit of ELAPE over conventional APR.



## → Principles of resection in colon cancer:

### → Colonoscopic polypectomy:

- using snare and electrocautery
- Tattoo the base of the lesion for future identification if further procedure needed.
- No further treatment needed if
  - relative margin  $> 2\text{mm}$
  - well differentiated
  - No LVI
  - No extension of malignant cells beyond the stalk (Haggitt level 1-3)
- Specimen orientation - mark the base.



### Haggitt classification for pedunculated polyp.

- Level - 0 - limited to mucosa.
- 1 - Invading submucosa but limited to head.
- 2 - limited to junction of head & stalk.
- 3 - limited to stalk.
- 4 - Below the level of stalk but above muscularis propria.

### Kikuchi classification for sessile polyps

Invading submucosa.

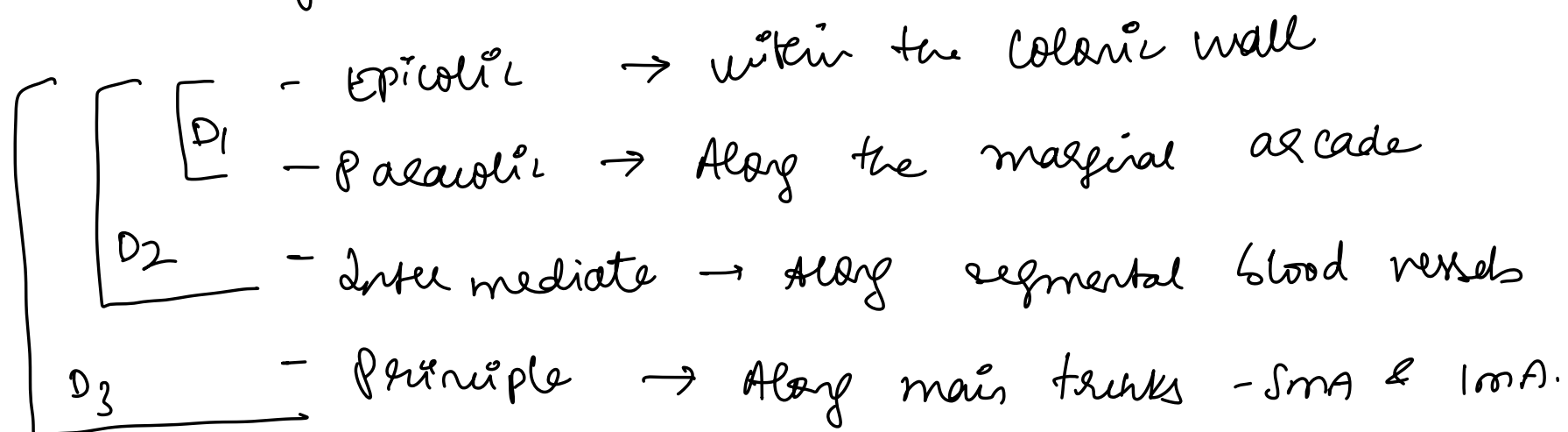
- Sm<sub>1</sub> - upper 1/3rd
- Sm<sub>2</sub> - upto middle 1/3rd
- Sm<sub>3</sub> - involving upper, middle and lower 1/3rd.

→ margins in colectomy → 5cm proximal & distal each.

→ lymphadenectomy in colectomy:

- At least 12 nodes to be sampled.

- levels of LN in colon:



D2 vs D3 lymphadenectomy in CA colon:

metaanalysis → D3 associated = Better LN retrieval,  
Better OS  
DFS  
RFS.

→ No significant difference in mortality, morbidity, hospital stay, blood loss, anastomotic leak.

→ No touch technique: / Turobult technique:

- vessel ligation first approach to theoretically prevent circulating tumor cells while handling the colon.
- Initially showed survival benefit
- RCT - TCOG 1006 → showed no survival benefit.

→ CME + CVL (Complete mesocolic excision + Central vascular ligation):

- CME
  - increased LN yield
  - Captures skipped lesions
  - improved survival
  - ↓ Recurrence

By Hohenberger et al.

→ Lap vs open CME colectomy:

COST trial

COLOR I trial

CLASSIC trial

Are all non inferiority trials.

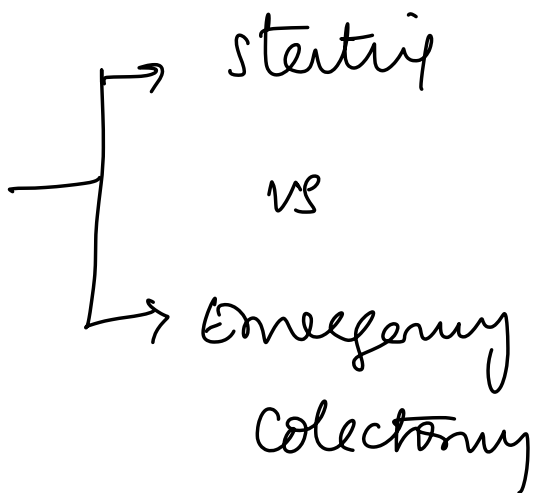
All showed lap is non inferior to open in terms of - OS, DFS, RFS, lymph node yield.

- No significant difference in port/wound site Recurrence.

→ Role of preoperative stenting in Obstructed (L) Colon cancer?

CREST trial - Colorectal Endoscopic Stenting trial:

Obstructed  
Colon  
Cancer



- Stenting led stoma rate  
- No significant difference in post op mortality / hospital stay / quality of life / Recurrence rate.