



Clinical Anatomy of the Anorectal Region

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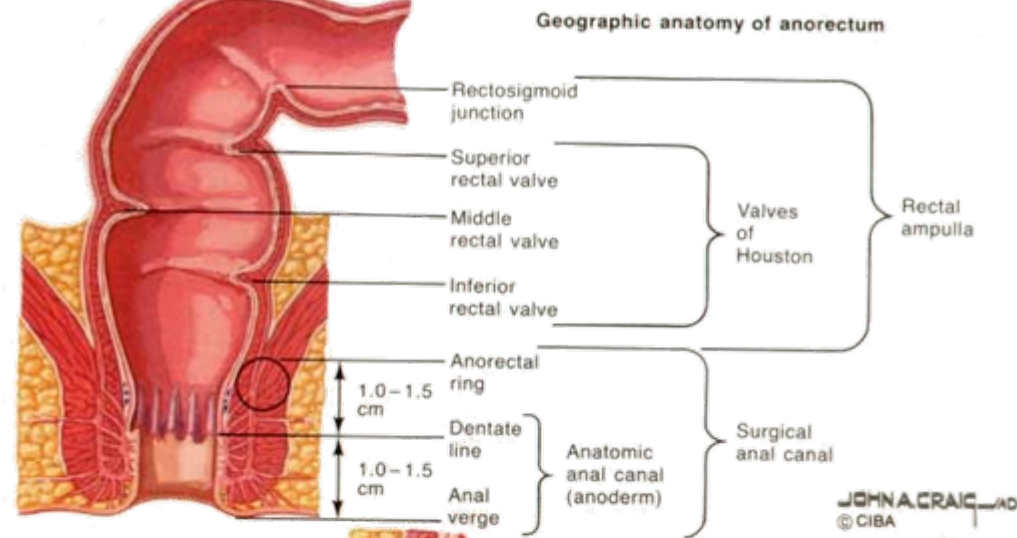
Terms

Rectum:

- no haustra, app. epiploicae
- taeniae coalesce to form a continuous longitudinal coat
- **Ampulla**: differing definitions
- **Houston's valves**
 - middle most constant
 - don't contain all layers

Anal canal:

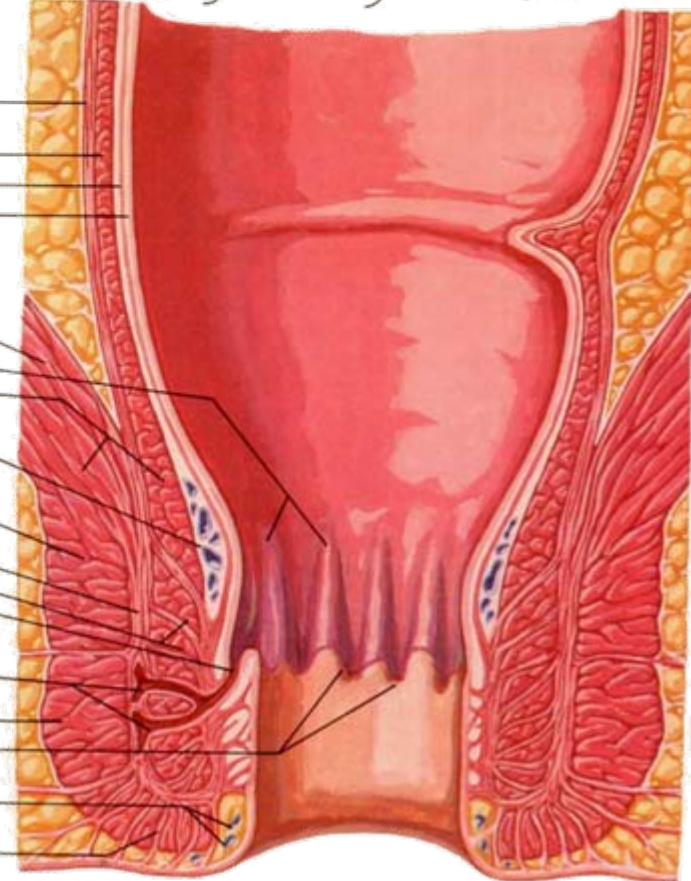
- **Anal verge**: between perianal skin and anal canal
- **Dentate line**: mucocutaneous jct.
- **Anal columns** of Morgagni
- **Anal valves**: largest posteriorly
- **Anal sinuses**: deep to valves
- **Anal crypts**: receive ducts of anal glands
- **Anal glands**: often tunnel into internal anal sphincter



Anorectal anatomy

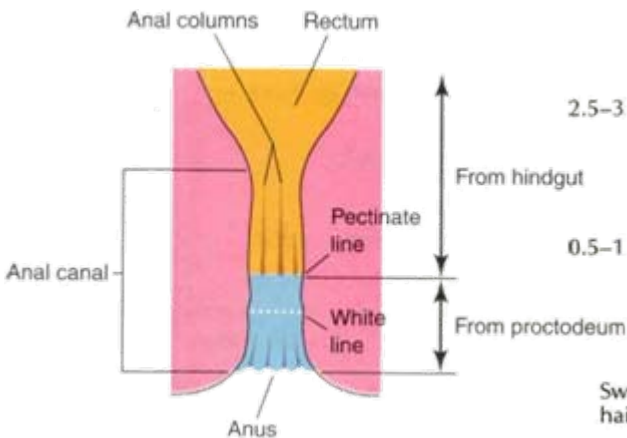
Longitudinal muscle of rectum
Circular muscle of rectum
Muscularis mucosae
Mucosa

Puborectalis muscle
Rectal columns
Anorectal ring
Internal hemorrhoidal plexus
Deep external sphincter
Intersphincteric plane
Internal sphincter
Anal crypt
Anal gland (lies in intersphincteric plane, opens into crypt)
Superficial external sphincter
Dentate line
External hemorrhoidal plexus
Subcutaneous external sphincter

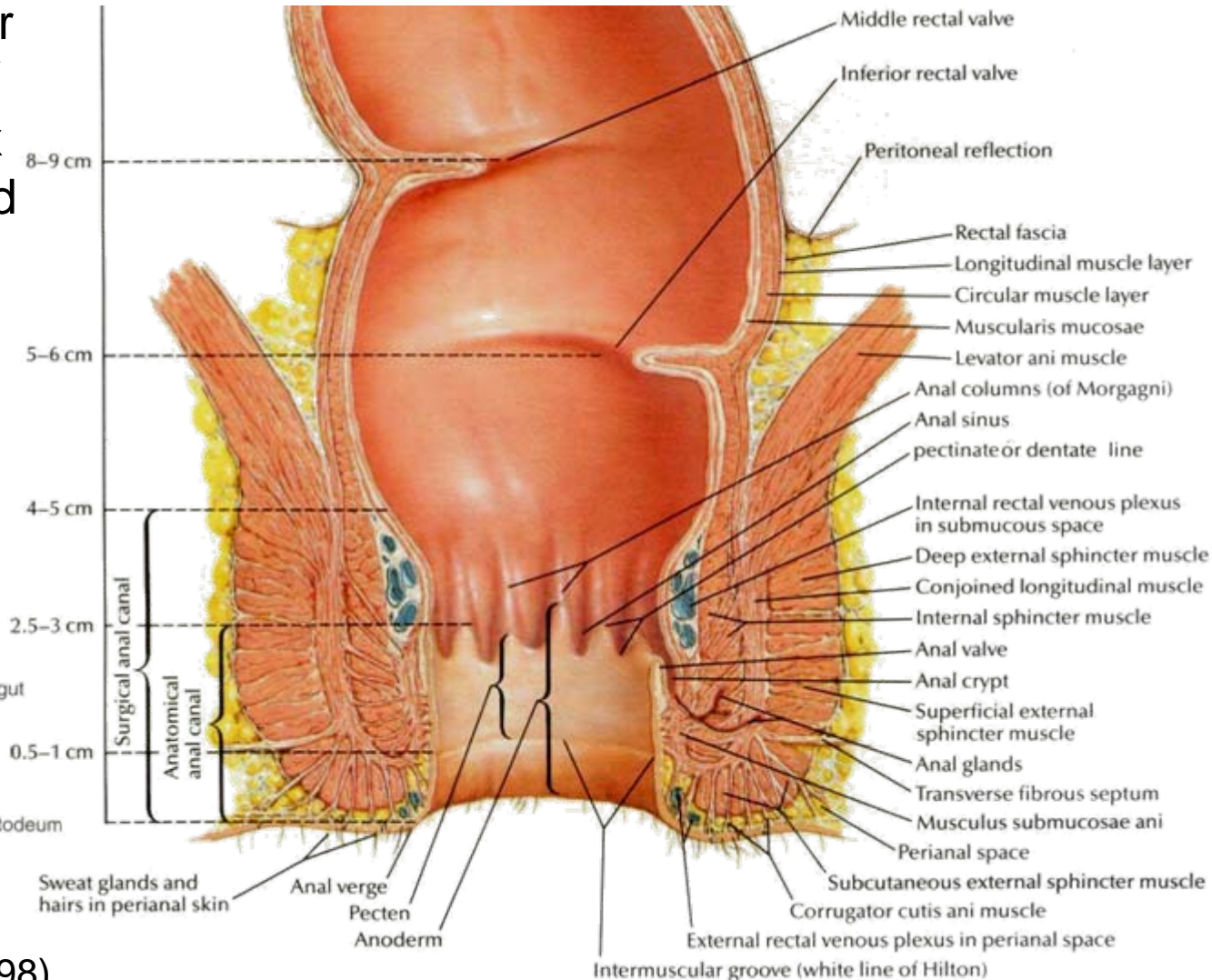


Terms

- **Anorectal ring:** upper border of sphincteric/puborectalis complex
- **Anoderm:** skin devoid of follicles & glands
- Anatomical vs. surgical anal canals
- **White line of Hilton:** intersphinct. groove



