

Small Bowel Imaging

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Conflict of Interest Disclosures

- Research support from Abbvie
- Consultancy fees from Abbvie
- Education support from Takeda

WE'LL DO AN MRI TO
BE SURE, BUT I'M FAIRLY
CERTAIN IT'S A SWANNOMA



CanMEDS Roles Covered

X	Medical Expert (as <i>Medical Experts</i> , physicians integrate all of the CanMEDS Roles, applying medical knowledge, clinical skills, and professional values in their provision of high-quality and safe patient-centered care. <i>Medical Expert</i> is the central physician Role in the CanMEDS Framework and defines the physician's clinical scope of practice.)
X	Communicator (as <i>Communicators</i> , physicians form relationships with patients and their families that facilitate the gathering and sharing of essential information for effective health care.)
X	Collaborator (as <i>Collaborators</i> , physicians work effectively with other health care professionals to provide safe, high-quality, patient-centred care.)
X	Leader (as <i>Leaders</i> , physicians engage with others to contribute to a vision of a high-quality health care system and take responsibility for the delivery of excellent patient care through their activities as clinicians, administrators, scholars, or teachers.)
	Health Advocate (as <i>Health Advocates</i> , physicians contribute their expertise and influence as they work with communities or patient populations to improve health. They work with those they serve to determine and understand needs, speak on behalf of others when required, and support the mobilization of resources to effect change.)
X	Scholar (as <i>Scholars</i> , physicians demonstrate a lifelong commitment to excellence in practice through continuous learning and by teaching others, evaluating evidence, and contributing to scholarship.)
X	Professional (as <i>Professionals</i> , physicians are committed to the health and well-being of individual patients and society through ethical practice, high personal standards of behaviour, accountability to the profession and society, physician-led regulation, and maintenance of personal health.)

Objectives

At the end of this session participants will be able to:

- Recognize the utility of radiologic imaging in evaluating the small bowel
- Appreciate differences in the investigation of small bowel diseases based on regional variation, availability of technology, and pediatric consideration

Case 1



- 16 year old girl
- **Abdominal pain x 4 weeks, 8-10/10**
 - Not sleeping, not going to school
- Intermittent vomiting
- **↓4kg**
- BM 2-3/day, no blood, no tenesmus, no urgency
- No EIM, travel, or sick contacts
- Looks unwell
- Abdomen diffusely tender

Investigations



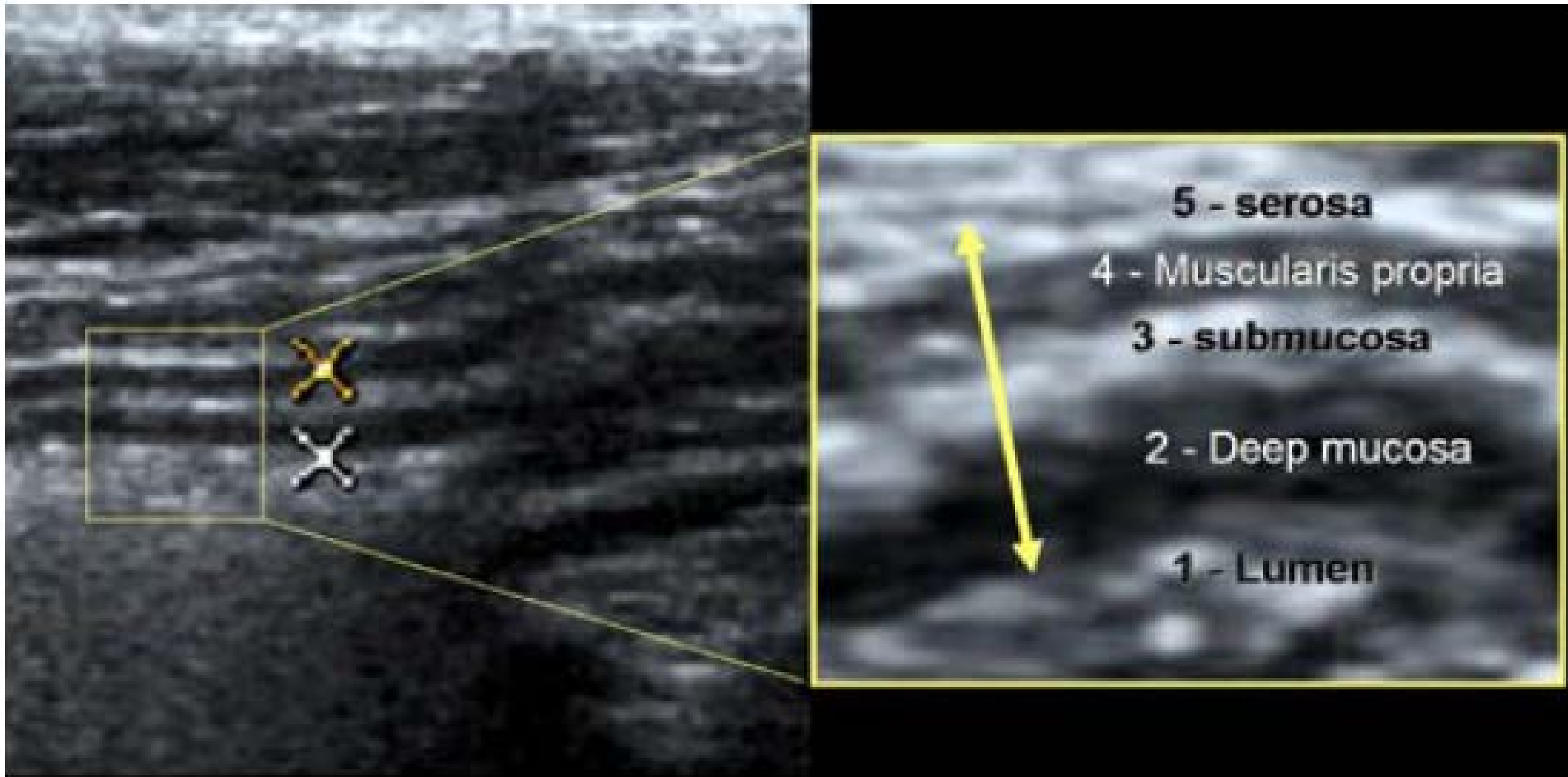
- HGB 124, MCV 75.3, WBC 12.7
- **CRP 4, ESR 35**
- **Alb 30**

