

Benign Rectal Disease

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OCTOBER 7, 2015

Objectives

Medical Expert:

1. Epidemiology, etiology and anatomy of rectal prolapse
2. Management of rectal prolapse (perineal and abdominal approach)
3. Diagnosis and management of rectal intussusception and solitary rectal ulcer syndrome
4. Investigation and management of constipation and colonic inertia
5. Investigation, etiology and management of recto-vaginal fistulas
6. Investigation, etiology and management of fecal incontinence

Objectives

Collaborator:

1. Role of investigations in benign rectal disease (defecography, manometry, transit studies etc.)

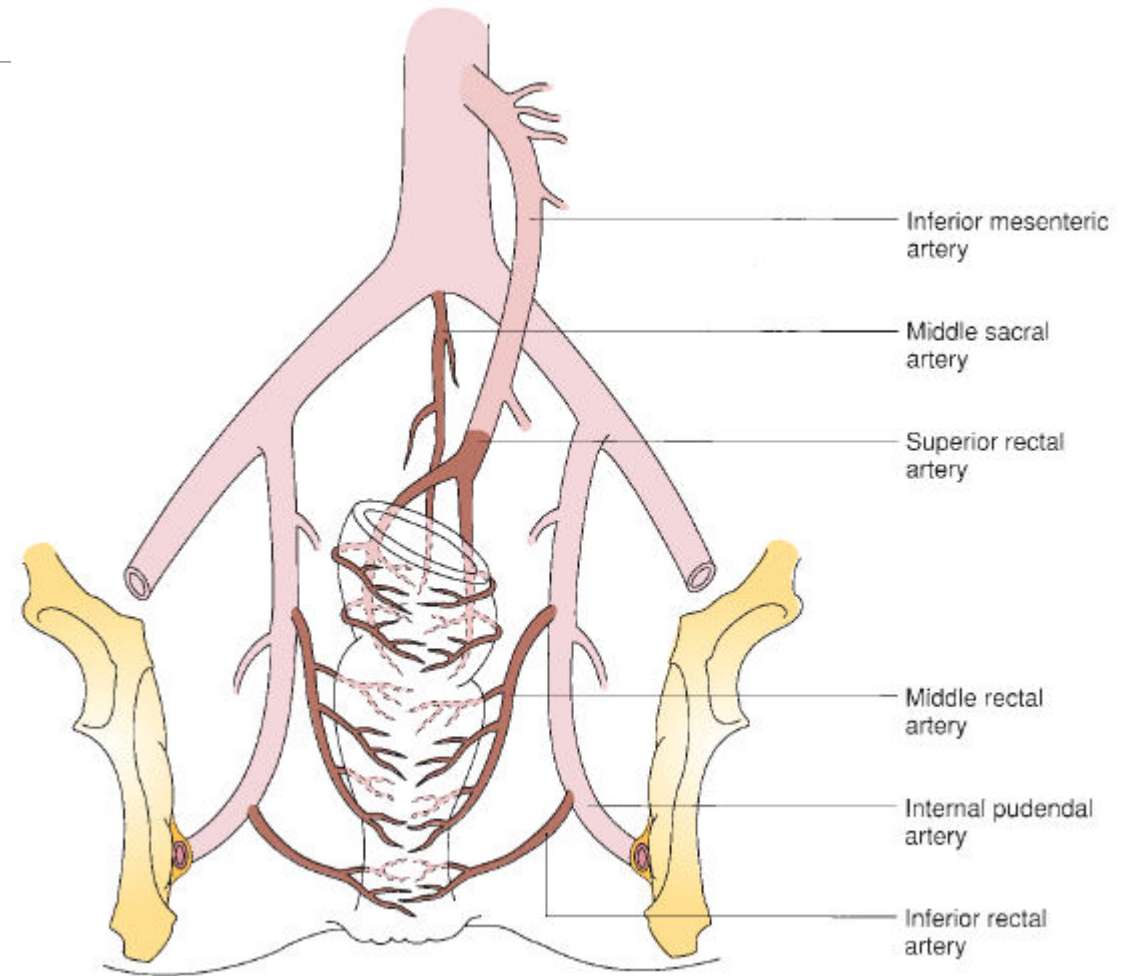
Scholar:

1. Review of some of the most recent seminal papers on topic

Rectal Anatomy

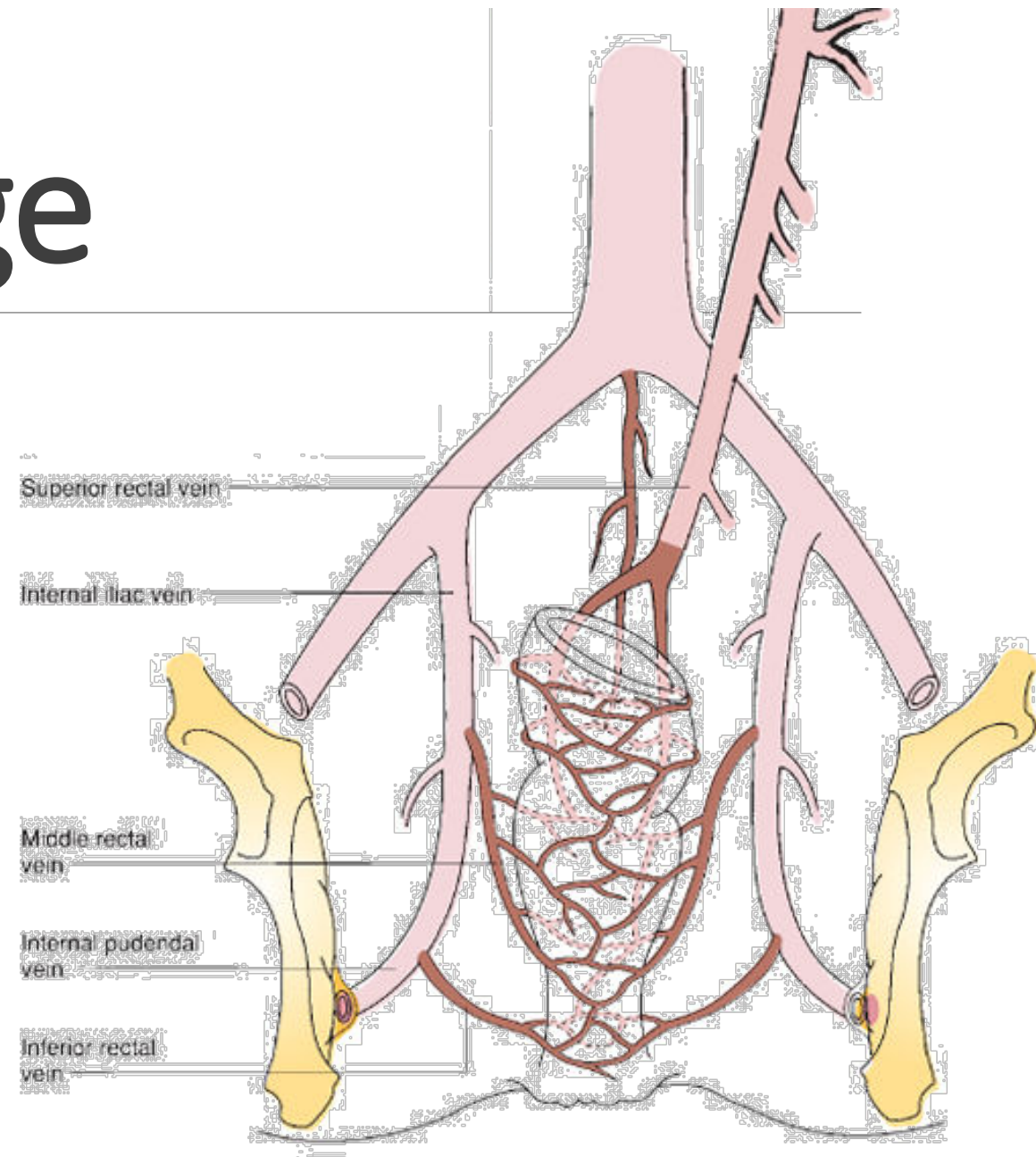
Arterial supply

- Superior rectal arteries arise from the IMA
- Middle rectal arteries arise from the internal iliac arteries
- Inferior rectal arteries arise from the pudendal arteries to supply the anal canal



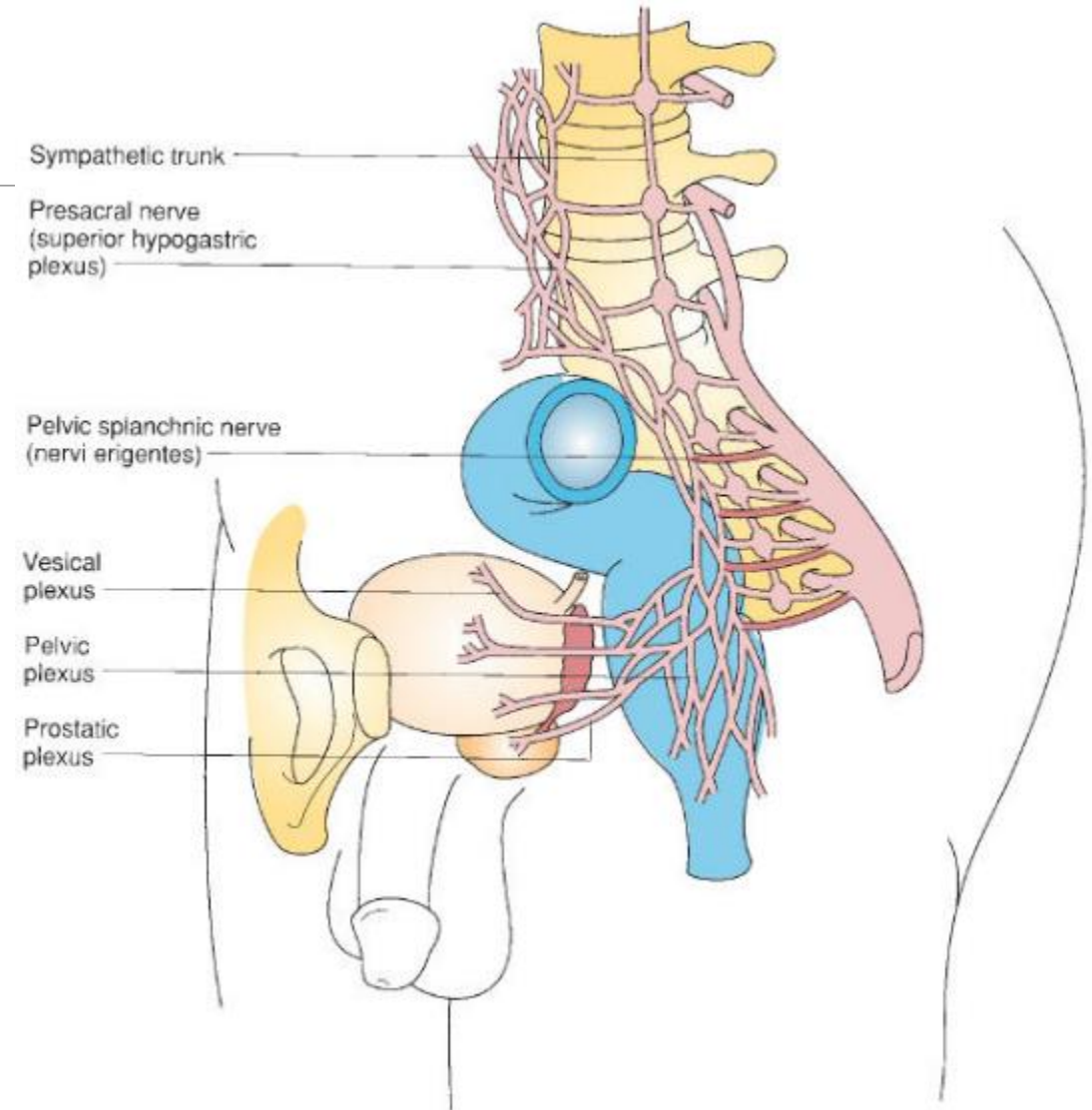
Venous drainage

- Follows arterial supply, and drains into both portal and systemic systems
- Hemorrhoidal cushions form from venous plexuses at the left lateral, right anterior and right posterior positions