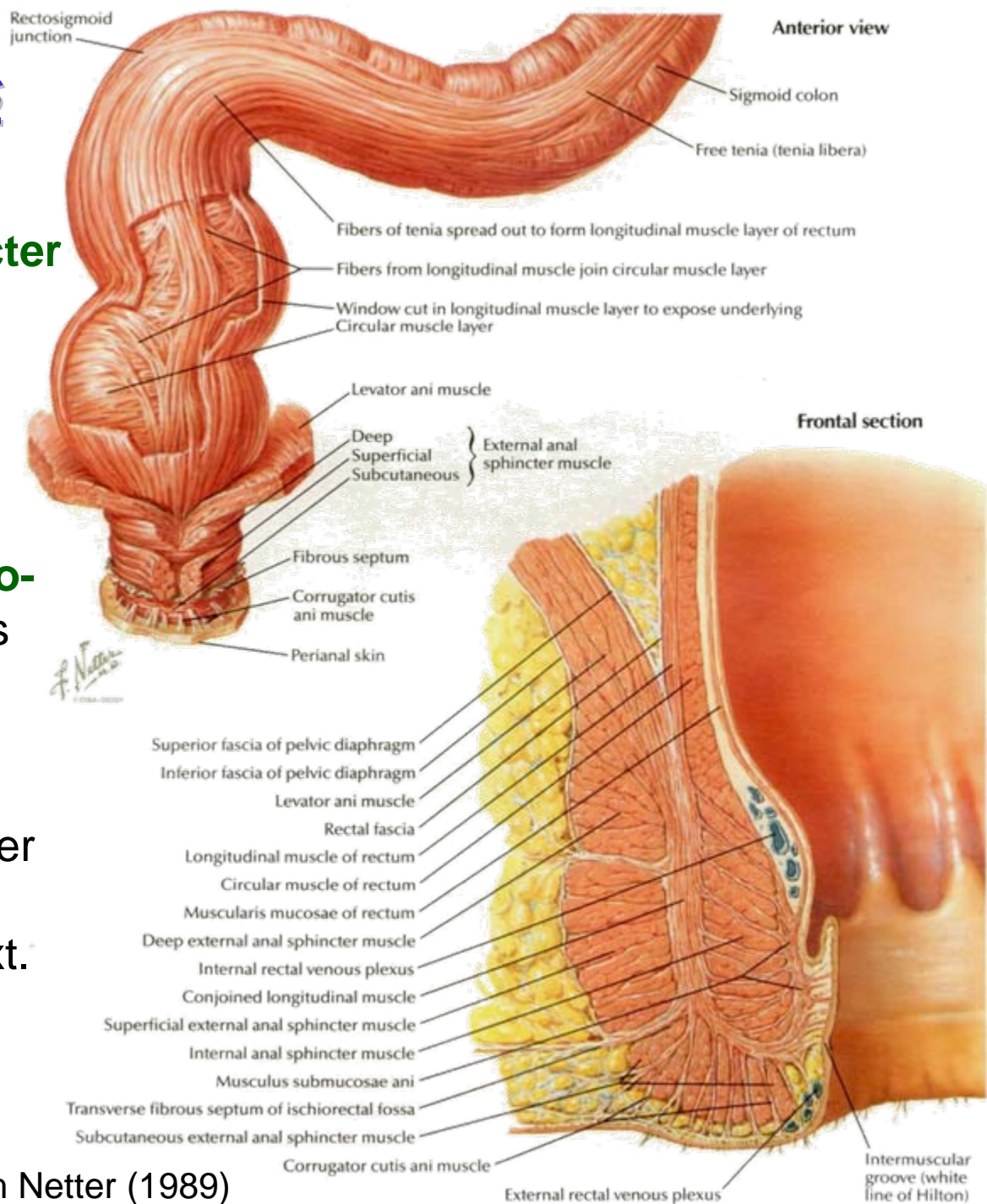
From Moore & Persaud (1998)



From Netter (1989)

Anorectal Muscles

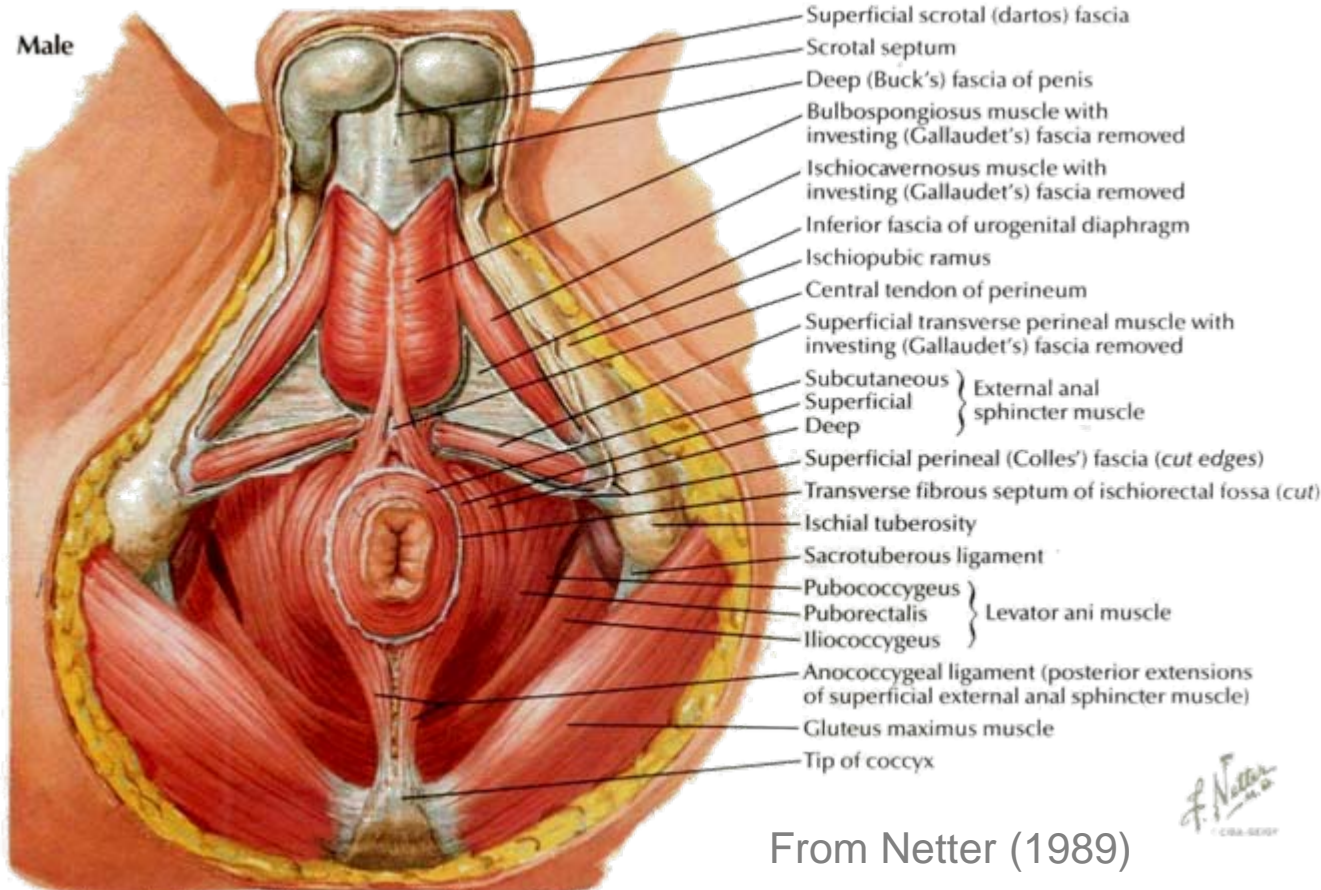
- Circular layer of rectum becomes **internal anal sphincter**
- Longitudinal layer of rectum becomes **intersphincteric fascial plane**
- **External anal sphincter** is composed of three parts
- **Levator ani** contributes **puborectalis**, which is continuous with deep external anal sphincter
- Tube within a tube
 - Inner tube: internal sphincter (smooth muscle)
 - Outer tube: puborectalis/ext. sphincter complex (skeletal muscle)



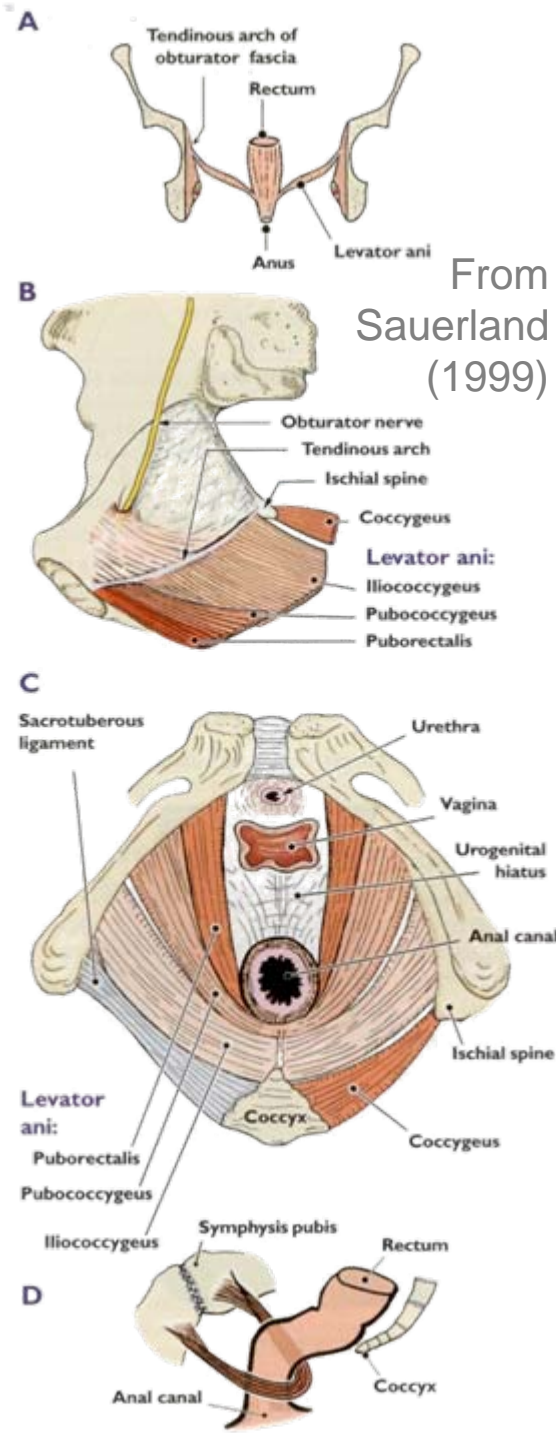
From Netter (1989)