- US done in ER

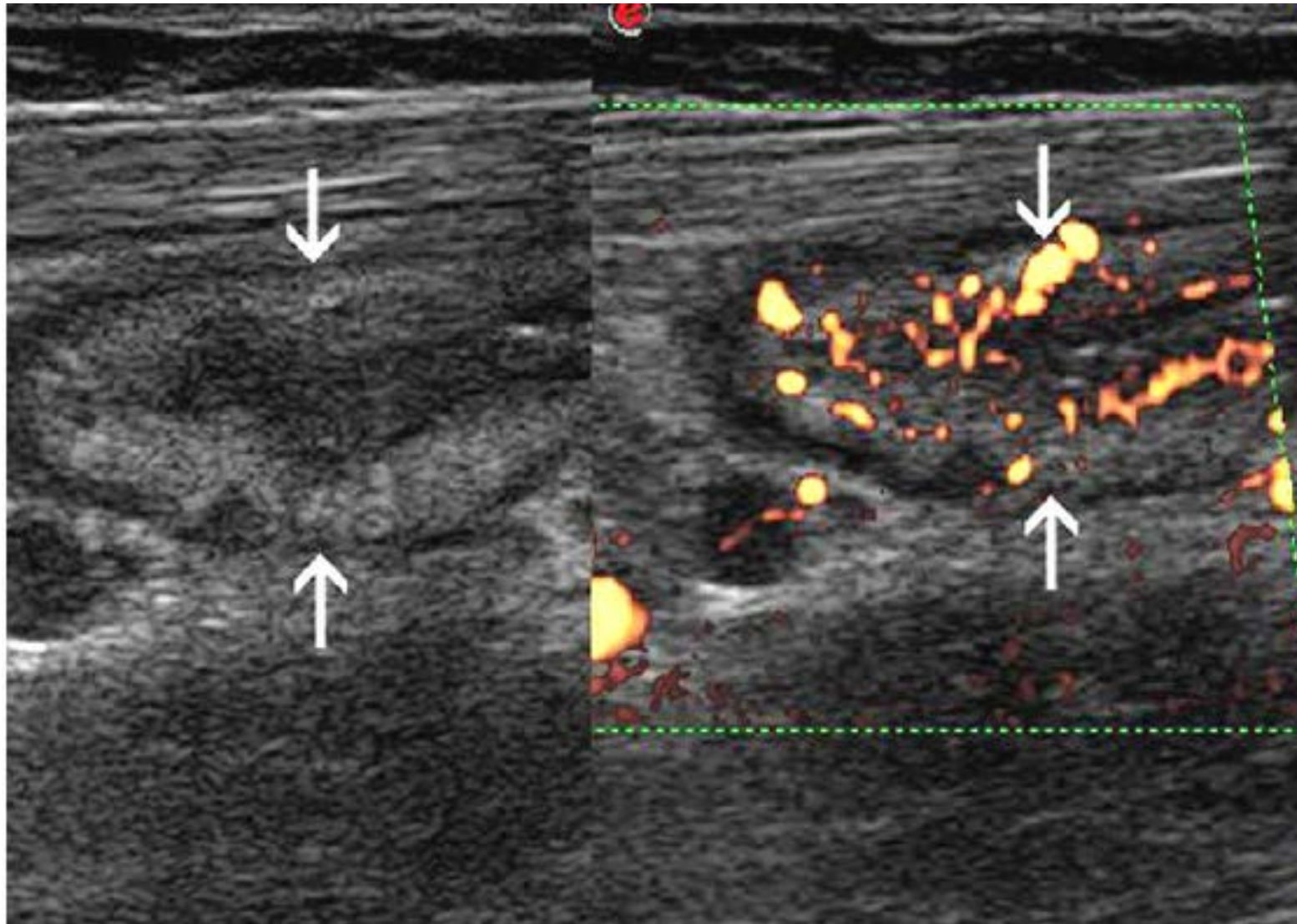
US findings present in Crohn's disease

- Wall thickness
- Loss of wall stratification
- Bowel wall blood flow

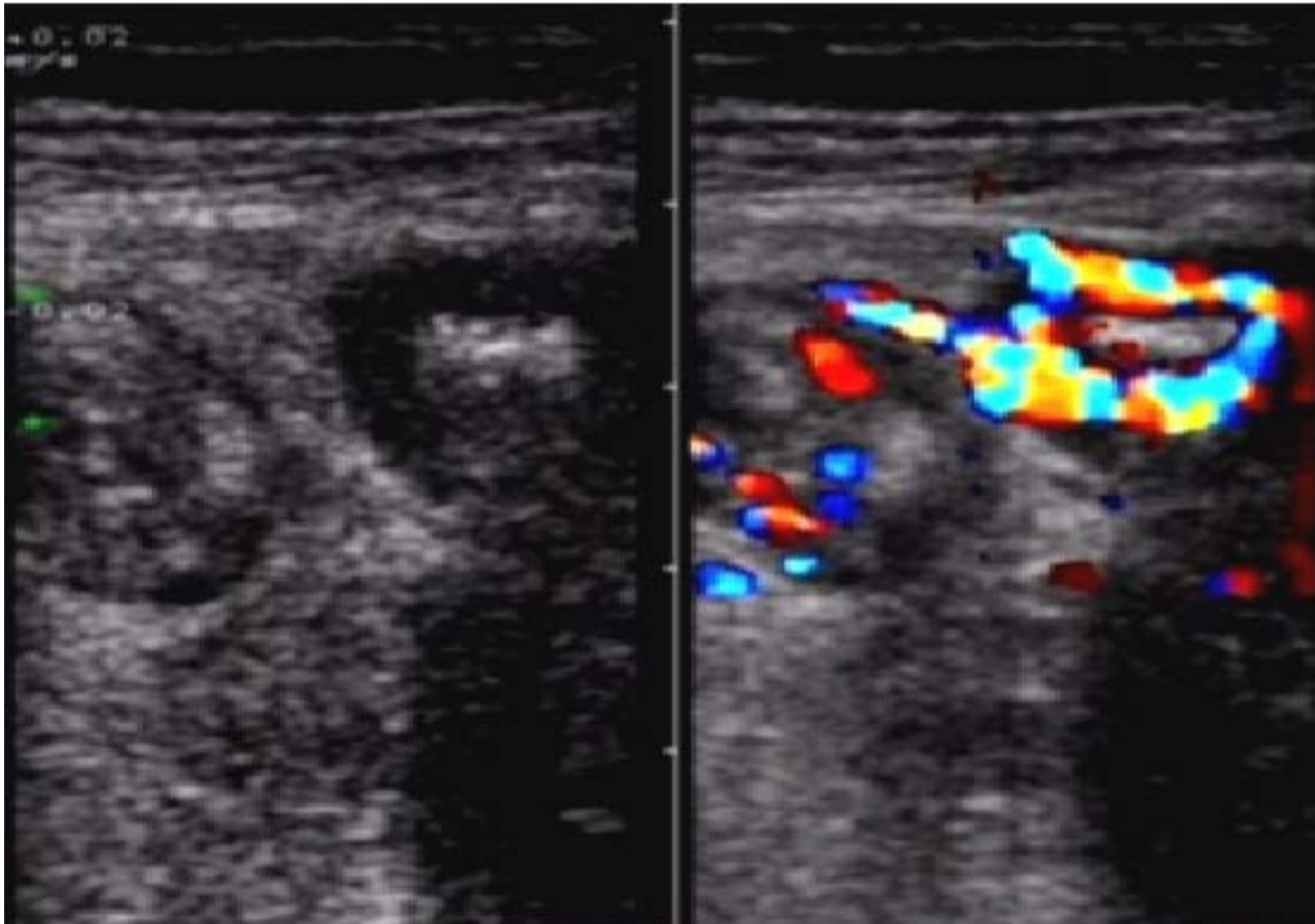
- Complications
 - Abscess
 - Stricture