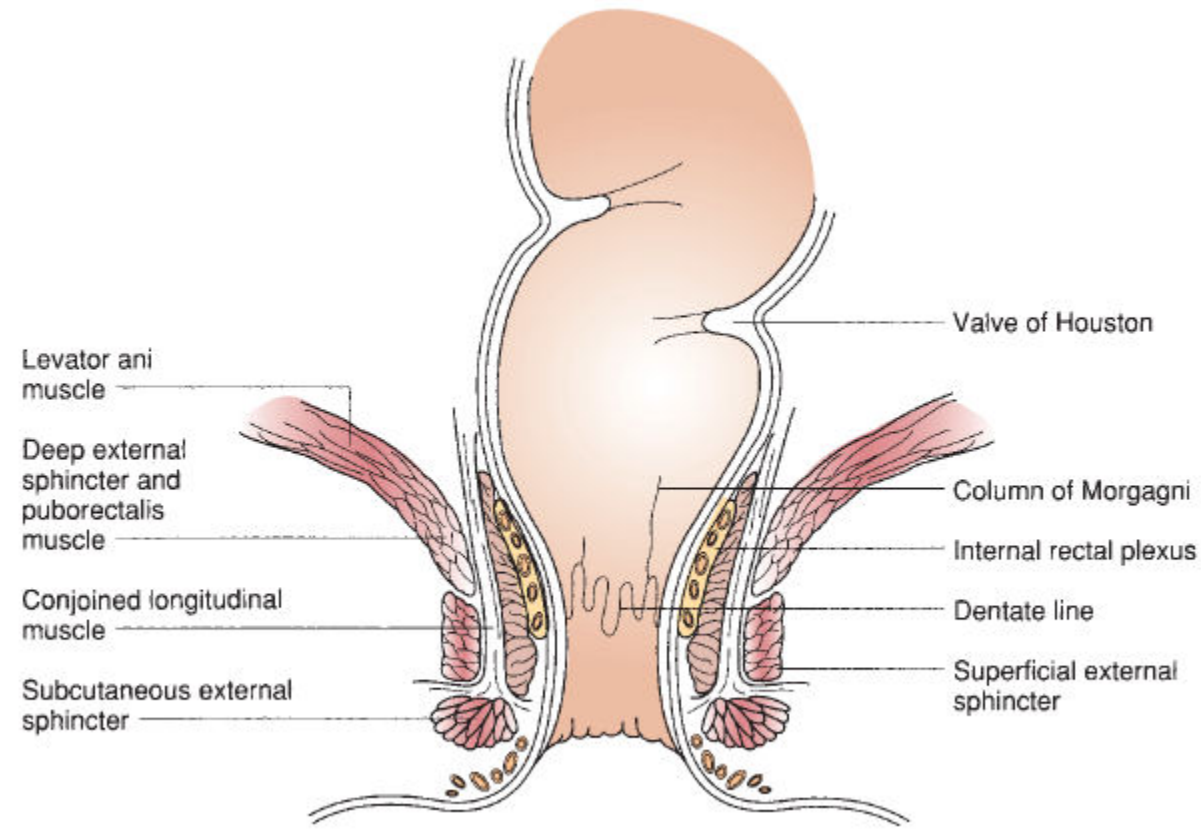
Nervous supply

- Sympathetic fibers arise from L1-L3
- Parasympathetics arise from S2-S4
- Both fibers come together in the lateral attachments of the rectum to form the pelvic plexus
- The anal canal external anal sphincter is supplied by the inferior rectal nerve (a branch of the pudendal nerve)



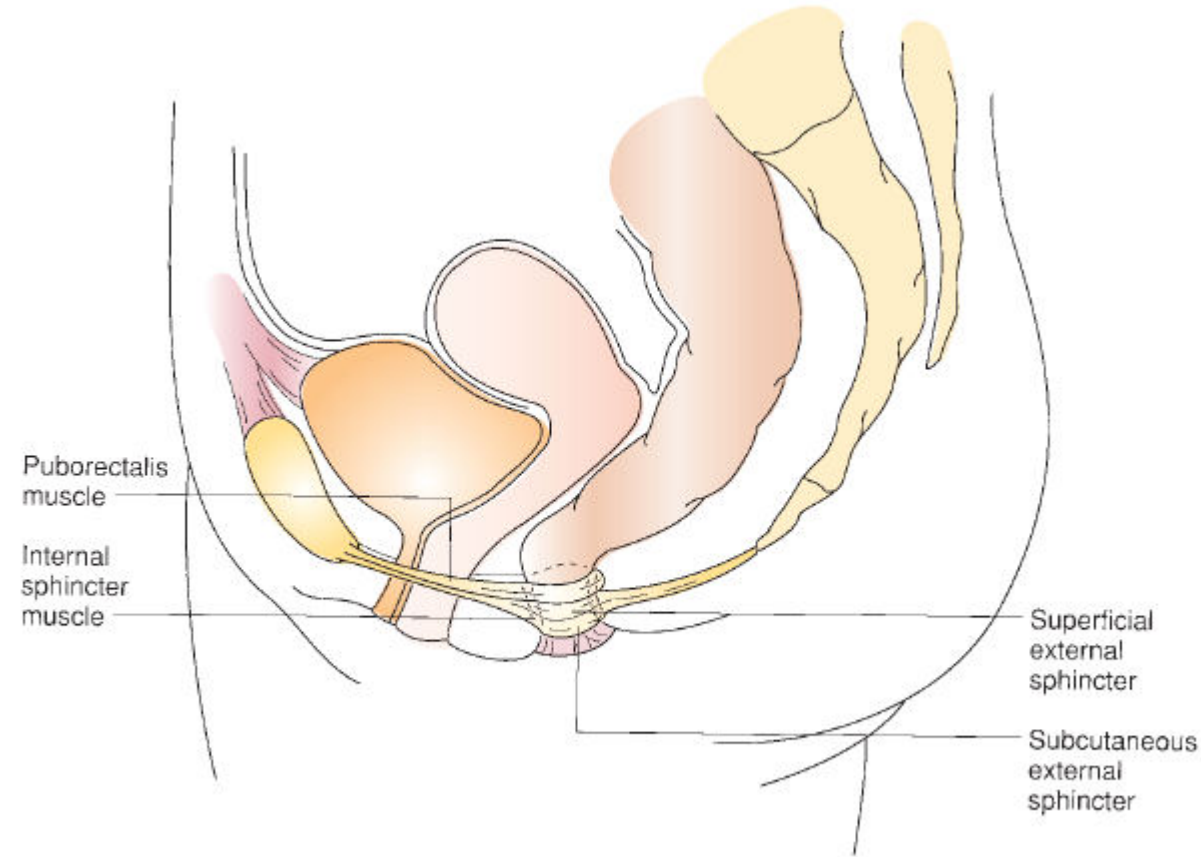
Muscular anatomy

- Levator ani muscles function to support the pelvic organs
- Puborectalis forms a sling and creates an anorectal angle of 80-90 degrees
- Internal and external sphincter muscles maintain resting pressure and continence



Physiology of defecation

- Puborectalis muscle relaxes and pelvic floor descends
- Valsalva maneuver increases abdominal pressure to overcome resting sphincter pressure
- External anal relaxes and rectum is evacuated
- Pelvic floor rises, and puborectal and sphincters contract and resting tone is restored



Rectal Prolapse

Overview

- Rectal prolapse (procidentia) is a pelvic floor disorder where the rectum telescopes into itself and protrudes from the anus
- Occult rectal prolapse or rectal intussusception occurs when the rectum does not protrude past the anal verge



Epidemiology

- The condition is uncommon, affecting less than 0.5% of overall adult population, and 1% of adults over age 65²
- 5 times more common in women than men
- Identified risk factors
 - Age over 40
 - Female gender
 - Chronic constipation/diarrhea
 - Vaginal delivery and multiparity
 - Dementia or prior stroke
 - Psychiatric illness

Pathophysiology

- Poorly understood but several anatomical and functional defects have been identified:
 - Abnormally deep cul-de-sac
 - Lax and atonic musculature of the pelvic floor
 - Lack of normal fixation of the rectum
 - Unusually redundant sigmoid colon
 - Lax and atonic anal sphincter
- Intussusception usually starts anteriorly
- Rarely, a rectal polyp or mass can form a lead point for intussusception.

Presentation

- Patients can present with a range of symptoms
 - Rectal mass
 - Incomplete evacuation
 - Mucus or stool discharge
 - Incontinence
- Grade IV prolapsed hemorrhoids can be confused for rectal prolapse
 - Prolapsed hemorrhoids have radial folds
 - Rectal prolapse will have concentric folds

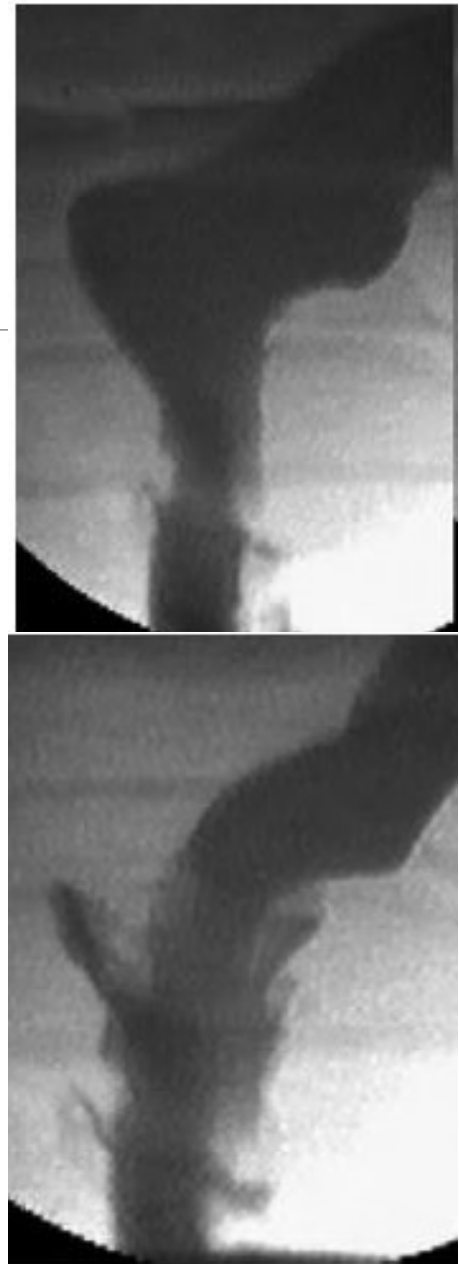


Evaluation

- Prolapse is often evident on examination by having the patient “bear down”
- Colonoscopy can identify polyps acting as lead point, or other pathology in the colon that must be addressed intra-operatively
- Video defecography can identify other pelvic floor abnormalities (i.e rectocele, non relaxing puborectalis) that may need to be addressed intraoperatively