Anorectal Muscles

- **Levator ani:** major support of pelvic floor
- **Puborectalis**
 - forms muscular sling around anorectal junction
 - controls anorectal angle and hence plays an important role in fecal continence and defecation



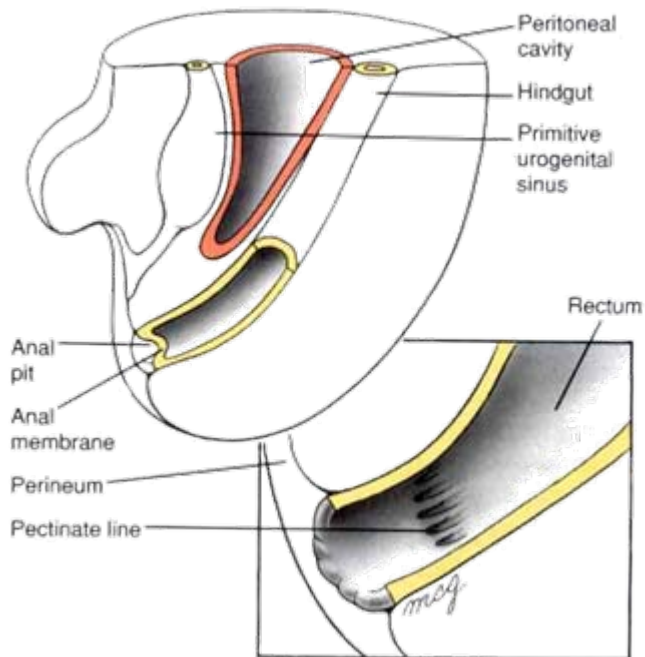
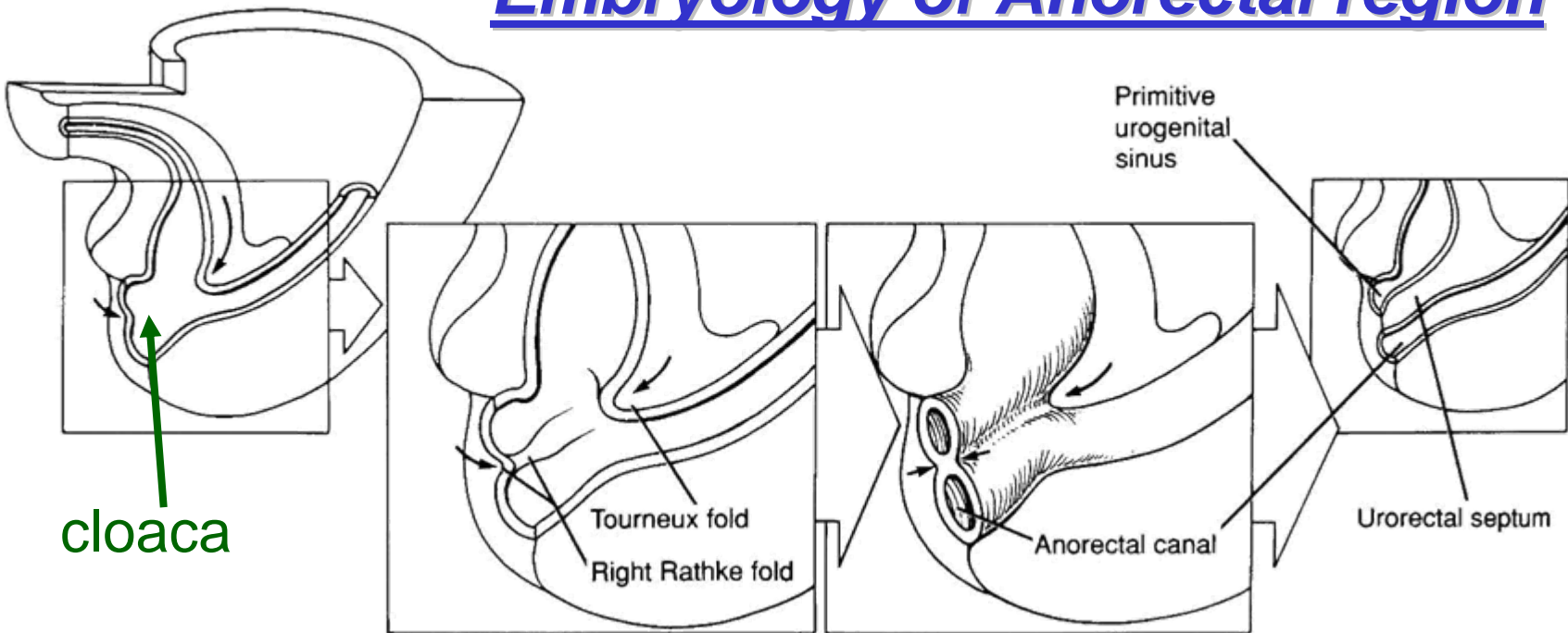
From Netter (1989)



From Sauerland (1999)



Embryology of Anorectal region

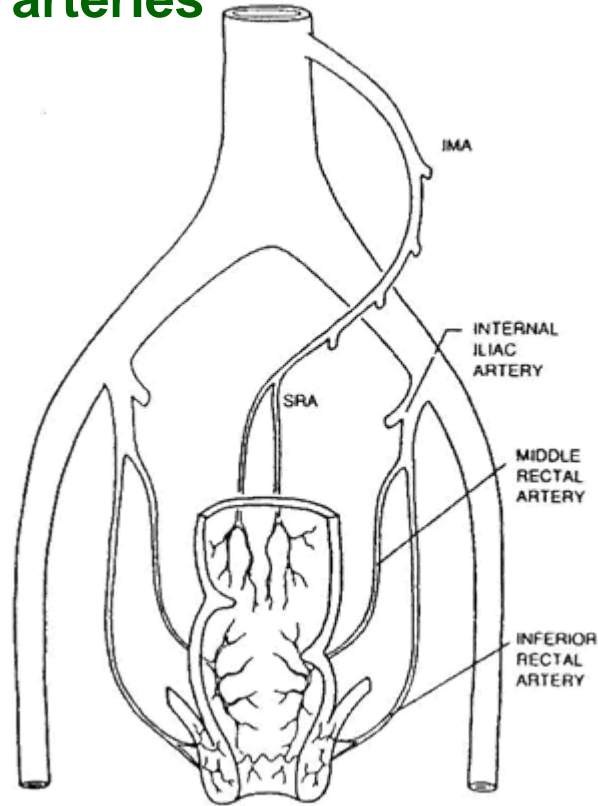


- Subdivision of embryonic cloaca by urorectal septum
- Ectodermal anal pit and membrane rupture and meet the endodermal anorectal canal
- Dentate (pectinate) line is the juncture

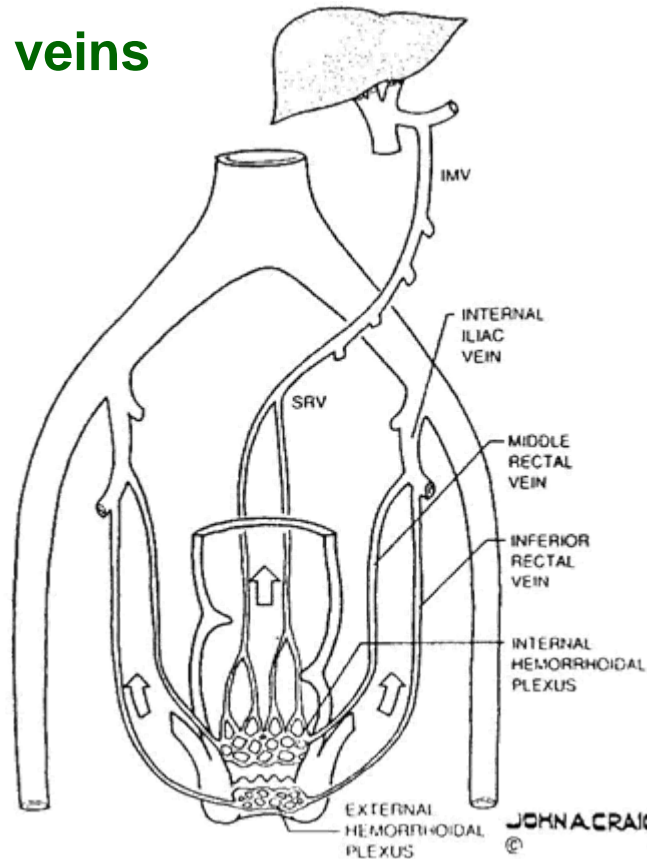
From Larsen (1997)