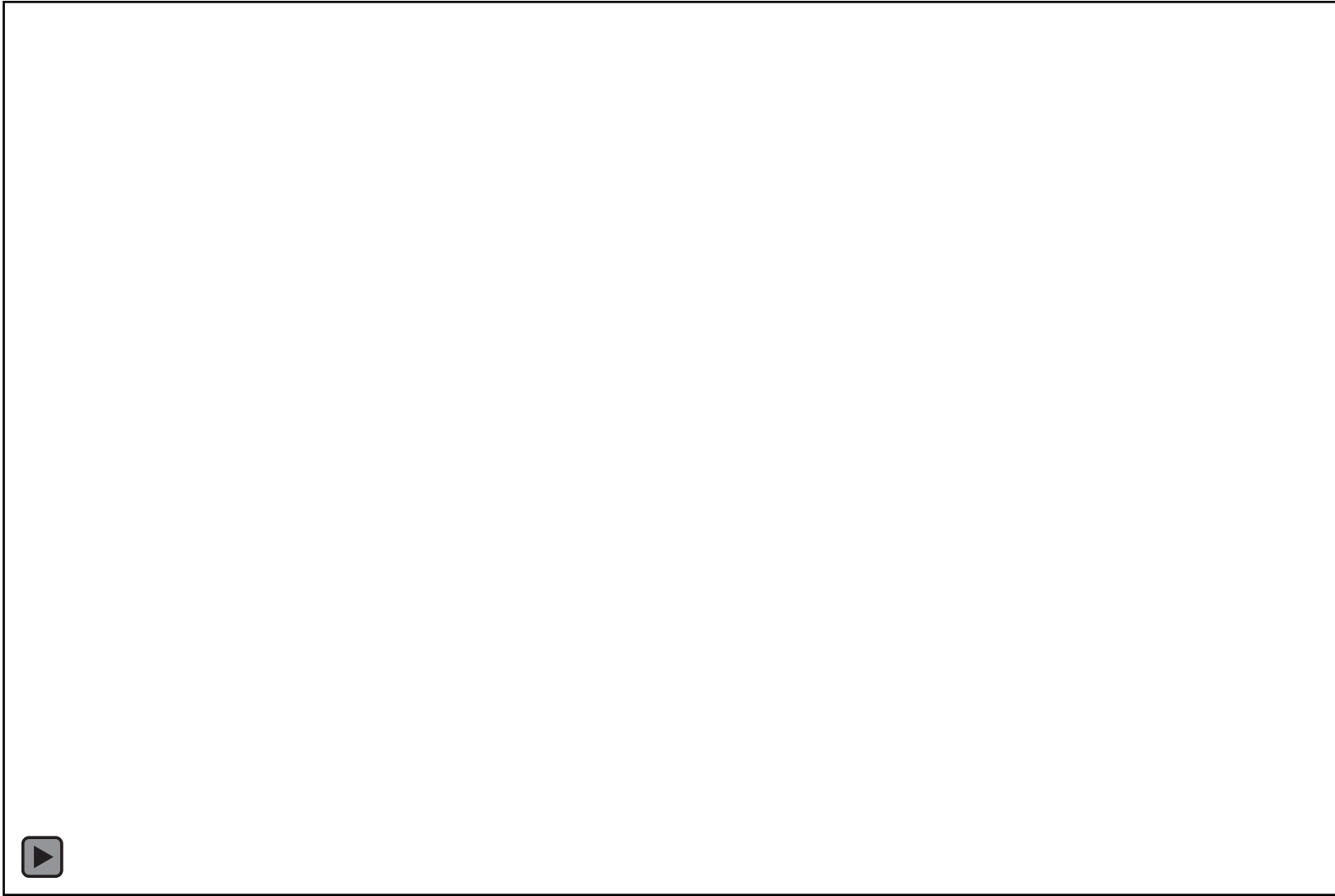
Wall thickening, increased vascularity



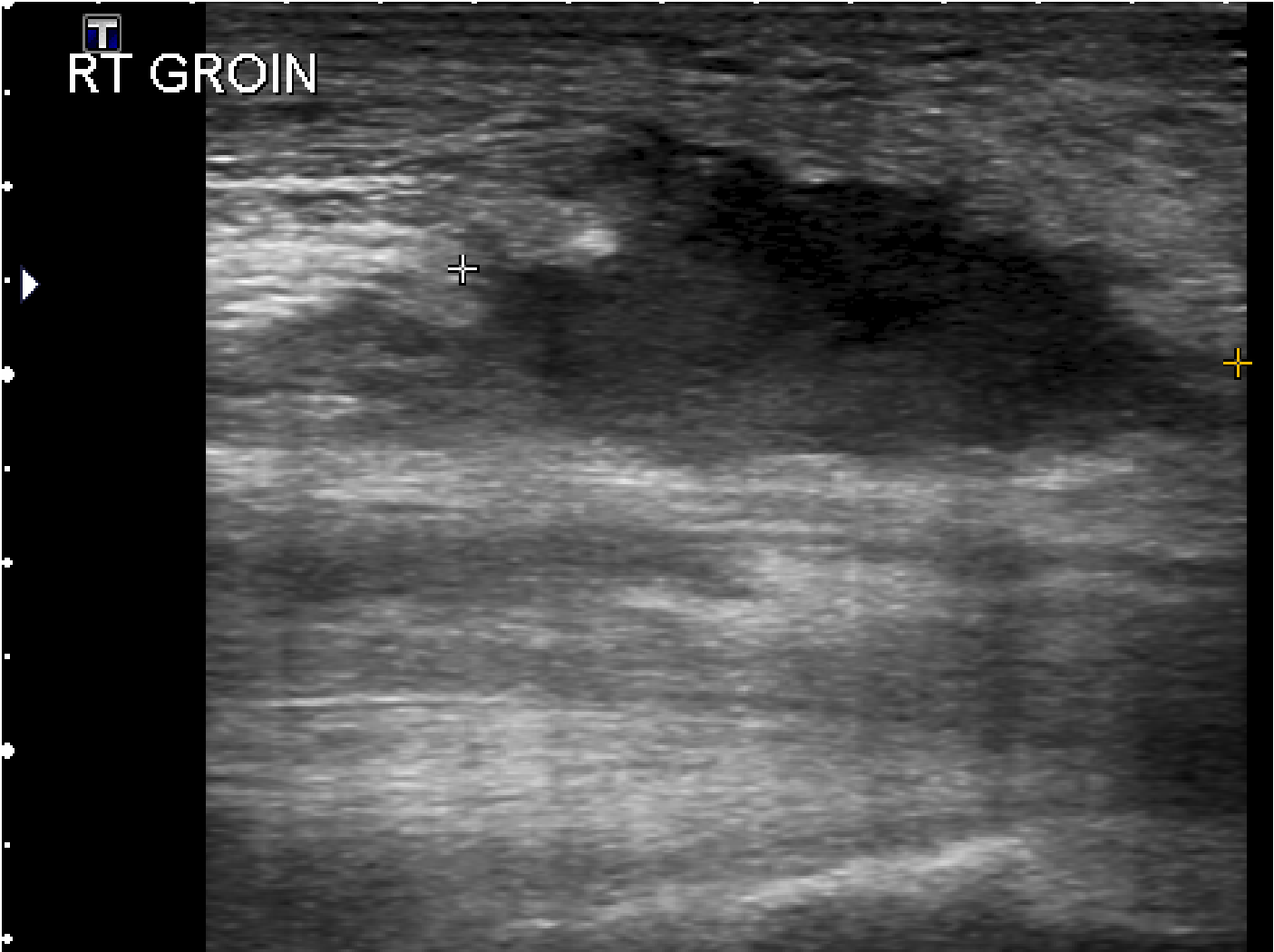
Loss of stratification, increased vascularity



Stricture



Abscess



Courtesy of Dr. Mary-Louise Greer

Back to the case...



- US
 - RLQ small bowel (?TI) thickened (9mm) and hyperemic
 - LLQ bowel (?sigmoid) thickened and hyperemic

Imaging study	Sensitivity diagnosing IBD	Specificity diagnosing IBD
SBFT	45%-76% ^[8-10]	67%-100% ^[8-10]
CTE	84% ^[23]	95% ^[23]
MRE	93% ^[23]	93% ^[23]
Ultrasound	90% ^[23]	96% ^[23]

*
*
*

US limitations

- Operator dependent
- Patient size
- Localization
- Length of disease
- Bowel gas

Admitted and scoped



- Severe gastritis
- Normal TI and colon
- Biopsies showed chronic inactive gastritis