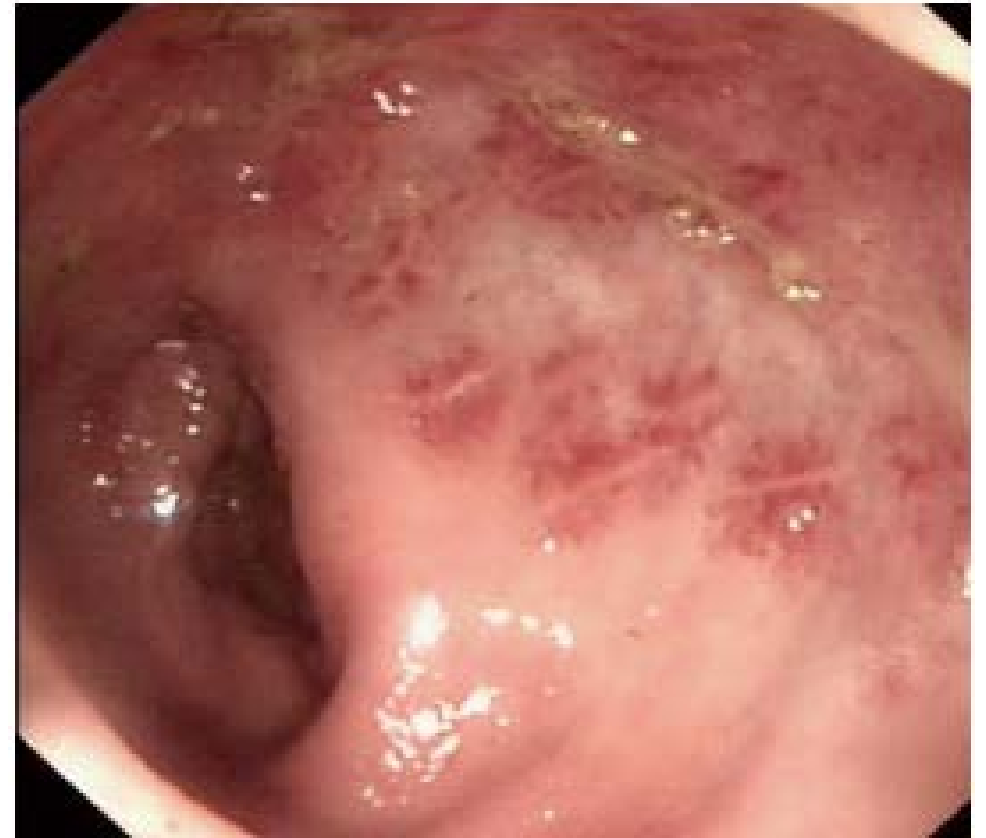
Video defecography

- Barium paste enema is given
- Patient then defecates while sitting on a radioluscent commode
- The pelvic floor is monitored with fluoroscopy while at rest, during straining, squeezing and during defecation
- Useful in identifying occult prolapse
- Patients may find this test uncomfortable and embarrassing which can affect findings



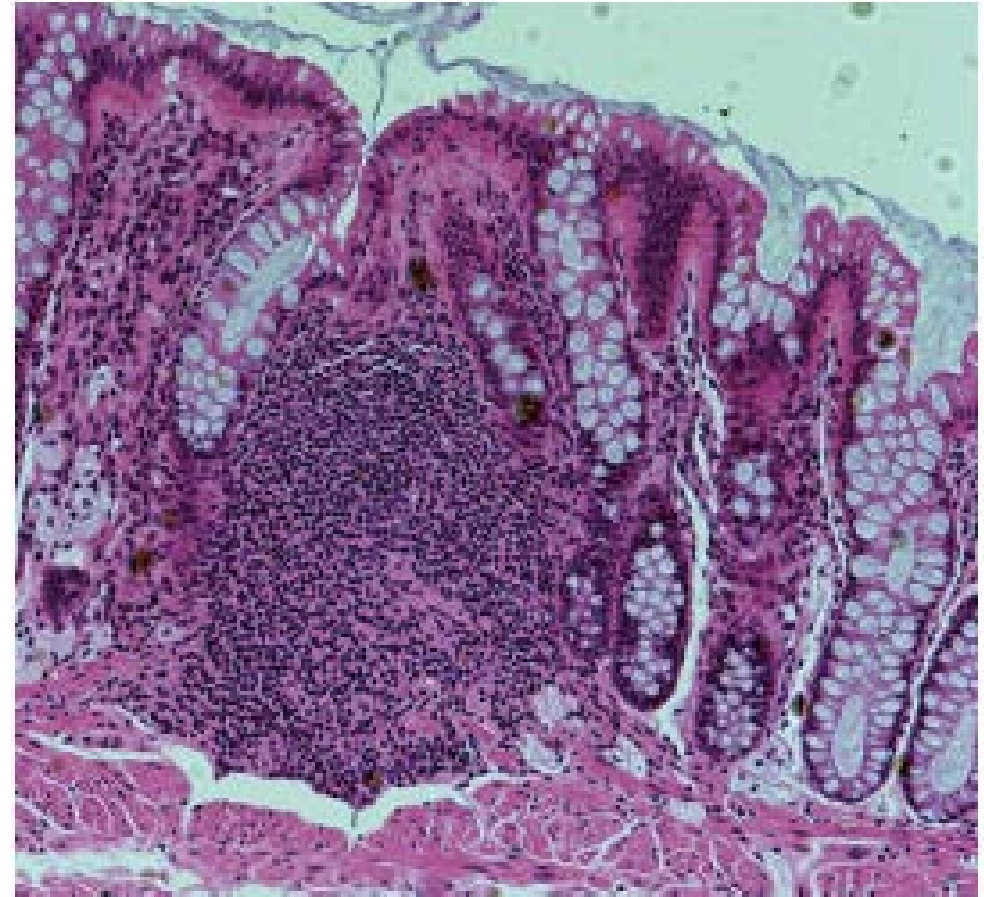
Solitary Rectal Ulcer Syndrome

- Uncommon disorder related to rectal intussusception, with an estimated incidence of about 1 in 100,000³
- Median age of diagnosis is 48 years
- Only 20% of patients have a solitary ulcer, while 40% have multiple ulcers, and others have varying lesions, ranging from mucosal erythema to polypoid masses



Solitary Rectal Ulcer Syndrome

- Histological examination shows obliteration of the lamina propria by fibrosis and extension of a thickened muscularis mucosa
- Etiology is poorly understood, but shear forces from excess straining, paradoxical puborectalis contraction and trauma from digital manipulation have been implicated

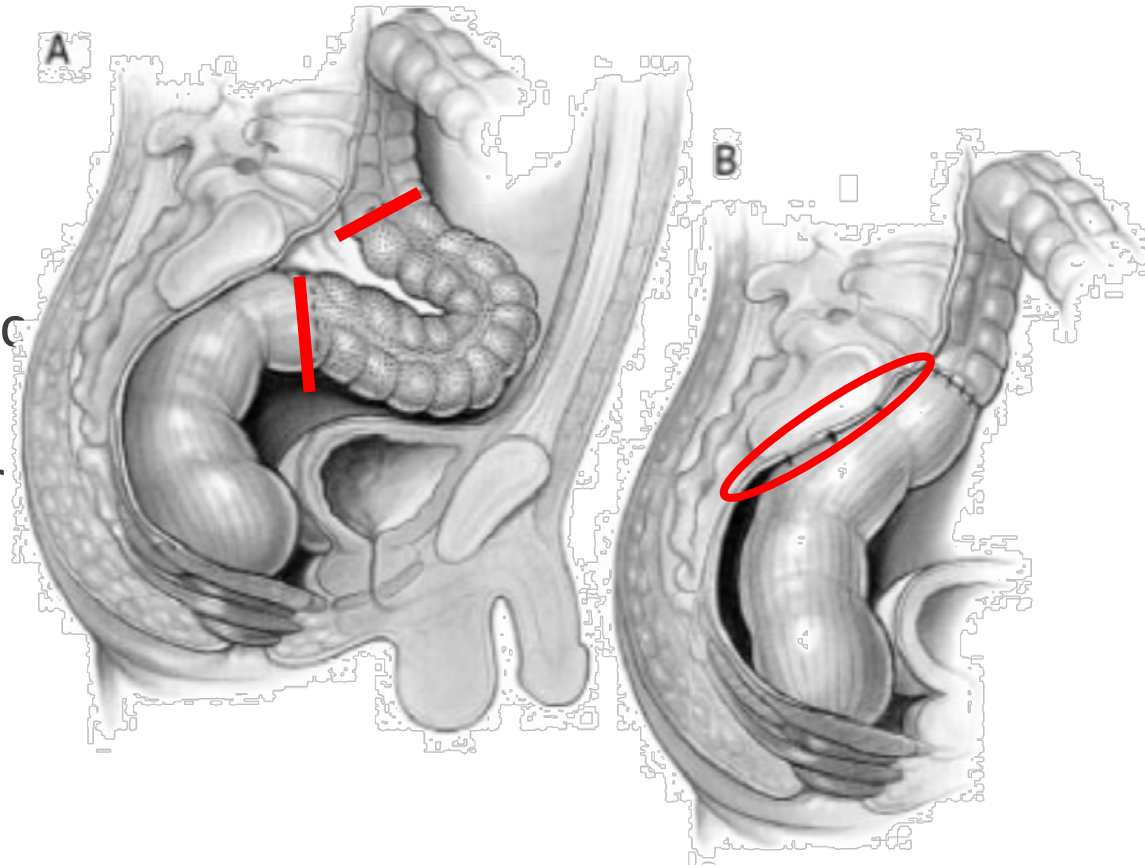


Management

- Acute prolapse should be treated with reduction
- Fiber supplementation and hydration can help minimize straining and symptoms of discharge, and can also minimize the symptoms of SRUS
- Definitive management requires operative intervention, but controversy exists as to optimal approach
- Abdominal Approach
 - Suture rectopexy +/- sigmoid resection
 - Mesh rectopexy +/- sigmoid resection
- Perineal Approach
 - Altemeier Procedure
 - Delorme Procedure

Suture Rectopexy

- Basic principle is the mobilization of the rectum to the pelvic floor and fixation of the rectum to the pelvic wall
- Can be done with resection of redundant sigmoid colon if there is a history of chronic constipation.
- Multiple variations exist, involving anterior vs posterior only mobilization, and preservation or division of lateral attachments of the rectum.



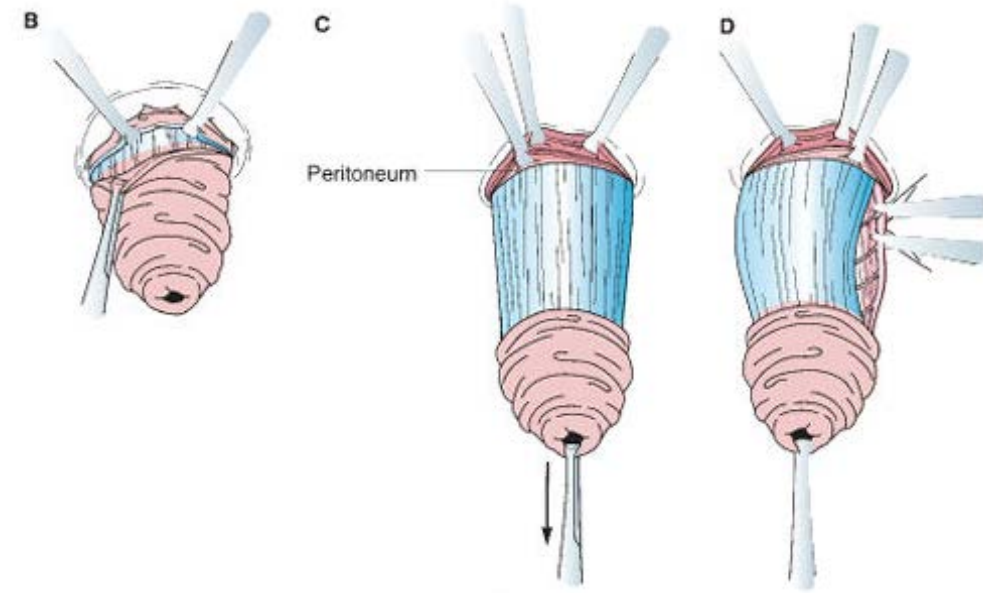
Mesh Rectopexy

- Mesh rectopexy or Ripstein procedure involves suturing a mesh sling to the rectum after mobilization of the posterior rectal wall
- The sling is sutured to the presacral fascia at the level of the sacral promontory
- Posterior aspect of the rectum is not encircled with mesh but left to simply abut the sacrum