Blood Supply & Lymphatics: The Dentate Line as a Watershed

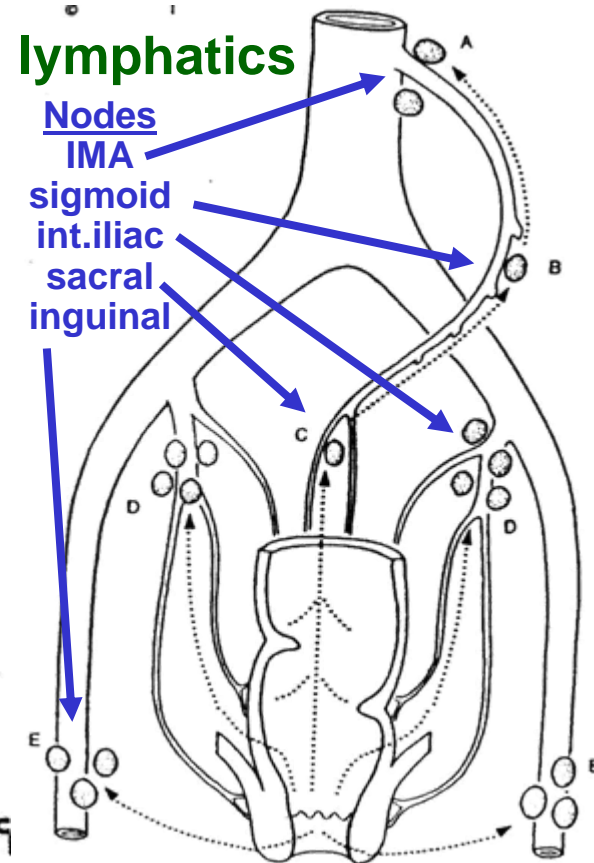
arteries



veins



lymphatics



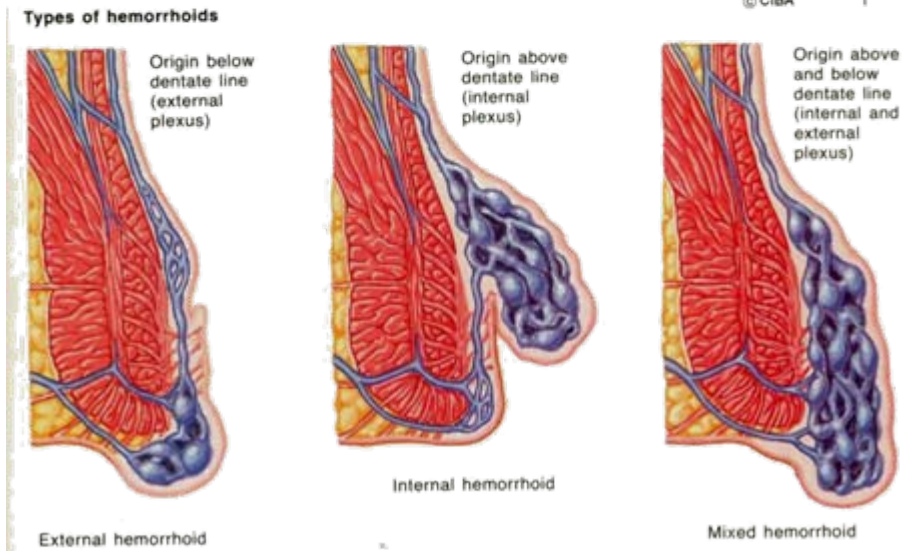
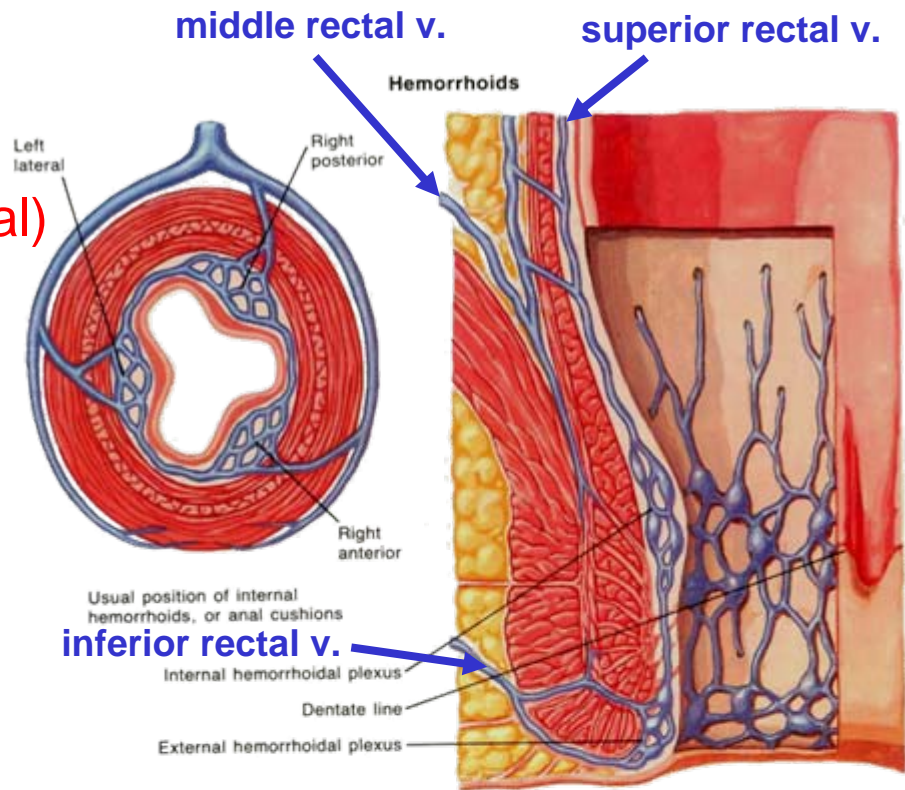
Nodes
IMA
sigmoid
int.iliac
sacral
inguinal

(anatomists:rectal = surgeons:hemorrhoidal)

Hemorrhoids

(anatomists:rectal=surgeons:hemorrhoidal)

- **Anal cushions:** 3 consistently placed submucosal vascular plexuses formed by anastomosis of rectal veins within anal columns
- Anal cushions are normal—their varicosity and prolapse is not
- **Internal hemorrhoids**
 - Above dentate line
 - Generally painless
- **External hemorrhoids**
 - Below dentate line
 - Generally painful



From Fry & Kodner (1985) CIBA

Nerve Supply to the Anorectal Region

(anatomists:rectal=surgeons:hemorrhoidal)

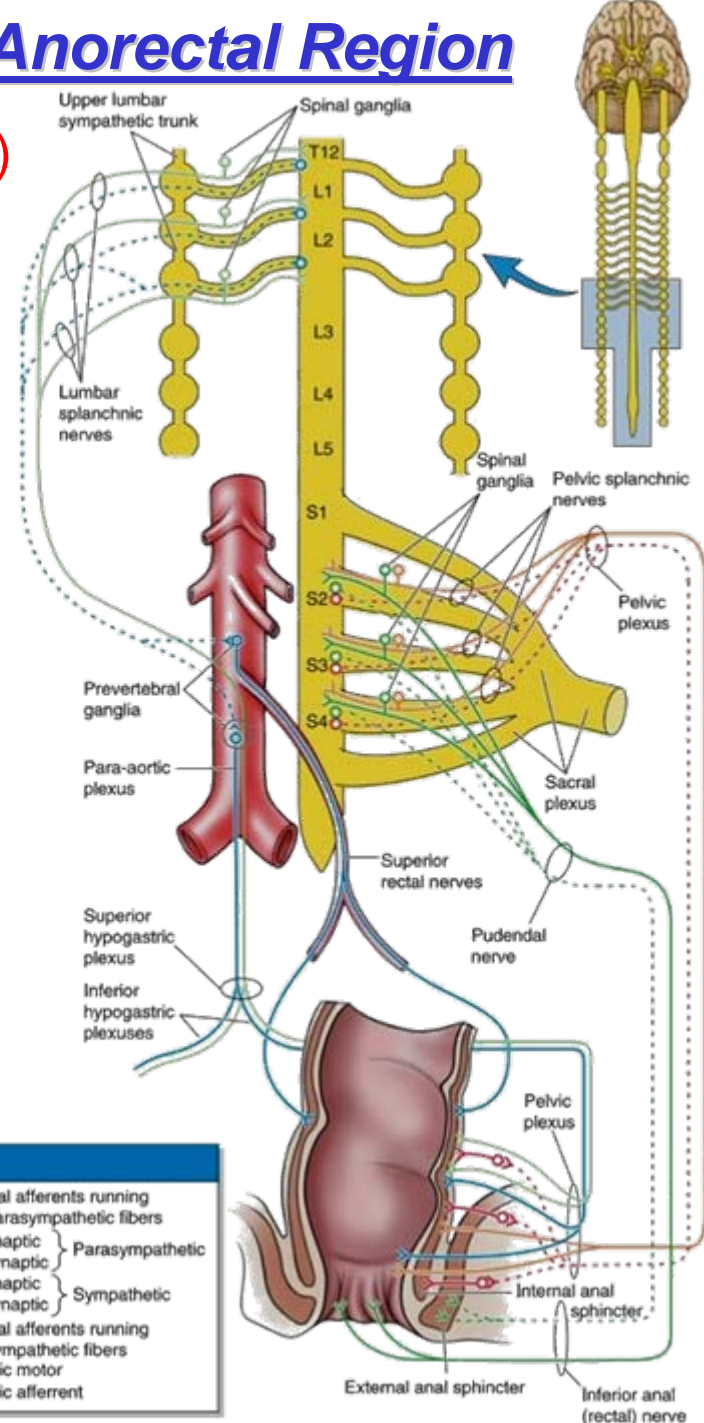
Somatic innervation

- **Pudendal nerve** (S2–S4)
 - **Inferior rectal n.:** sensory & motor to muscles & mucosa below dentate line
 - **Perineal n.:** sensory & motor to perineal region