- High dose PPI
- Discharge home



Prompt return of symptoms

- **Ongoing severe abdo pain**
- Intermittent vomiting
- **↓4kg more!**
- Very little PO intake
- BM 1-2/day, non-bloody
- No EIM
- **HGB 108, MCV 75.5**
- CRP 1.2, **ESR 26**
- **Alb 22**
- Infectious workup negative

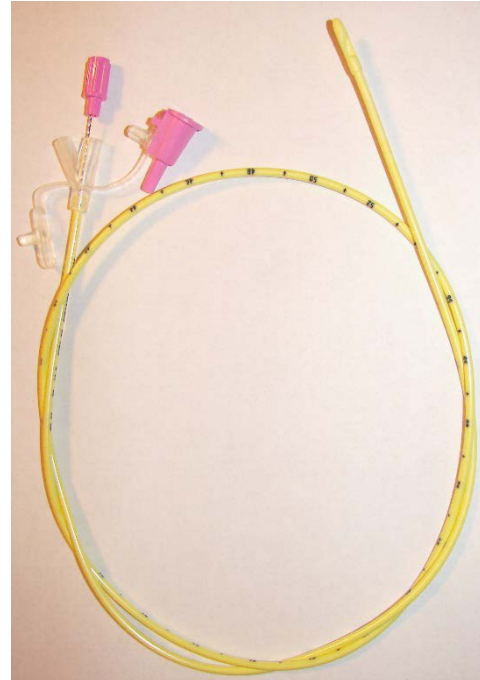
Approach?

- Treat Crohn's disease?
 - Steroids?
 - EEN?

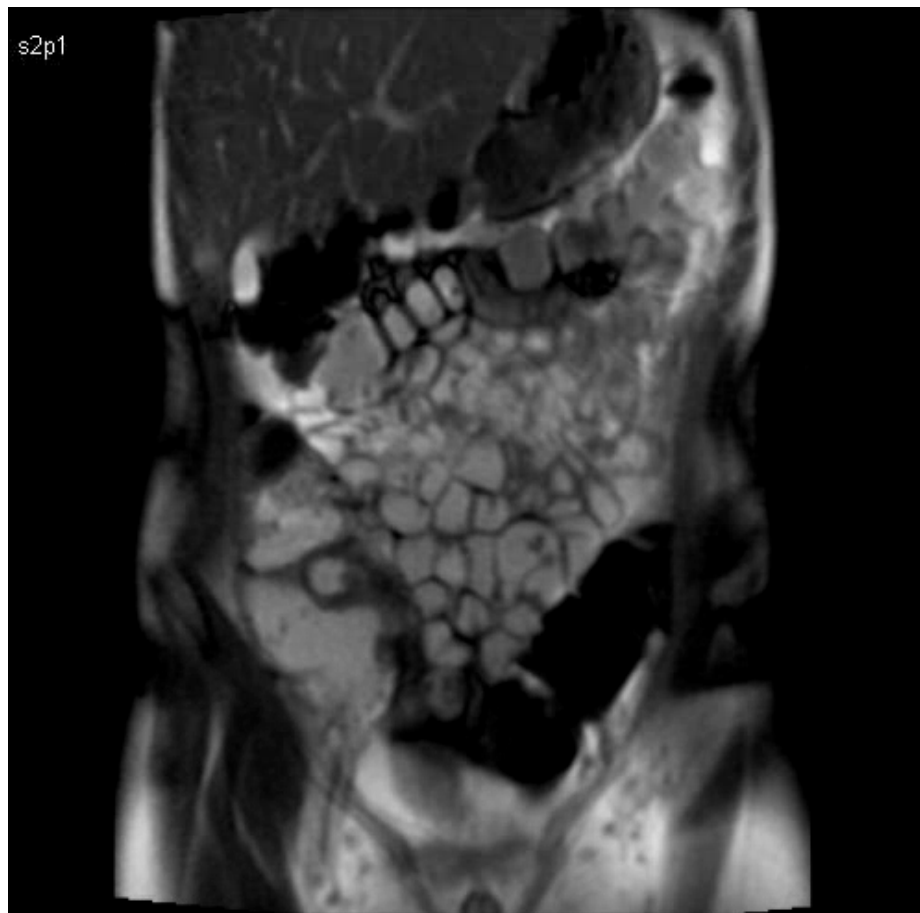
- More investigations?
 - MRE?
 - CT?
 - Capsule?
 - Other?