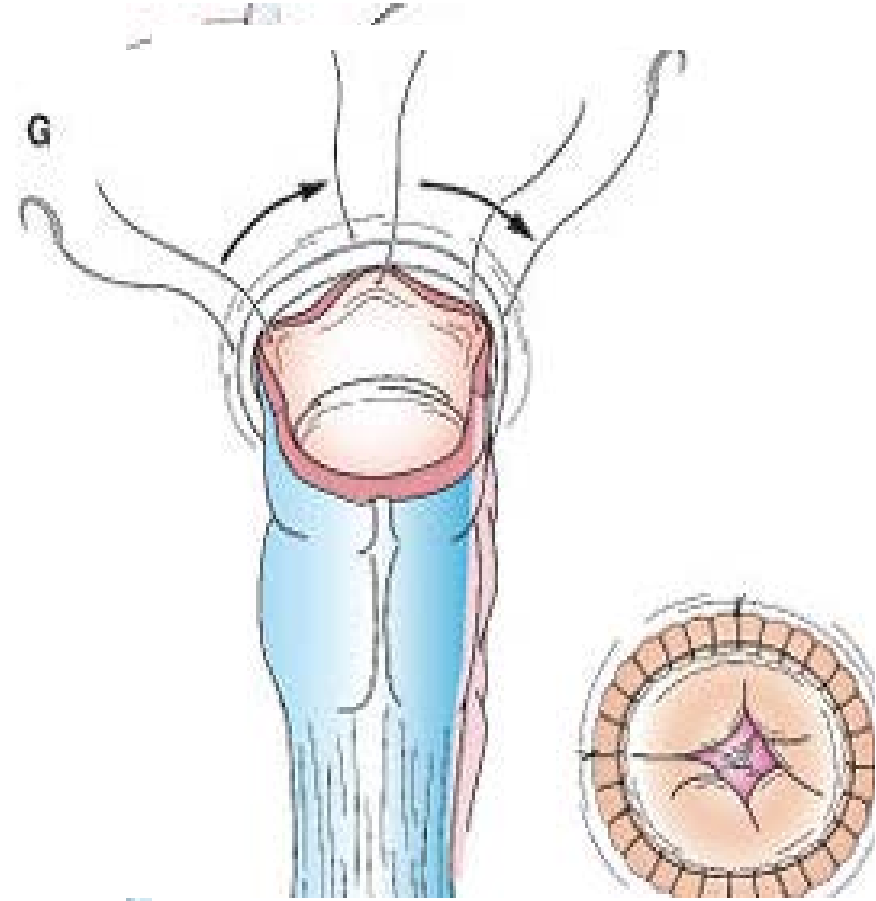
Altemeier procedure

- Perineal rectosigmoidectomy
- Redundant rectum is prolapsed through the anus with Allis or Babcock clamps
- Dentate line is identified with injection of epinephrine for hemostasis
- Full thickness circumferential incision is made 1-2 cm proximal to dentate line, and dissection is extended proximally to separate the prolapsed rectum from mesorectum and ligamentous attachments



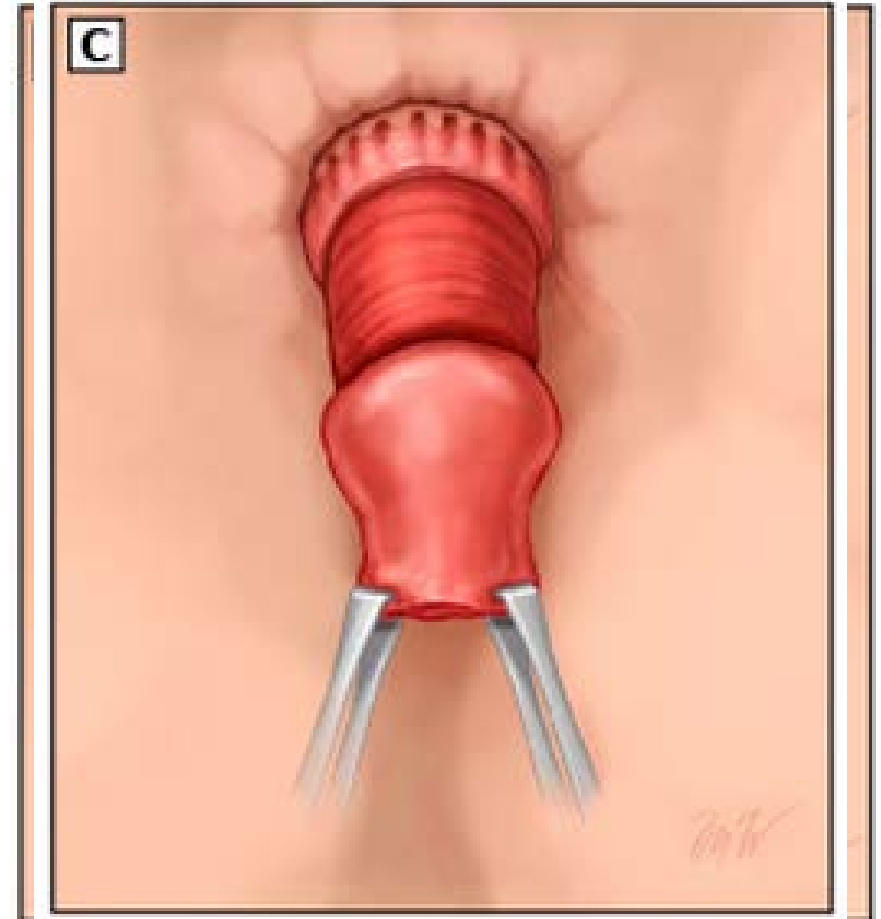
Altemeier procedure

- The puborectalis and levator ani are then approximated to support the pelvic organs
- The prolapsed sigmoid is excised 1 cm distal to the anal verge
- 4 stay sutures are inserted and the anastomosis completed with 4 running sutures in the 4 quadrants



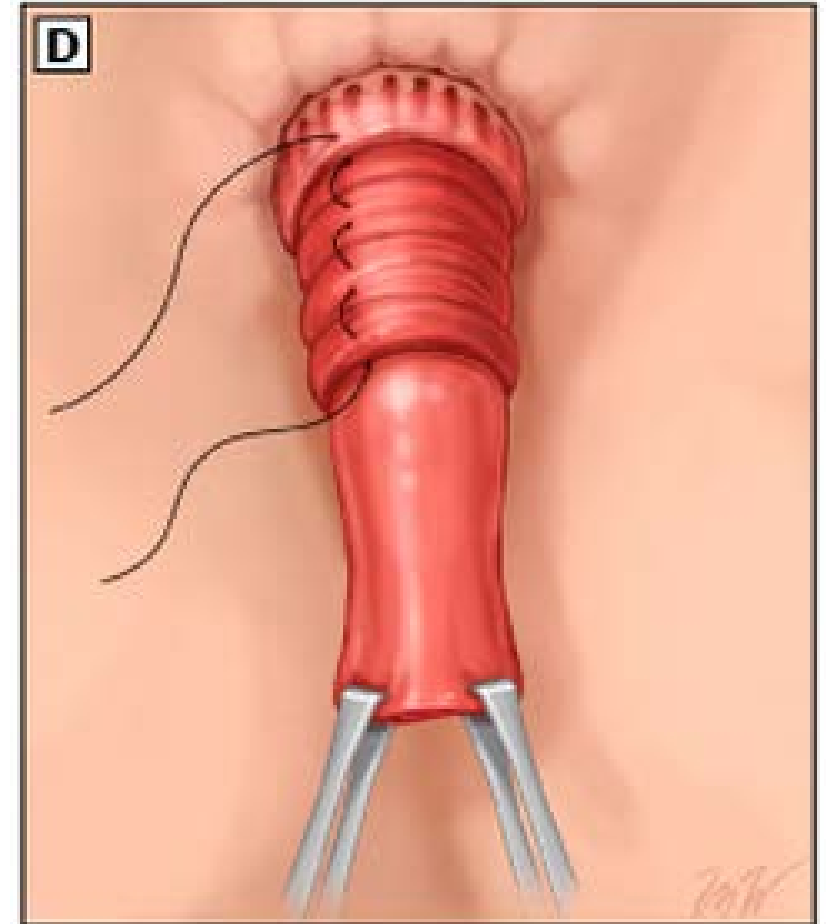
Delorme procedure

- Perineal mucosectomy and plication
- Useful for shorter segment prolapses where an Altemeier procedure would be challenging
- Rectum is prolapsed as in the Altemeier
- Injection of saline-epinephrine solution can elevate the mucosa and aid in hemostasis
- Circumferential incision is made 1 cm proximal to dentate line, incising only mucosal layer but leaving muscularis propria intact
- Dissection is carried proximally until taut



Delorme procedure

- Plicating sutures are placed in the seromuscular layer, and dissection mucosal sleeve is excised
- Sutures are tied down, resulting in a shortened rectum and a plicated layer of muscularis serving as a buttress
- Does not provide the opportunity for a levatorplasty as the Altemeier

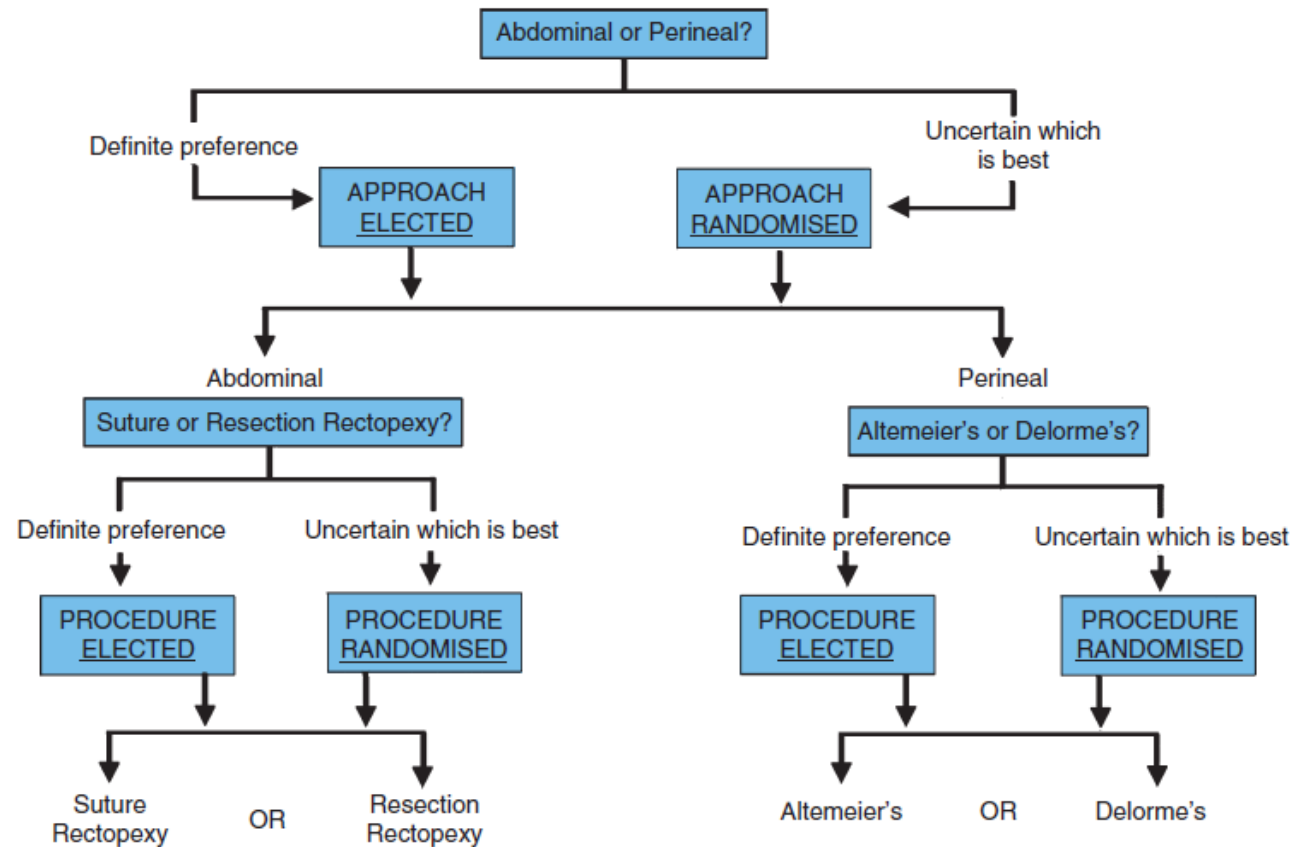


Perineal vs abdominal approaches

- Prevailing opinion is that perineal approaches are more suitable for medically frail patients with multiple comorbidities
- Retrospective studies show lower recurrence rates for abdominal procedures (5% vs 16%)⁴, at the cost of longer length of stay and higher morbidity⁵
- Lack of pelvic dissection in perineal procedures may lead to lesser impact on sexual function
- Increasing use and comfort with laparoscopic procedures may make abdominal approaches more accessible