Autonomic innervation

- Sympathetics from thoraco-lumbar segments via **sup. hypogastric plexus** & **hypogastric nn.**
- Parasympathetics from S2–S4 (**nervi erigentes**)
- Unite in **inf. hypogastric plexus**
- Distributed to pelvic viscera & sexual organs

From Moore & Dalley (2006)



Nerve Supply to the Anorectal Region

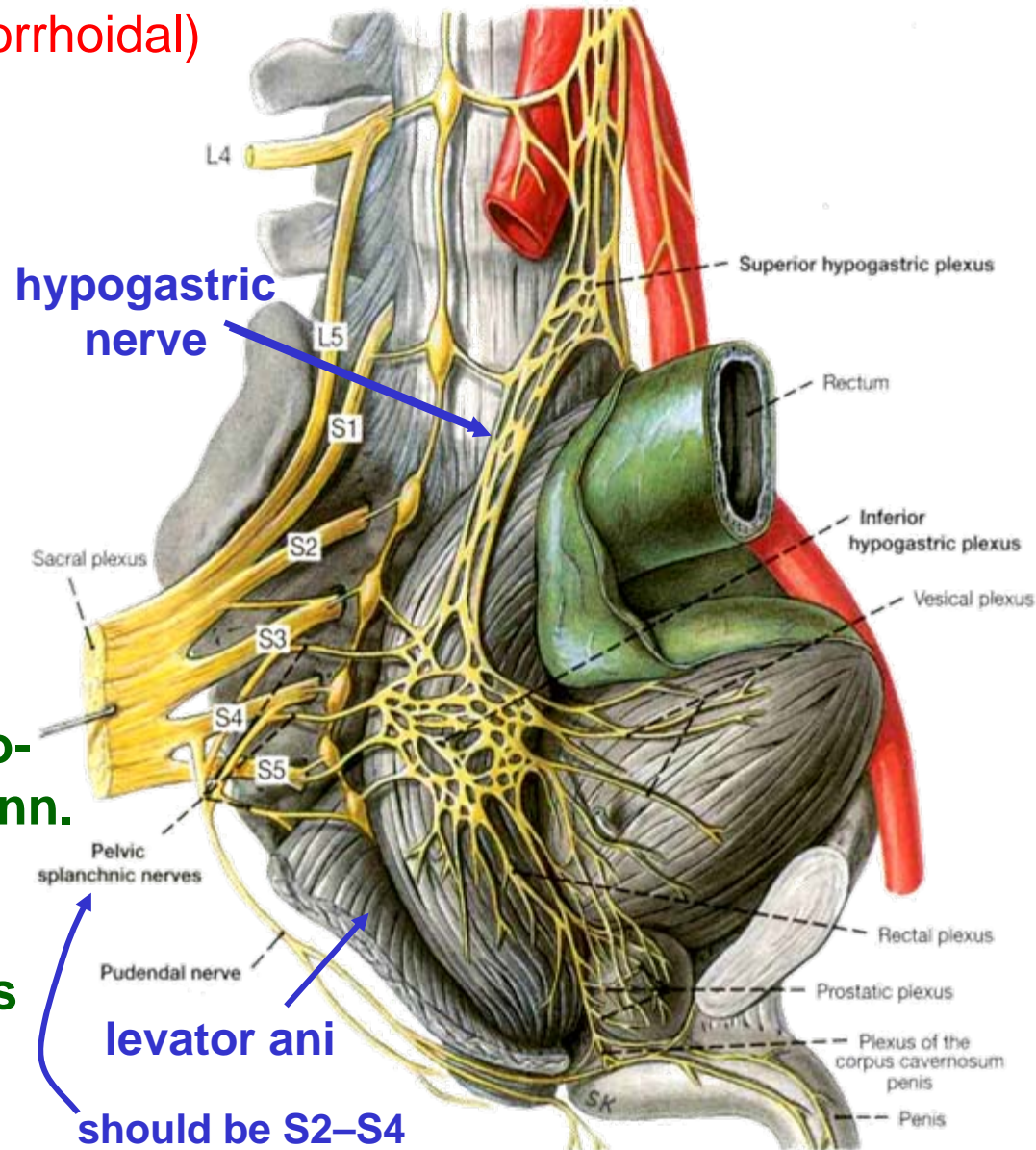
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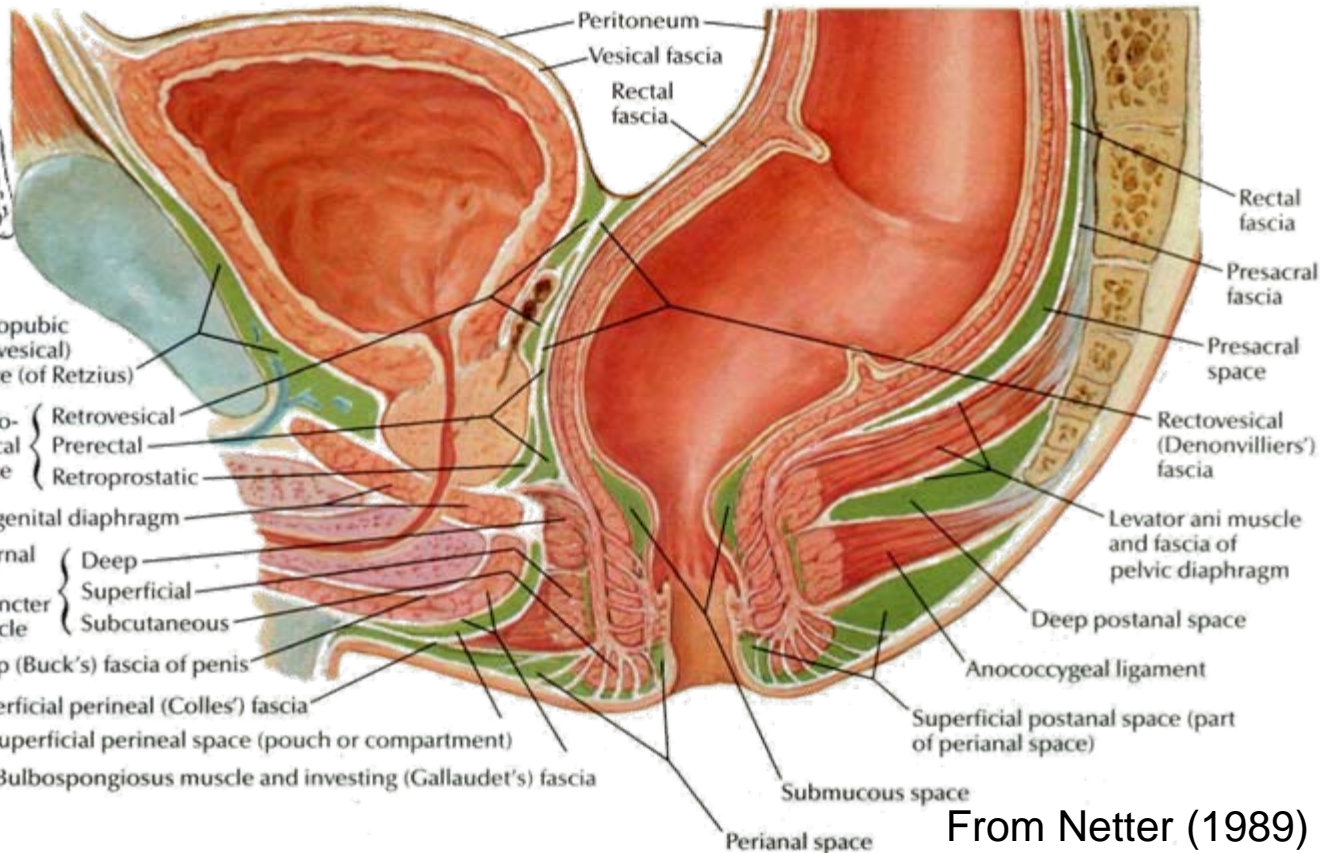
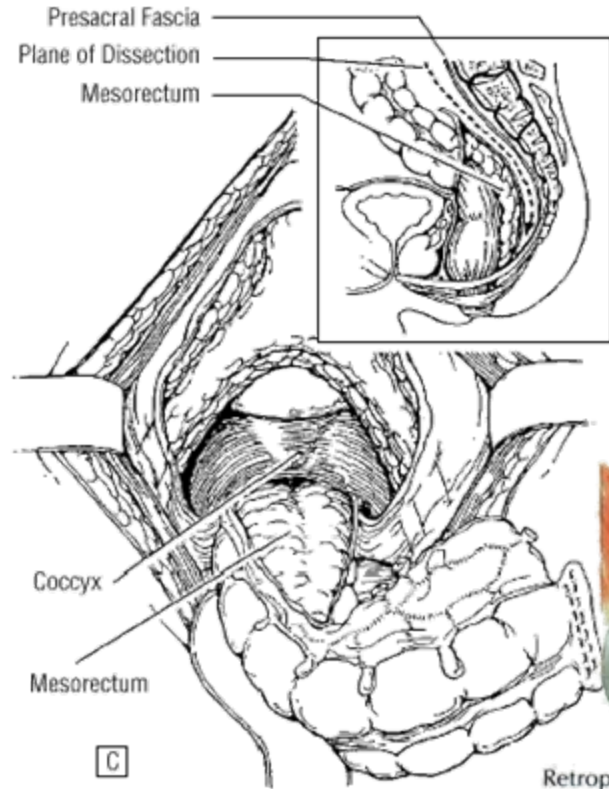