MR Enterography

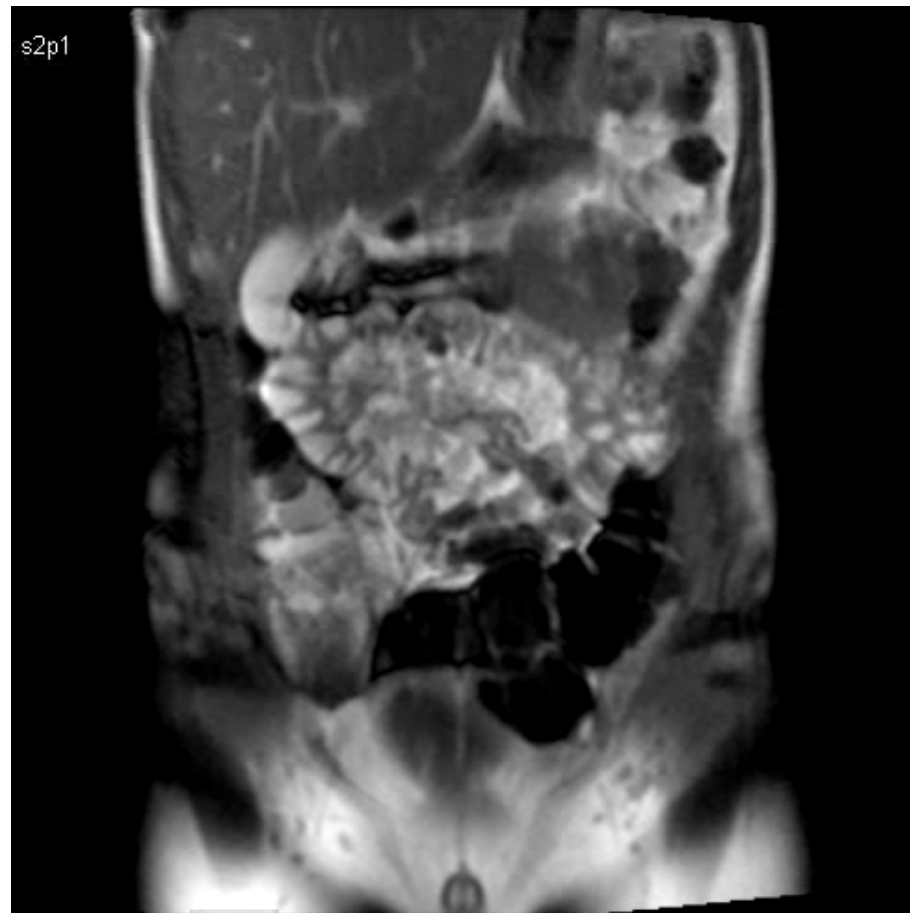
- IV contrast
- Antispasmodic
- Enteral contrast



**CINE TRUEFISP
PRE GLUCAGON**



**CINE TRUEFISP
POST GLUCAGON**



Crohn's Disease Findings

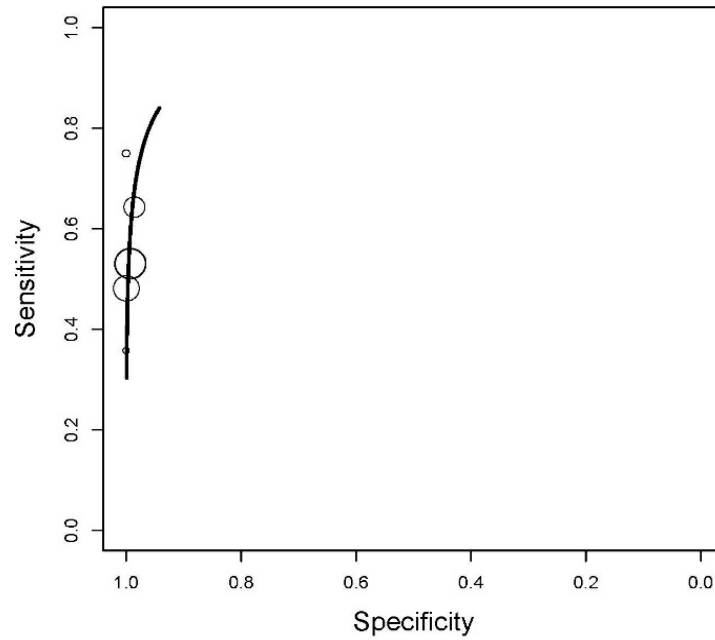
- ~~Superficial ulcerations~~
- Deep ulcerations
- Sinus tracts/fistulae
- Transmural inflammation
- Bowel wall thickening
- Mesenteric inflammation
- Hyperemia
- Stiffening of bowel
- Lymphadenopathy