Perineal vs abdominal approaches

- PROSPER RCT compared 293 patients who received abdominal vs perineal resection. Each arm was further divided into suture vs resection rectopexy, and Altemeier vs Delorme procedure.⁶
- Patients were followed for a median of 36 months



Perineal vs abdominal approaches

- Found higher recurrence rates for suture rectopexy vs resection rectopexy (46% vs 18%), but was not statistically significant
- Similar recurrence rates for Delorme vs Altemeier (46% vs 41%) and open vs perineal (37% vs 32%)
- Recurrence rates much higher than previously reported in literature
- Similar QoL outcomes in all compared arms
- Study underpowered due to randomization scheme

Constipation and colonic inertia

Definitions

- A standard definition of constipation is difficult to establish
- Patients may describe several complaints as “constipation”
 - Infrequent bowel movements
 - Hard or small stools
 - Need to strain
 - Sensation of incomplete emptying
- A 1987 epidemiological study defined constipation as fewer than 3 bowel movements per week⁷
- More recently, Rome III Criteria were established in 2006⁸

Rome Criteria

- Two or more of the following in at least 25% of defecations
 - Straining
 - Lumpy or hard stools
 - Sensation of incomplete evacuation
 - Sensation of anorectal obstruction/blockage for at least
 - Manual maneuvers to facilitate defecation
 - Fewer than three defecations per week
- Loose stools occur rarely without the use of laxatives
- Insufficient criteria for diagnosis of IBS

Epidemiology

- Estimates of prevalence vary based on diagnostic criteria used, ranging from 2% to 28%, and most studies citing 12% to 19%
- Estimates based on self-reported constipation are consistently higher than estimated based on standardized criteria
- Two large studies utilised random telephone interviews conducted in the US in 1999⁹ and in Canada in 2001¹⁰
 - 10,018 Americans and 1149 Canadians completed the interview
 - Rates were similar in both studies
 - Approximately 15% of respondents met Rome II criteria
 - Prevalence of self-reported constipation was 27%

Etiology

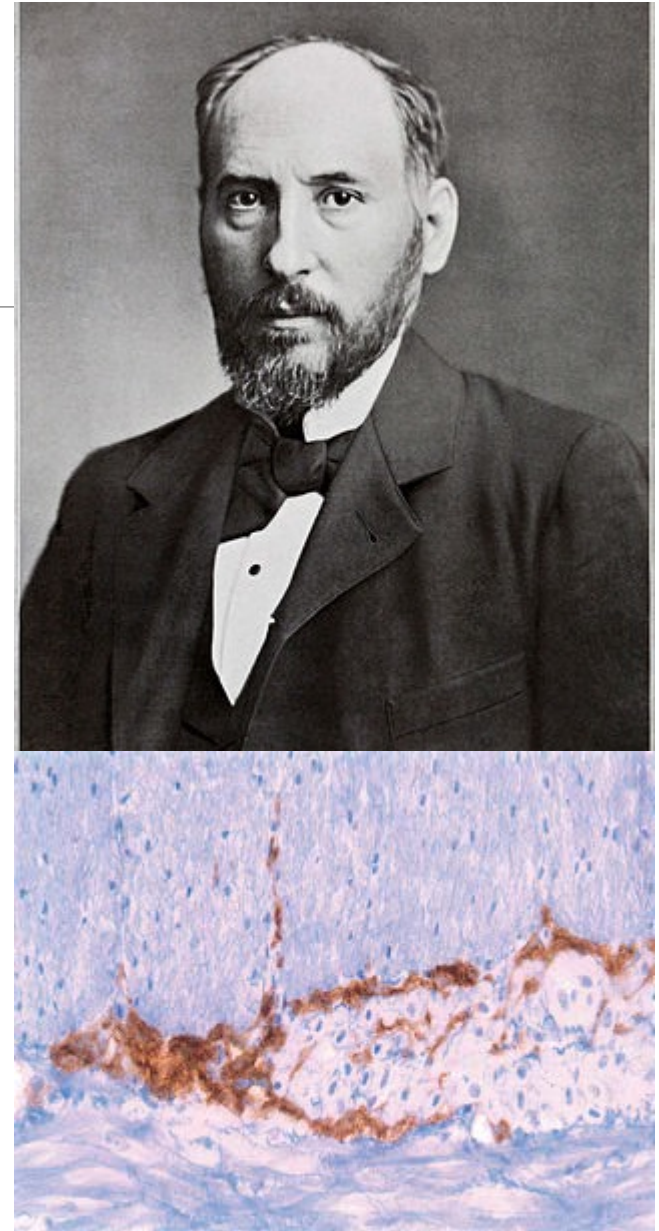
- Constipation can be divided into two broad categories
- Primary causes
 - Normal transit constipation
 - Colonic inertia
 - Pelvic floor dysfunction
- Secondary Causes
 - Electrolyte and hormonal imbalances
 - Drug side effects
 - Neurological disorders

Evaluation

- A good history is crucial to identify potential causes
- A stool diary may be needed to delineate defecation habits
- Laboratory investigations can identify electrolyte abnormalities, hormonal imbalances or metabolic disorders
- Other investigations to be considered
 - Colonoscopy
 - Colonic transit study
 - Defecography
 - Anal manometry

Colonic Inertia

- Colonic inertia or slow transit constipation describes a disorder in colonic motility
- Delayed transit through the entirety of the colon without the presence of an anorectal evacuation abnormality
- Decreased number and response of the interstitial cell of Cajal results in blunted peristalsis in response to stimulus and inability to trigger sufficient pressure for evacuation



Colonic Transit Study

- Diagnosis can be made by colonic transit study
- Patients take a high fiber diet while on laxative from 3 days prior to study
- Patient then swallows a capsule with radiopaque markers
- Serial abdominal X-rays are taken
- Retention of more than 5 markers is considered indicative of slow transit constipation, if dyssynergic defecation is excluded



Normal transit constipation

- In normal colonic transit constipation, patients have normal large bowel motility but still report sensation of constipation
- Patients may have high rectal distensibility or impaired anorectal sensation leading to retention and hard stools

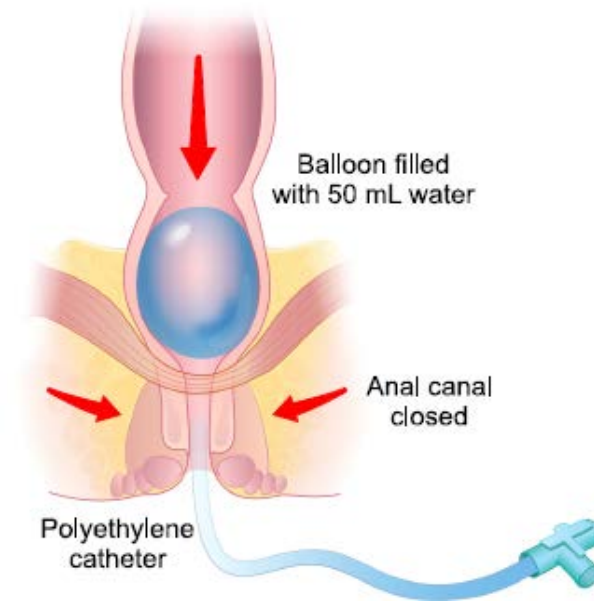
Pelvic Floor Dysfunction

- Abnormalities in the synchronized function of pelvic floor muscles can lead to stagnation and impaction of stool in the rectum despite normal colonic transit
- Paradoxical contraction of the puborectalis during defecation tightens the anorectal angle and makes evacuation difficult
- Abnormal pelvic floor descent can lead to prolapse of the rectum into, and obstruction of, the anal canal



Balloon Expulsion Test

- A balloon is inserted into the rectum and filled with 50 mL of water or until patient feels the urge to defecate
- Patient is then asked to defecate the balloon in a sitting position in privacy
- 93% of normal controls are able to expel the balloon within 1 minute and expulsion time over 2 minutes is considered abnormal
- No accepted standardized protocol between institutions¹¹



Normal < 60 seconds



Secondary causes

- Hormone and electrolyte imbalances can lead to constipation, including hypercalcemia, hypokalemia, and hypothyroidism
- Constipation may be a side effect of many drugs, including opiates, oral iron, anti-cholinergics, anti-psychotics, anti-depressants and anti-convulsants
- Neurological diseases such as MS, Parkinson's and diabetic neuropathy can also lead constipation, which may be aggravated by the medication used to treat them
- Treatment aimed at addressing underlying cause

Initial treatment

- Initial step in management in management for all etiologies is dietary and behaviour modification
 - Patients should be advised to increase fiber and water intake
 - Behavioural modification includes increasing physical activity and taking advantage of gastrocolic reflex
- Dietary fiber supplements such as psyllium, methylcellulose or bran fiber can lead to bulkier stools that are easier to pass
- Osmotic laxatives such as PEG help keep water within the colon and prevent inspissation of stool



Medical management

- Stimulant laxatives can be combined with fiber and PEG containing compounds if desired effect is not seen
- Bisacodyl
 - Increases motor activity of myenteric plexus
 - Alters electrolyte transport causing net fluid shift into intestinal lumen
 - Can be given as oral or rectal formulations
- Severely constipated patients may need manual disimpaction and enemas

Linacлотide

- Minimally absorbed peptide agonist of guanylyl cyclase-C receptor
- Increases fluid secretion into intestinal lumen and decreases transit time
- Also alleviates pain from IBS in higher doses, presumably by effect on efferent sensory neurons
- In a Phase 3 RCT, clinical improvement was seen in 20% of patients compared to 6% of placebo¹²



Biofeedback training

- Involves insertion of pressure monitor into the anal canal and placement of electromyography electrodes on the abdomen
- Patients are instructed to squeeze, strain and relax as they watch real time EMG and pressure readings
- Patients undergo about 10 sessions in three weeks
- Studies are limited but show better results for pelvic floor dyssynergia than laxatives
 - 2006 RCT reported 80% of patients having symptomatic improvement with biofeedback compared to 22% of those treated with laxatives¹³

Surgical management

- Patients with severe isolated slow transit constipation may not respond to behavioural or laxative therapy
- Surgical intervention with subtotal colectomy can be considered if
 - The patient has chronic, severe symptoms refractory to medication
 - There is slow colonic transit through the entire colon
 - There is normal transit through the proximal bowel
 - There is no pelvic floor dysfunction
 - Abdominal pain is not a predominant symptom
- Multiple operative techniques have been described

Surgical management

- Segmental resections, with ileorectal, ileosigmoid and cecorectal anastomoses have all been described
- Studies are small and results widely variable, but segmental resections typically lead to recurrence of symptoms in a large number of patients
- Conversely, patients who undergo ileorectal anastomosis typically have excellent result, with up to 90% reporting good or excellent outcomes¹⁴