From Clemente (1997)

Planes, Fasciae, and Spaces

Fasciae:

- Presacral (Waldeyer's) fascia
- Rectovesical (-vaginal; Denonvillier's) fascia: middle rectal vessels
- Lateral ligg. (stalks): acc. middle rectal vessels
- Rectal fascia proper: rectum & mesorectum



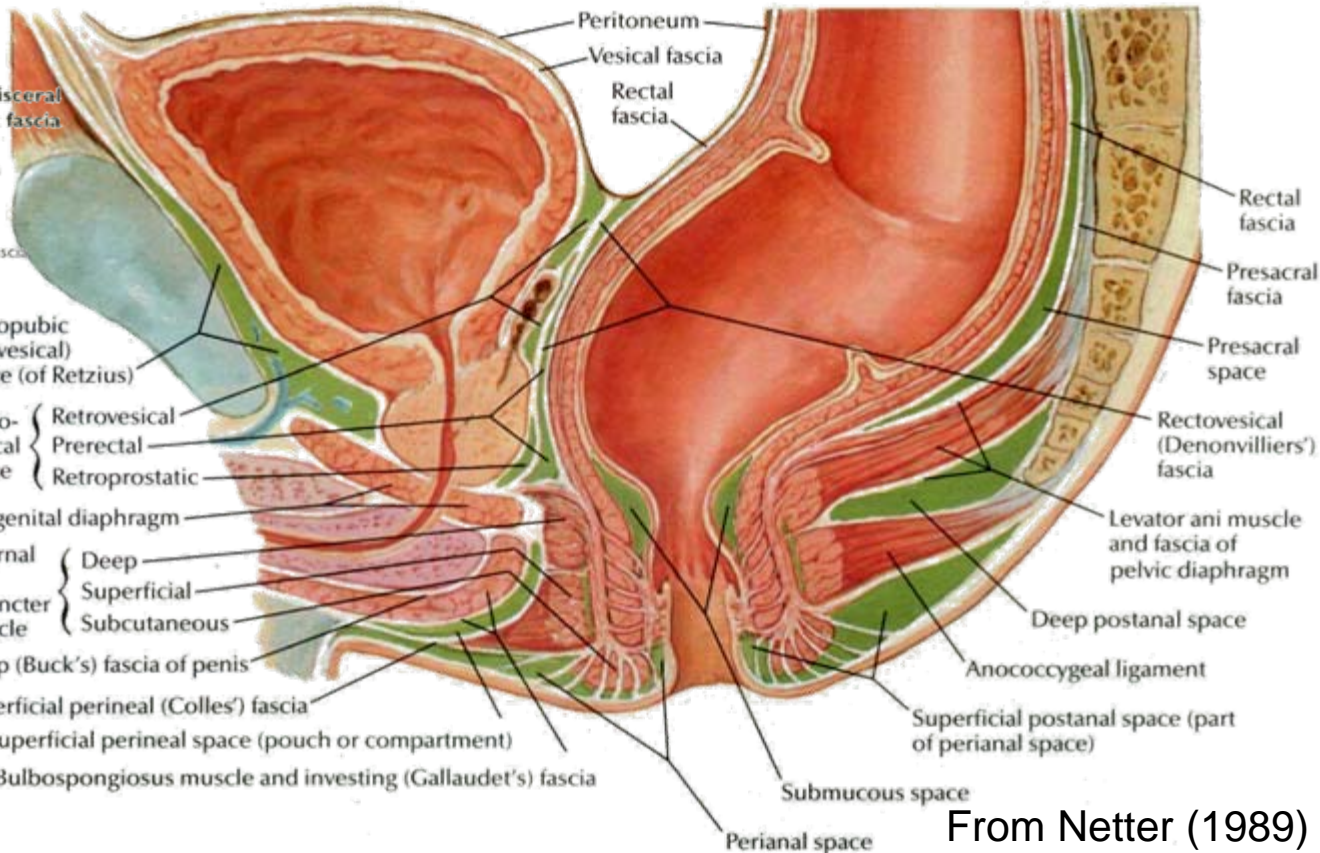
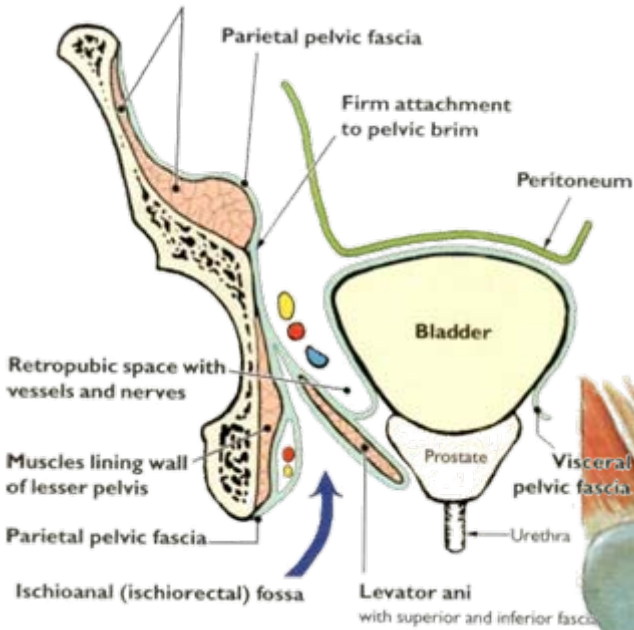
From Read & Kodner
(1999) *Arch. Surg.*

From Netter (1989)

Planes, Fasciae, and Spaces

Spaces:

- Perianal space
- Intersphincteric space
- Ischioanal space
- Deep postanal space
- Suprlevator space
- Presacral space
- Submucous space
- Rectovesical space

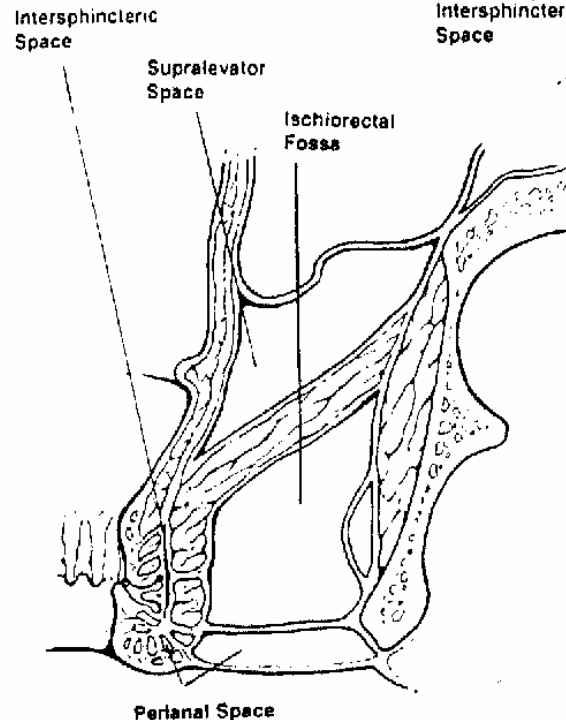
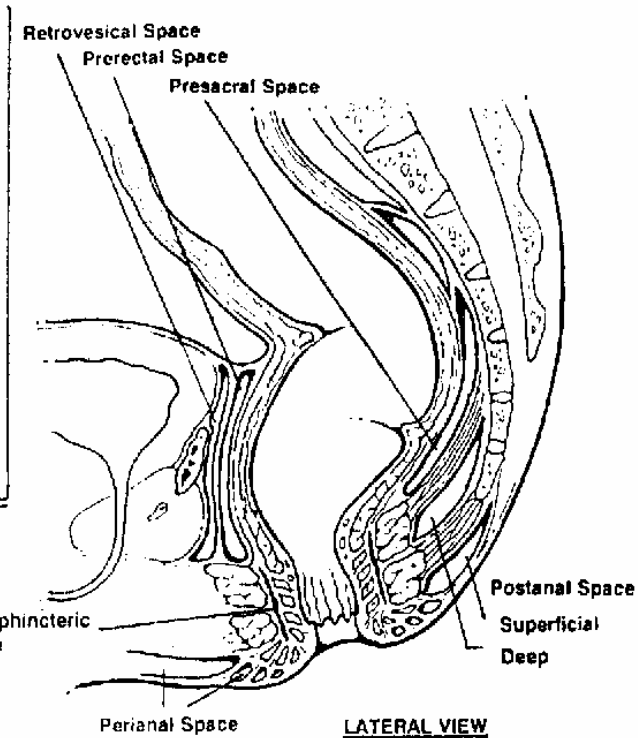
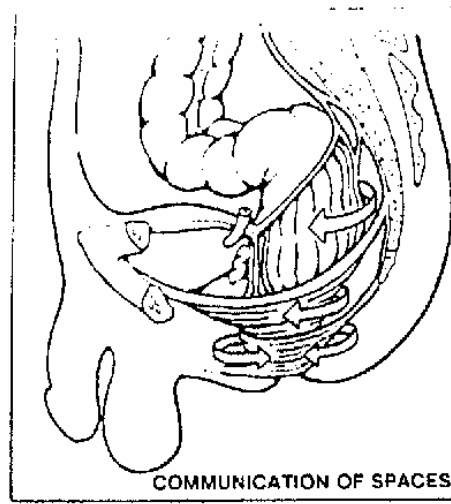


From Sauerland (1999)

From Netter (1989)