Fecal incontinence

Definitions

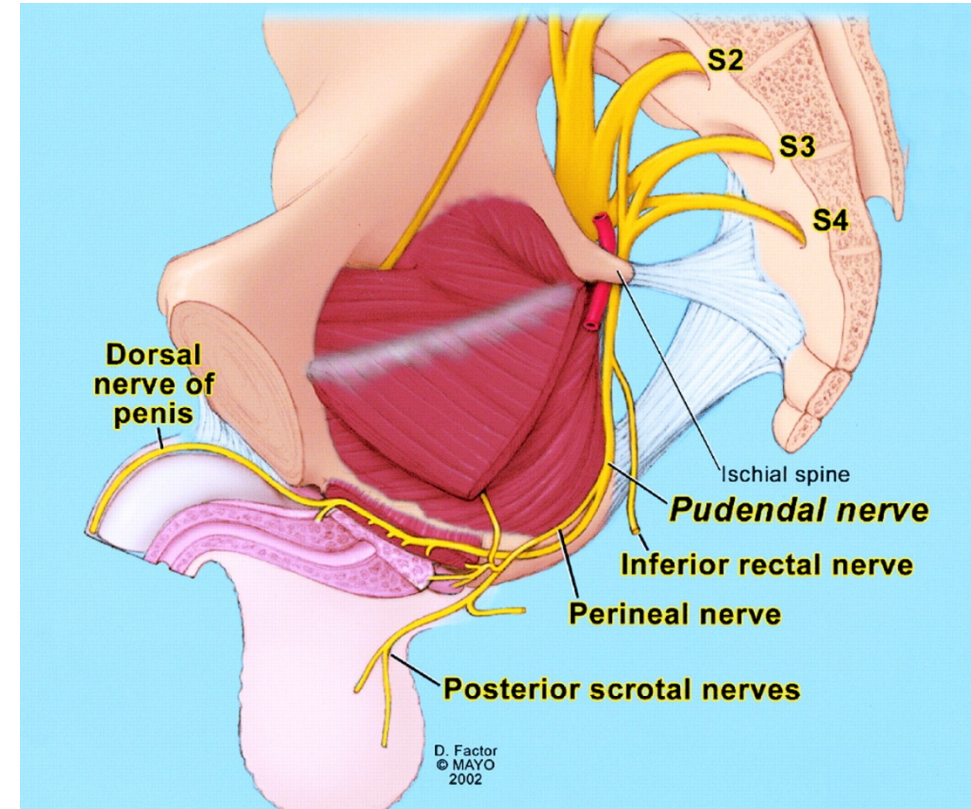
- Fecal incontinence refers to involuntary loss of solid or liquid stool
- Anal incontinence refers to involuntary loss of stool or flatus
- Based on the mechanism, incontinence can be divided into the two following categories
 - Urge incontinence: patient feels the urge to defecate and incontinence occurs despite efforts to retain stool
 - Passive incontinence: patient has no awareness of need to defecate before incontinent episode

Epidemiology

- Prevalence varies with age, and is likely underreported
- Most common in elderly, especially women
- May be as high as 55% in elderly patients in nursing homes¹⁵
- Identified risk factors include
 - Multiple vaginal deliveries and traumatic childbirth
 - Anorectal trauma
 - Prior pelvic surgery
 - Pelvic irradiation
 - Diabetes
 - Neurologic disorders

Etiology

- Anal sphincter weakness
 - The external sphincter accounts for 30% of resting anal canal pressure, while the internal sphincter accounts for 55%¹
 - Loss of function in one can be compensated to a certain extent
- Nerve damage and neuropathy
 - Traumatic: Spinal cord injury, obstetrical trauma
 - Atraumatic: Systemic sclerosis, diabetic neuropathy



Etiology

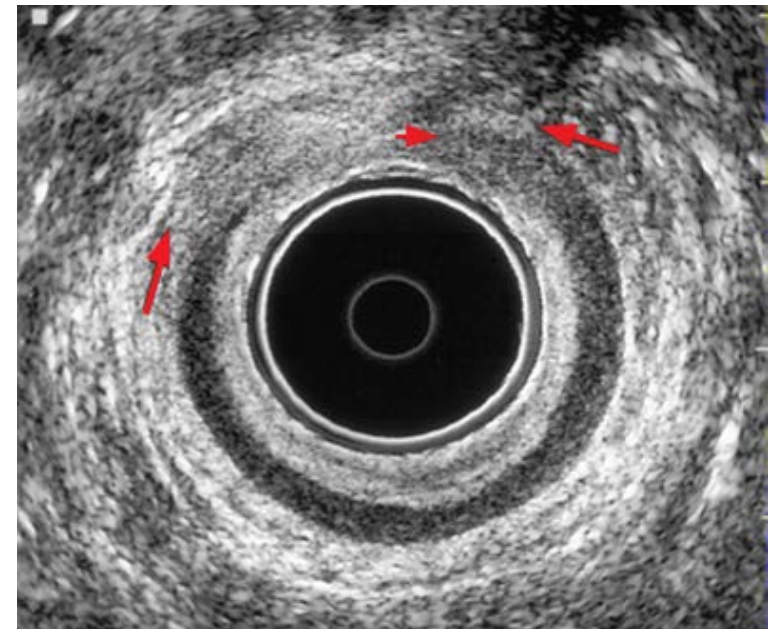
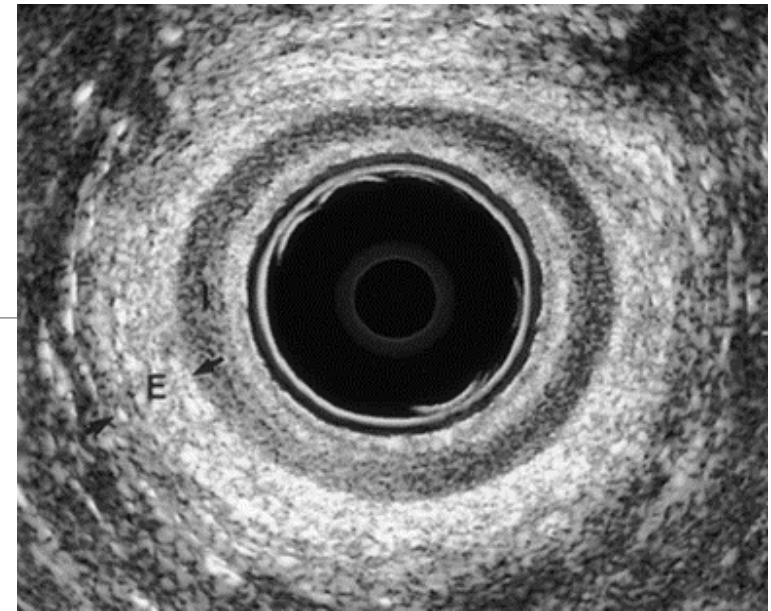
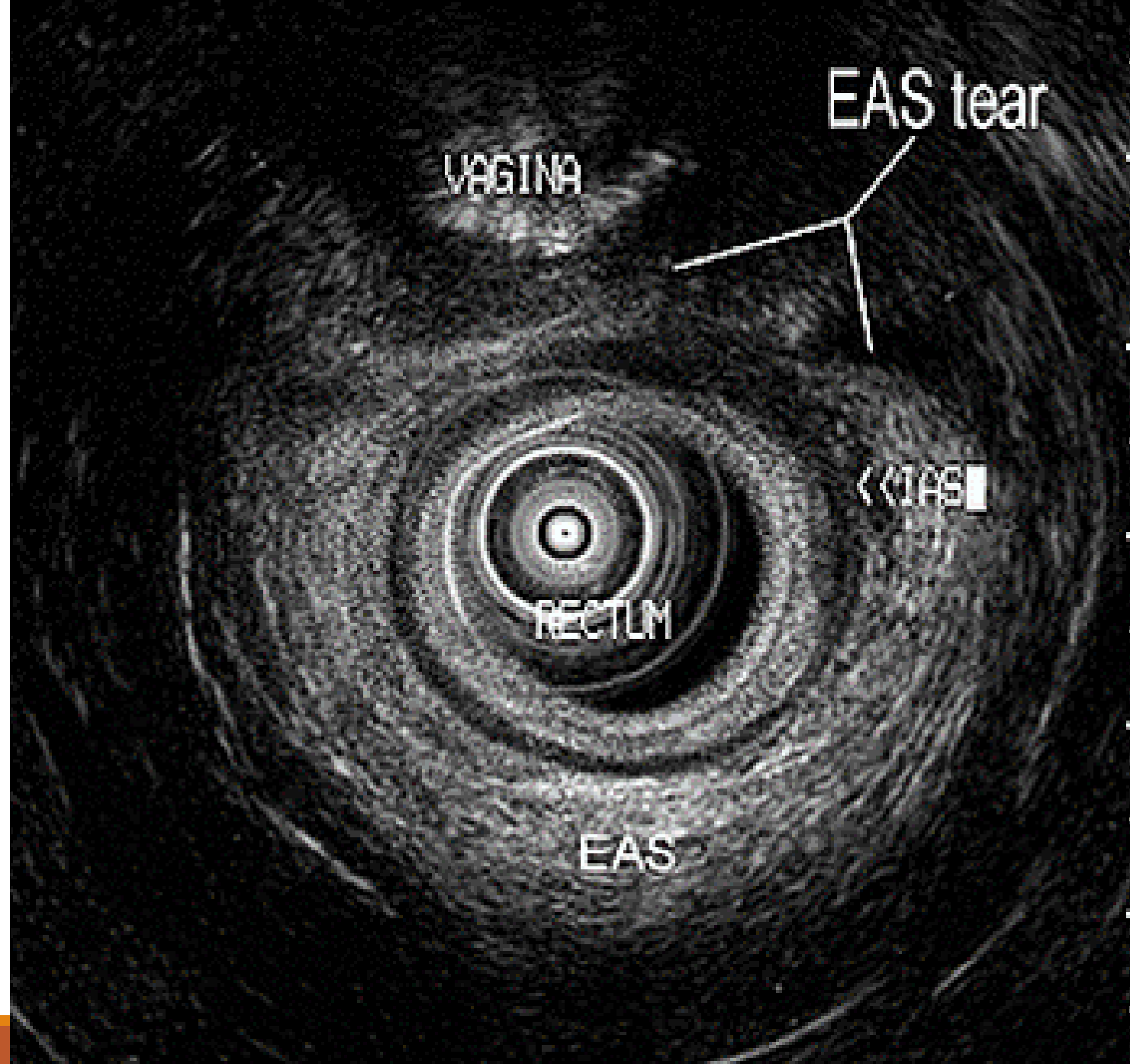
- Decreased rectal sensation and compliance
 - Decreased compliance can occur from ulcerative proctitis, Crohn's disease, radiation proctitis, or rectal surgery
 - Decreased sensation can occur from autonomic neuropathy secondary to diabetes, spinal cord injury or multiple sclerosis, while decreased perception can be the result of dementia or stroke
- Overflow incontinence
 - Poor bowel habits can lead to impaction of stool in the rectum
 - This leads to constant inhibition of internal anal sphincter tone
 - Decreased pressure in anal canal leads to incontinence

History

- Evaluation should begin with a thorough history
 - Clarify severity and frequency of incontinence
 - Distinguish overflow or urge incontinence
 - Acquire obstetric history or other possible causes for sphincter injury
- Presence of motor or sensory deficits in the perineum and lower extremities can suggest spinal cord lesions
- Sensation of protruding mass can suggest hemorrhoidal disease or rectal prolapse