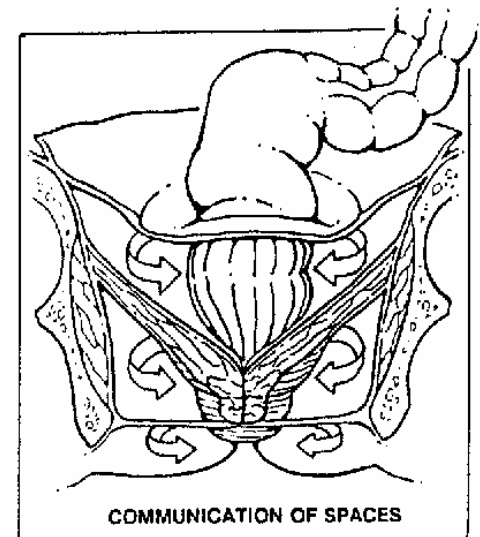
Communication of Spaces

- Perianal space: around anus below transverse septum
- Ischiorectal space: posteriorly around anorectal region via deep postanal space
- Supralelevator space: posteriorly around rectum via pre-sacral space



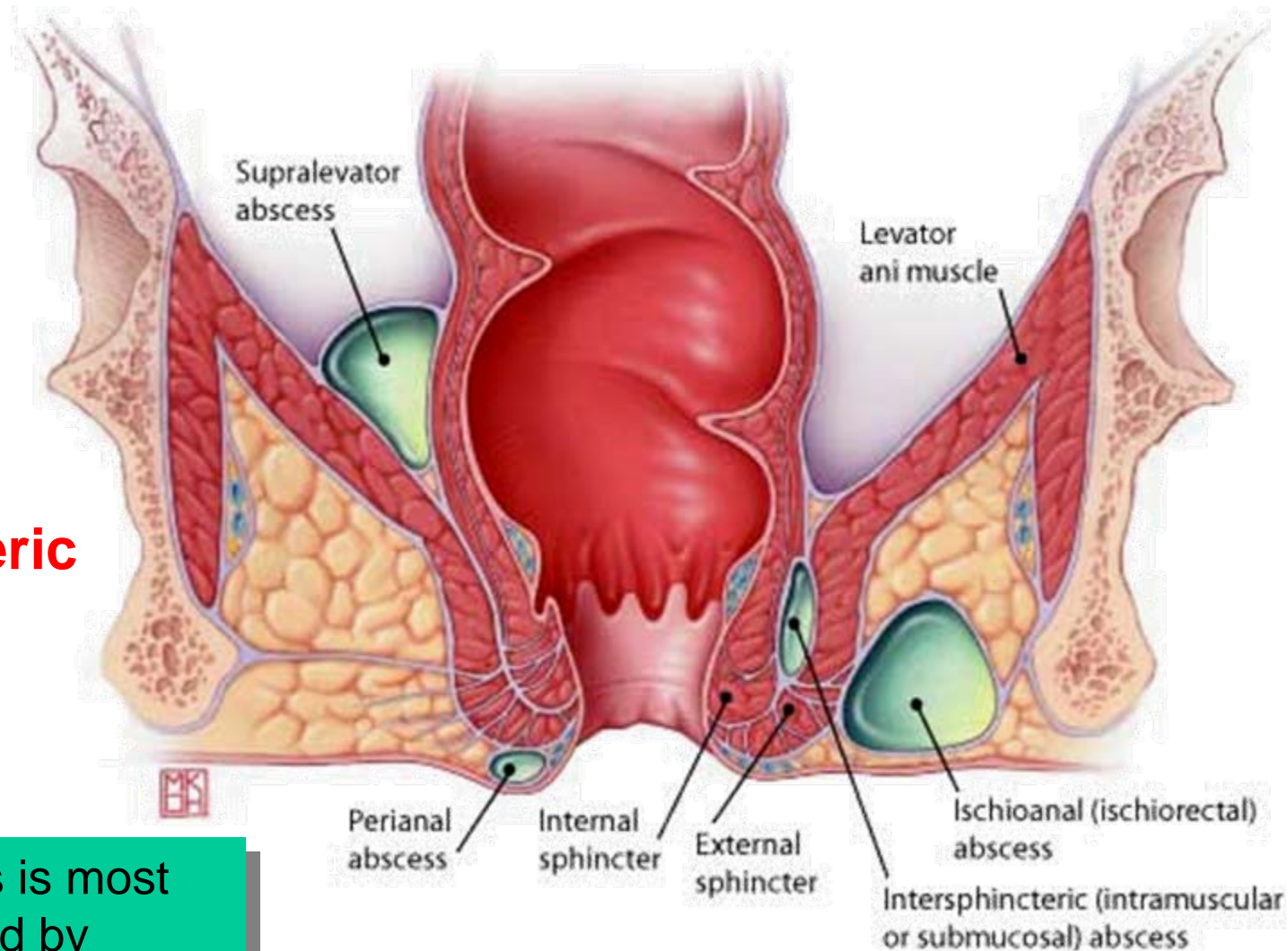
Perianal Space

ANTERIOR VIEW



Sites of Anorectal Abscess

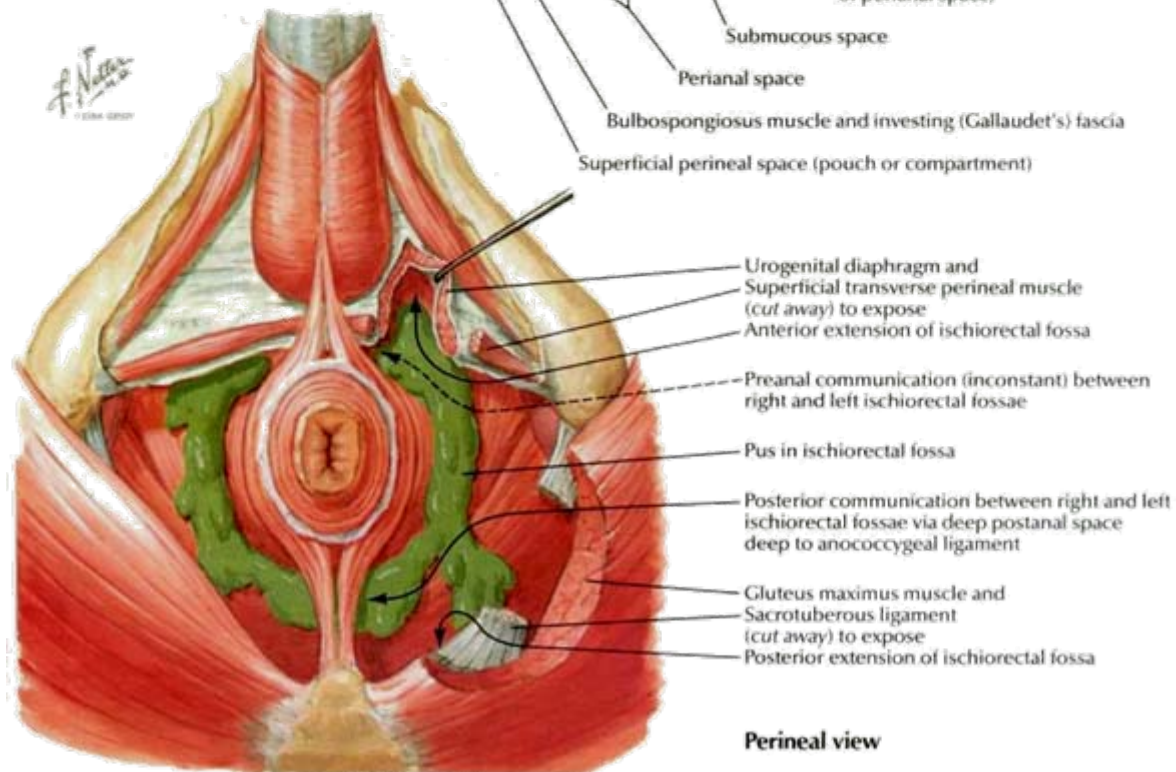
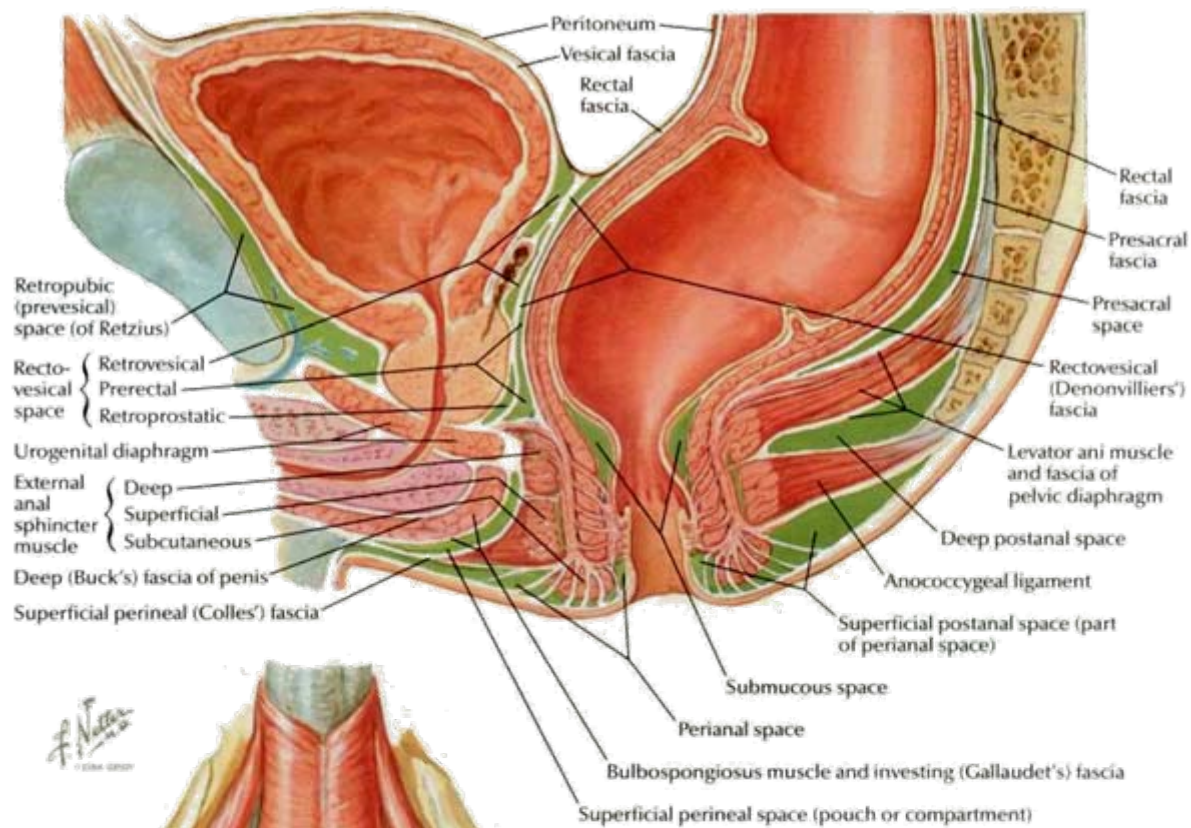
- **supralelevator**
- **ischiorectal**
- **intersphincteric**
- **perianal**