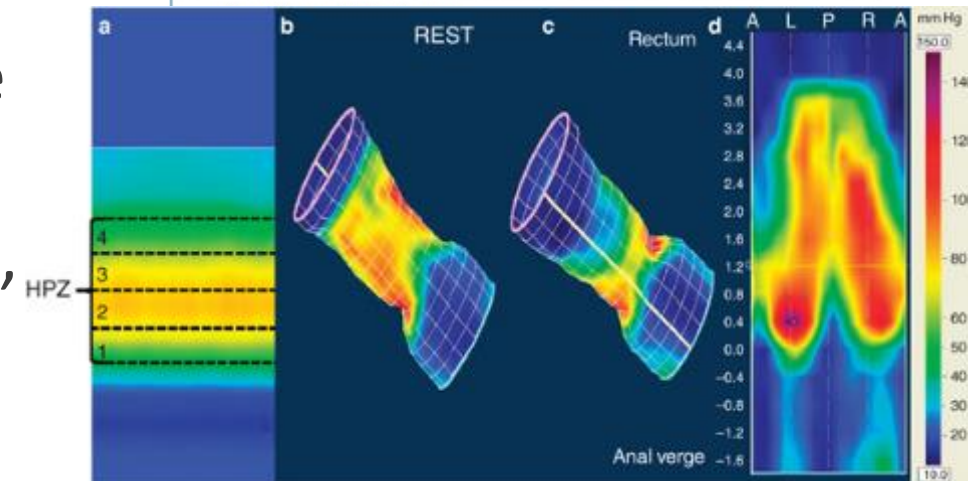
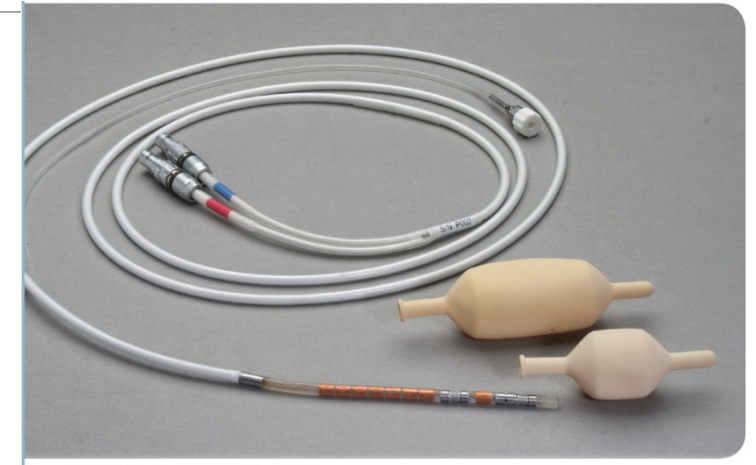
Physical Exam

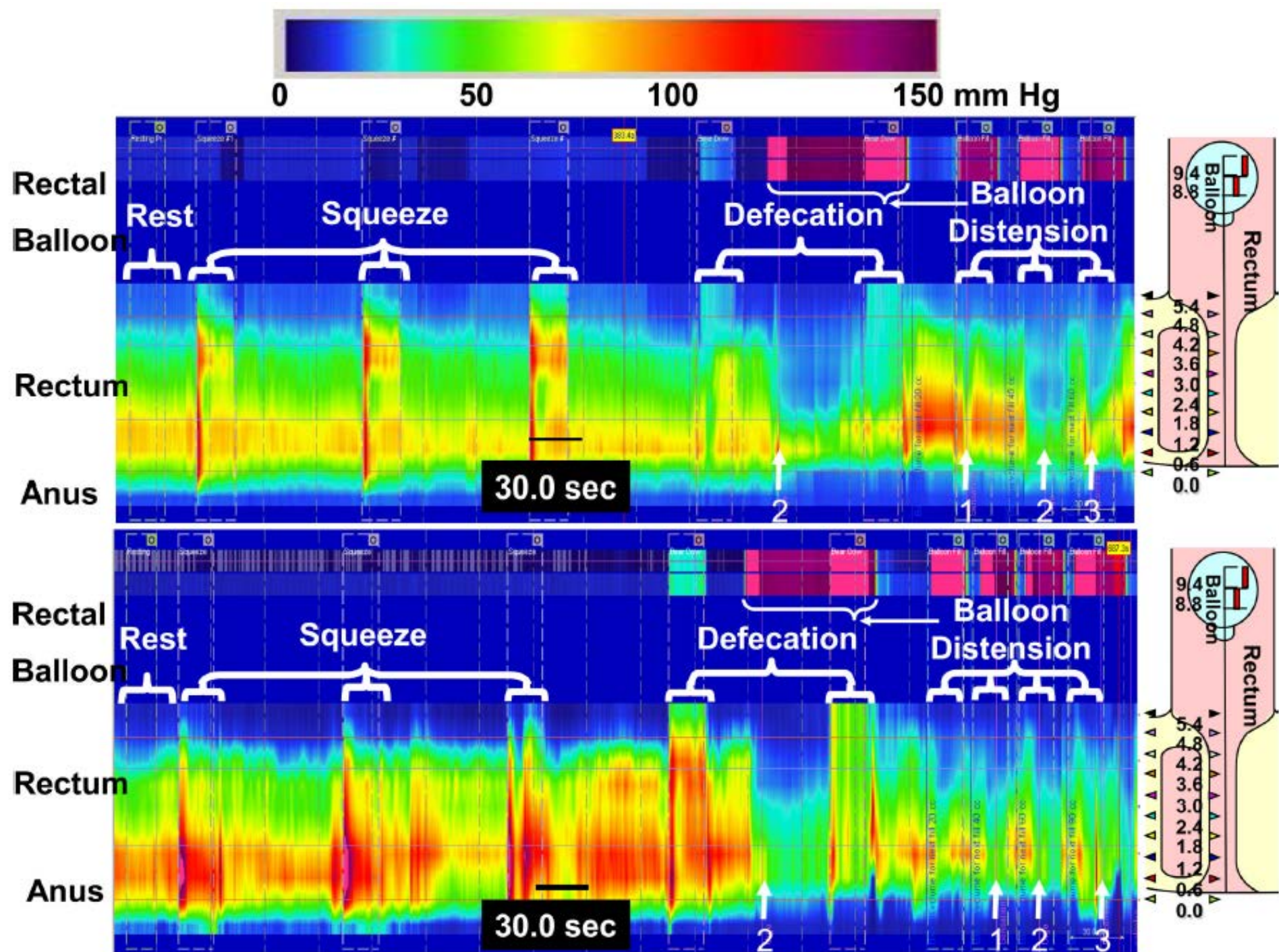
- Examination can reveal prolapse, dermatitis suggestive of chronic irritation or fistulising disease suggestive of Crohn's disease
- DRE should be performed with assessment of resting tone, straining and squeeze
 - Resting tone allows for assessment of internal anal sphincter
 - Squeeze pressure assesses external anal sphincter and puborectalis
 - Straining can allow for measurement of perineal descent
- Demonstration of anal wink reflex is a simple assessment of the sacral lower motor neuron reflex arc
- Requires experience and expertise to be reliable



Anorectal manometry

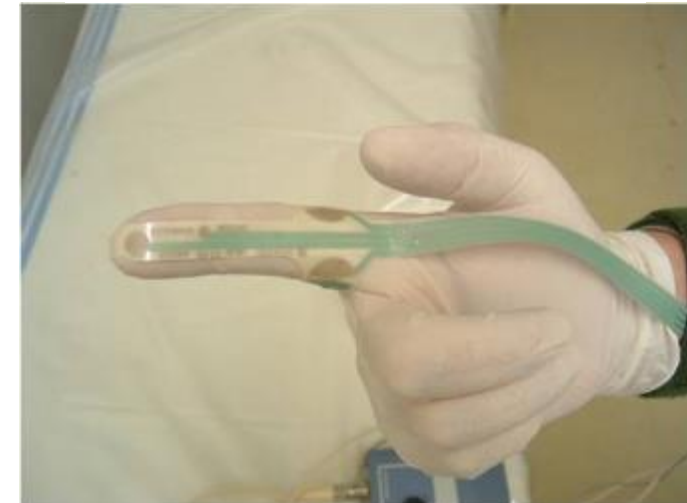
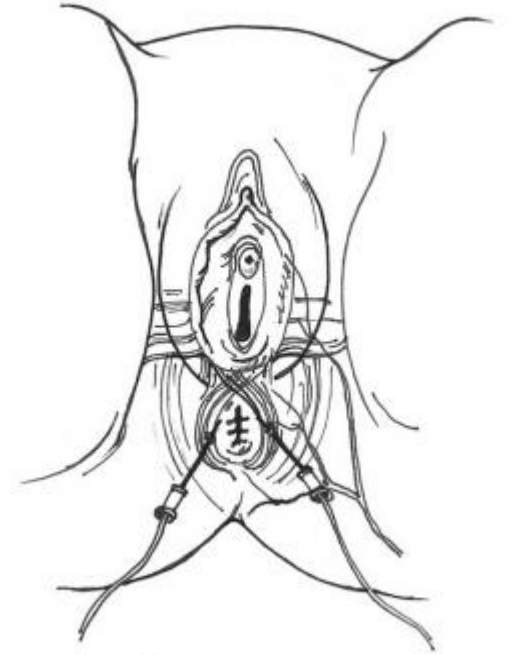
- Catheter with pressure sensors is inserted into the rectum, and measures pressures during rest, squeeze, strain, and cough.
- Rectal balloon can measure compliance, rectal sensory threshold, urgency threshold and maximum tolerable volume
- High resolution 3D manometry has 256 sensors circumferentially in the anal canal, and can detect sphincter defects
- Limited availability and standardization





EMG and PMNL

- Electromyography (EMG) involves insertion of a needle electrode into the external anal sphincter to measure motor action potentials during rest and voluntary contraction
- Pudendal Motor Nerve Latency or PMNL testing involves stimulating the pudendal nerve through the rectum and measure time to response of the external anal sphincter
- Can delineate neural deficits from structural ones



Medical Management

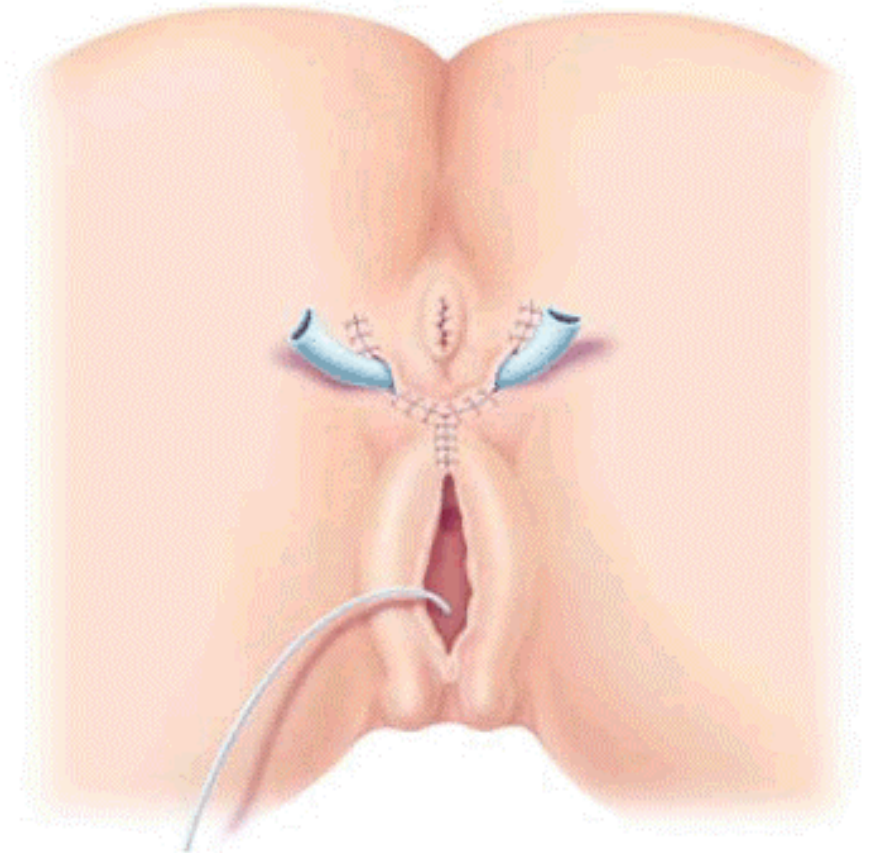
- As continence is easier to maintain with solid stools than soft or liquid stools, initial medical management is aimed at bulking stools and preventing diarrhea
- Anti-diarrheals such as loperamide or diphenoxylate/atropine, and bile acid binders such as cholestyramine can be used
- Medications are not curative but can improve symptoms to minimize impact on quality of life

Pelvic floor exercise

- Pelvic floor exercise aim to strengthen muscles involved in continence to improve symptoms in combination with drug therapy
- Can be performed in isolation or with biofeedback
- 2012 Cochrane Review examined 21 studies with 1525 subjects¹⁶
 - Some evidence that pelvic floor exercises and biofeedback training may lead to improves outcomes
 - Results highly variable and conclusions limited by small studies with methodological weaknesses