Perianal abscess is most common, followed by ischioanal, intersphincteric, & supralelevator abscesses

From Pfenninger & Zainea (2001)

Ischiorectal Abscess

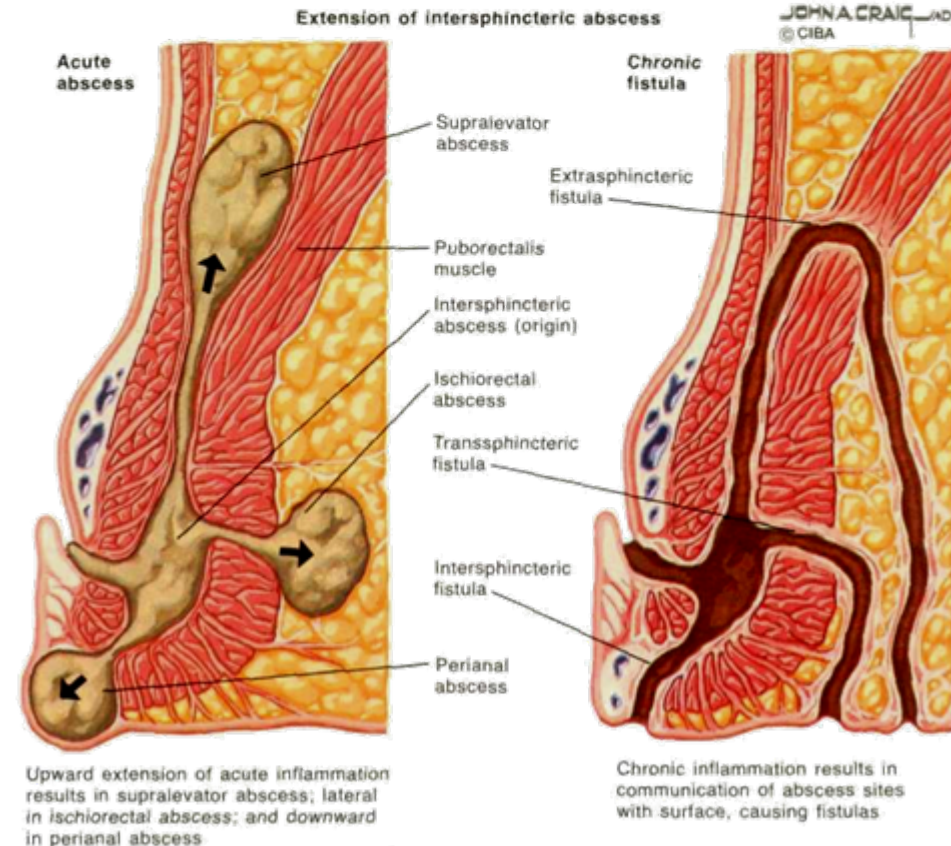
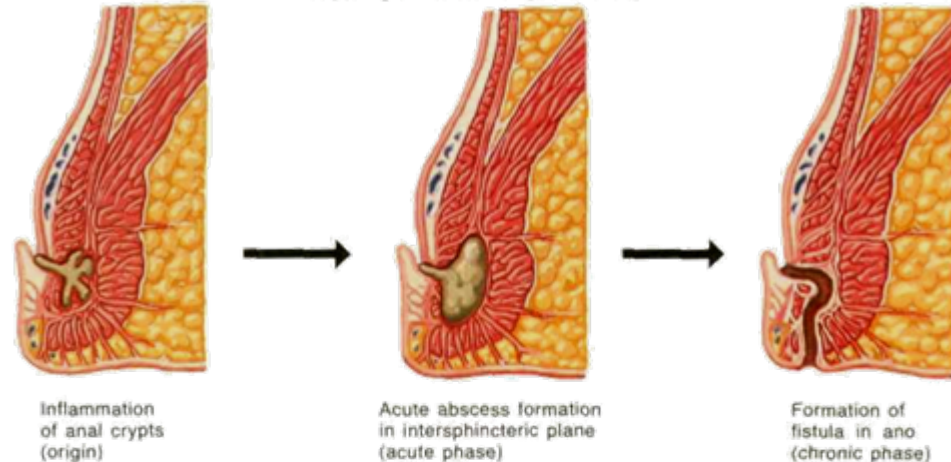


Contralateral communication via deep postanal space

Abscess & Fistula

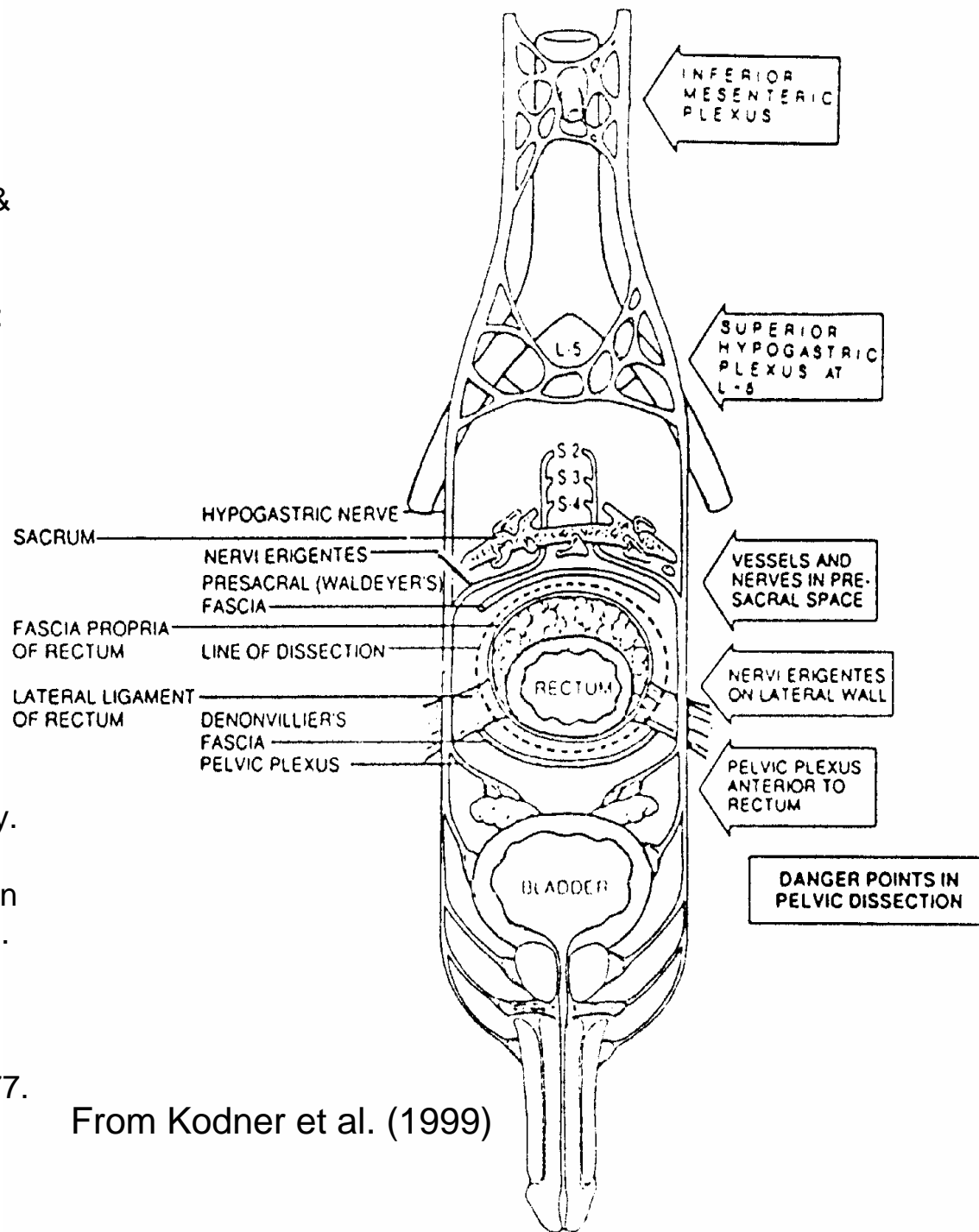
- 95% results from a cryptoglandular source
- Originate as intersphincteric abscess
- Can spread to other spaces
- Abscess in acute phase, fistula in chronic phase
- Fistula in ano: fistula with external opening in perianal skin & internal opening at dentate line

Anorectal Abscess and Fistula in Ano
Cryptoglandular Origin Theory



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From Kodner et al. (1999)