Anal Sphincteroplasty

- Curvilinear incision is made over the sphincter defect and the sphincter muscles are dissected from surrounding tissue.
- Muscle is divided through the defect, but scar tissue is left as suture anchor.
- Sphincteric flaps are overlapped and plicated. Levatorplasty can be performed.
- Sphincter should still permit digitation
- Incision closed in a V-Y fashion

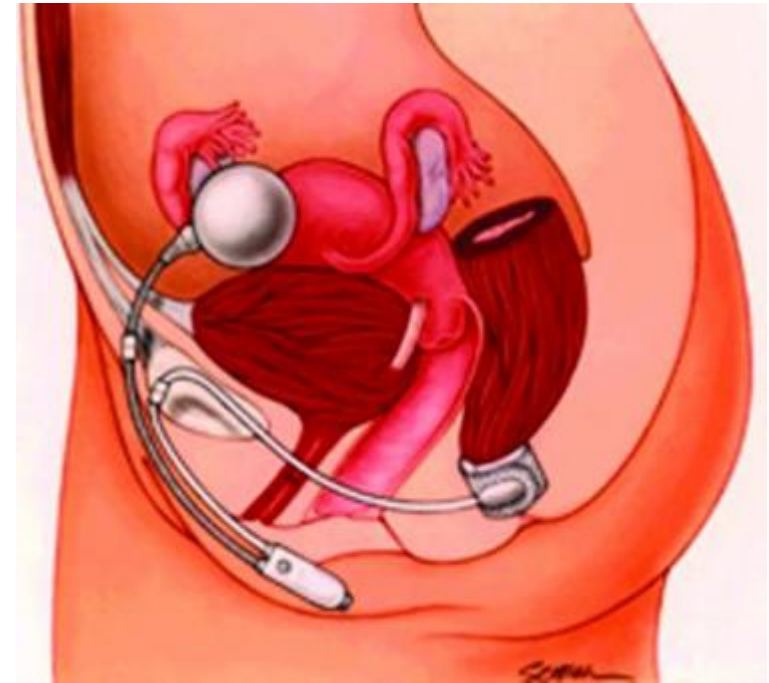


Sphincteroplasty outcomes

- Best outcomes seen in young patients with demonstrated defect in the external anal sphincter
- Short term restoration of continence is seen with 80-85% of well-selected patients.
- Unfortunately, results are short lived, with only 40% reporting continence at 10 years follow up¹⁷
- Complication and failure rates remain high

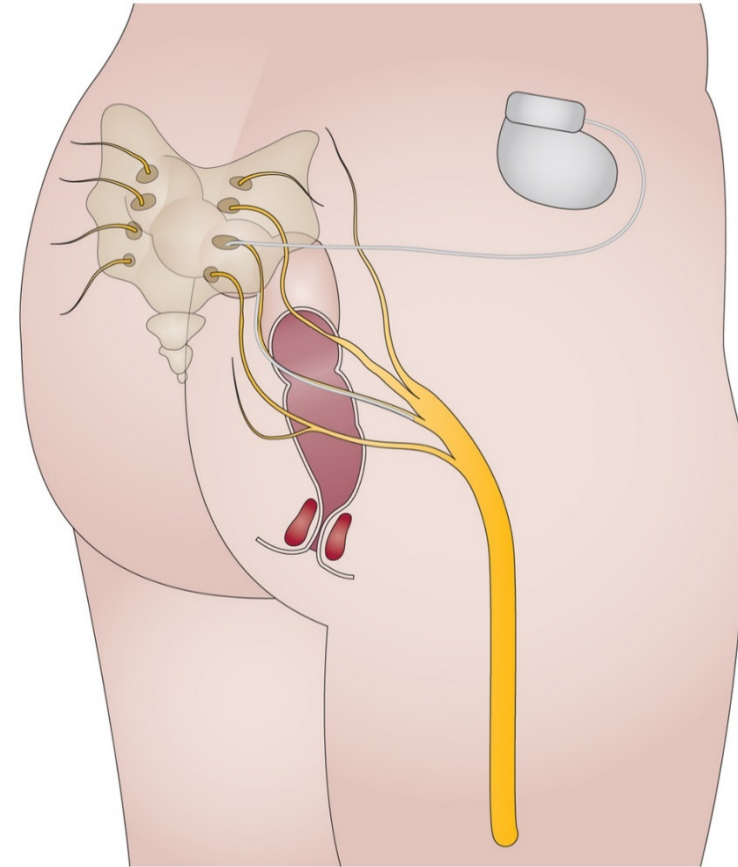
Artificial anal sphincter

- Inflatable cuff is implanted around sphincter complex, with pump placed in the labia/scrotum and reservoir in the prevesical space
- Complication rates are high¹⁸
 - 25-30% infection rate
 - 20-35% explantation rate
- If implantation successful, device remains stable for many years



Sacral Nerve Stimulation

- Wire electrode is placed in the S3 foramen
- Electrode is connected to an external stimulator for 10-14 day trial period.
- Patients who receive 50% or greater improvement in symptoms move to permanent stimulator implantation subcutaneously
- Frequency and voltage of stimulation can be adjusted to achieve appropriate symptom control
- 80% of patients report improvement of 50% at 1 year, while 40% have complete continence¹⁹



Rectovaginal fistula

Rectovaginal fistula

- Most commonly formed as a result of obstetrical trauma, especially in developing countries
 - Prolonged labour can cause pressure necrosis of rectovaginal septum
 - Failed repair of third or fourth degree perineal tear
 - Infection following an episiotomy
- Other causes included diverticulitis, Crohn's disease, radiation damage, or as complication following pelvic surgery
- Classified as high or low based on relation to dentate line
- Can be severely damaging to self-esteem and quality of life

Epidemiology

- Uncommon complication, occurring after 0.1% of vaginal deliveries²⁰
 - Number much higher in the developing world
 - Associated risk factors include prolonged labour over 24h, teenage pregnancy, and home births
- Lifetime of rectovaginal fistulas in patients with Crohn's disease is estimated to be 10%, especially with especially with rectal disease²¹
- Rectovaginal fistula after rectal surgery (i.e. Low Anterior Resection) have variable incidence rates, and are thought to be a result of improper equipment use

Presentation

- Patients may complain of passage of gas, odorous discharge, mucous, or even frank stool from vagina
- Complaints may be more frequent with loose bowel movements
- Can predispose patients to recurrent urinary tract infections
- Small fistulae can be asymptomatic, and incidentally found on imaging for unrelated cause
- Patients should be questioned about fecal incontinence if RVF is suspected, as it may indicate involvement of the sphincter complex

Evaluation

- Evaluation should begin with a rectal and vaginal exam to identify the opening of the fistula. If identified, opening can be explored with a lacrimal probe to identify fistula tract
- Anoscopy and proctoscopy may be needed to identify higher fistulas
- Dilute Methylene blue can be instilled in the rectum to identify vaginal opening
- Other tests (endoanal ultrasound, MRI, CT, colonoscopy, etc) should be performed based on clinical concern

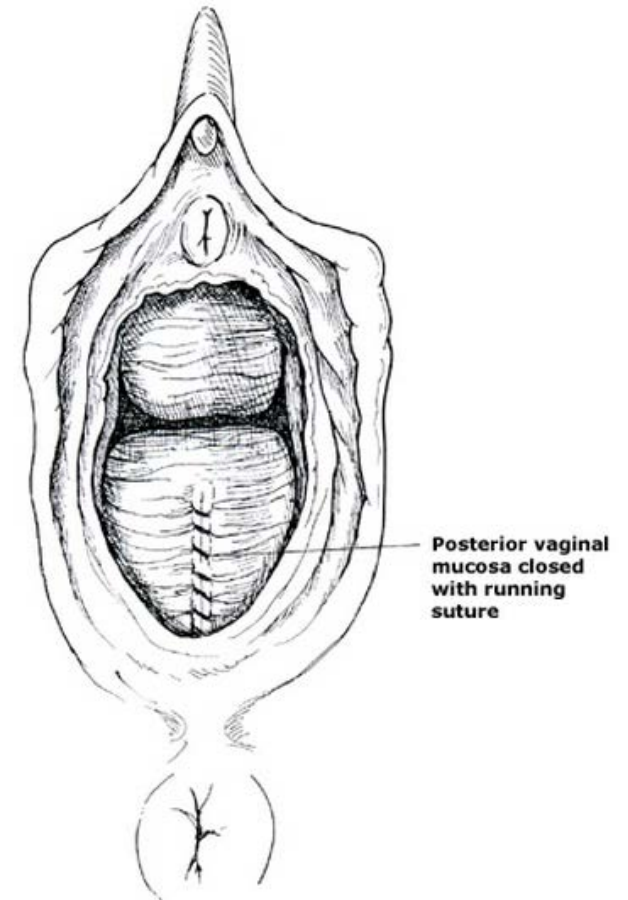


Management

- For small, minimally symptomatic fistulas or poor operative candidates, conservative management with dietary modification and stool bulking to prevent diarrhea may suffice
- About one half of small obstetric rectovaginal fistula will heal spontaneously with conservative management
- Pre-operative medical management should be aimed at optimizing chances for healing and minimizing failure
 - Treatment of any infection or drainage of abscess
 - Medical therapy for Crohn's disease
 - Removal of foreign bodies such as staples or sutures

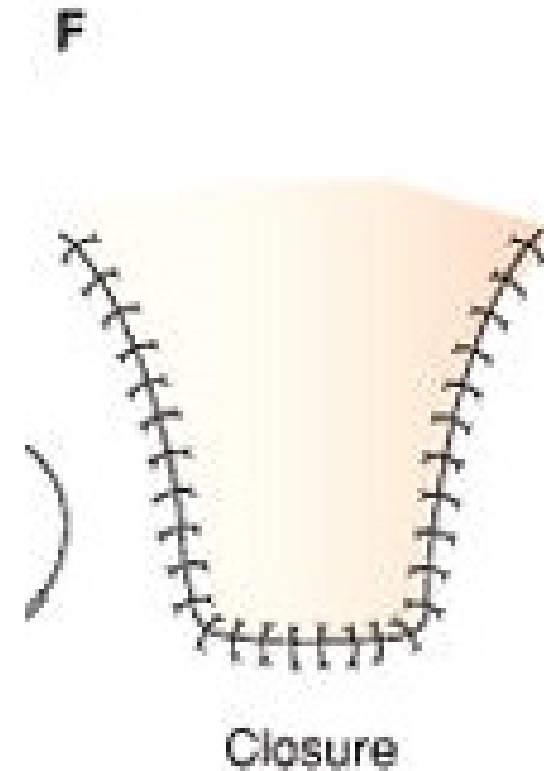
Fistulectomy and layered repair

- Useful for small, simple, low fistulas
- Incision is made over fistula opening
- Vagina and rectum are then sharply dissected, and the entire fistula tract and scar tissue is excised
- Defects are then closed in multiple layers: rectal mucosa and submucosa, pararectal fascia, puborectalis, and vaginal mucosa



Endorectal advancement flap

- Flap can be performed from either the rectal or vaginal side
- Rectal flap of mucosa, submucosa, and internal sphincter is created and reflected upwards
- Fistula tract is excised and longitudinal muscle is reapproximated
- Vaginal opening left unclosed for drainage



Other surgical options

- High rectovaginal and colovaginal fistulas need to be addressed with a transabdominal approach
- Depending on the size of the fistula and viability of tissue, formal resection of the involved segment of bowel may be required
- For patients at high risk of failure, interposition graft with a gracilis or Martius flap (bulbocavernosus and labial fat pad) can introduce new vascular tissue into an otherwise tenuous repair
- Diverting stomas can protect repair from infection and recurrence
- For patients with multiple recurrences or severely damaged tissues, permanent colostomy may be only option

Outcomes

- Large RCTs comparing surgical approaches are lacking and reported results vary widely²²
 - Most studies on rectal advancement flaps report 60-90% closure rate, though follow up intervals vary widely (7-40 months)²³
 - Transabdominal procedures have a reported success rate of up to 95% at 2 years follow up
- Recurrence rates due to inflammatory or radiation induced fistulas are generally much higher, and perioperative morbidity is higher as well

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