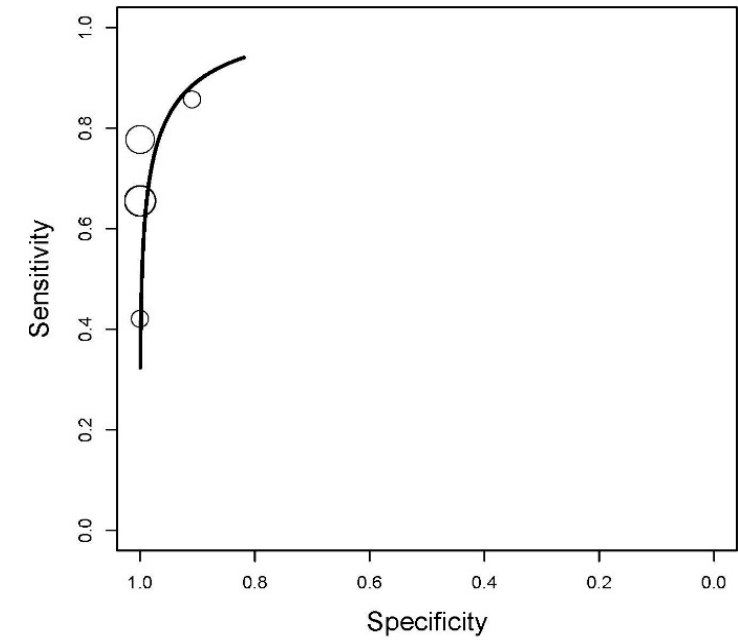
Most accurate signs of inflammation



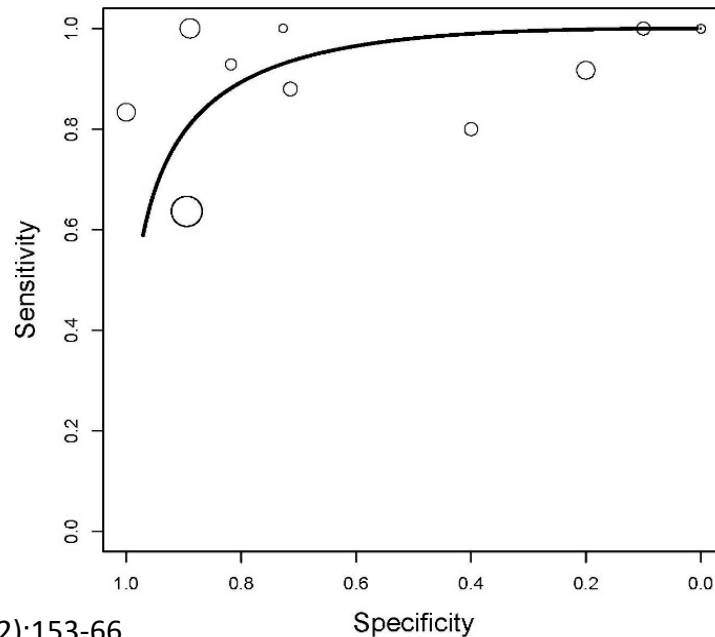
T2 Hyperintensity



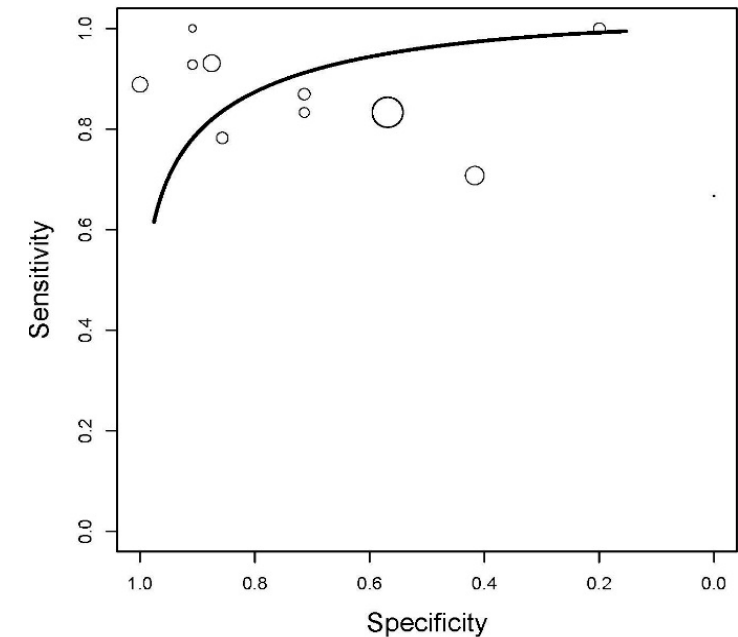
Mucosal Lesions



Wall Thickening

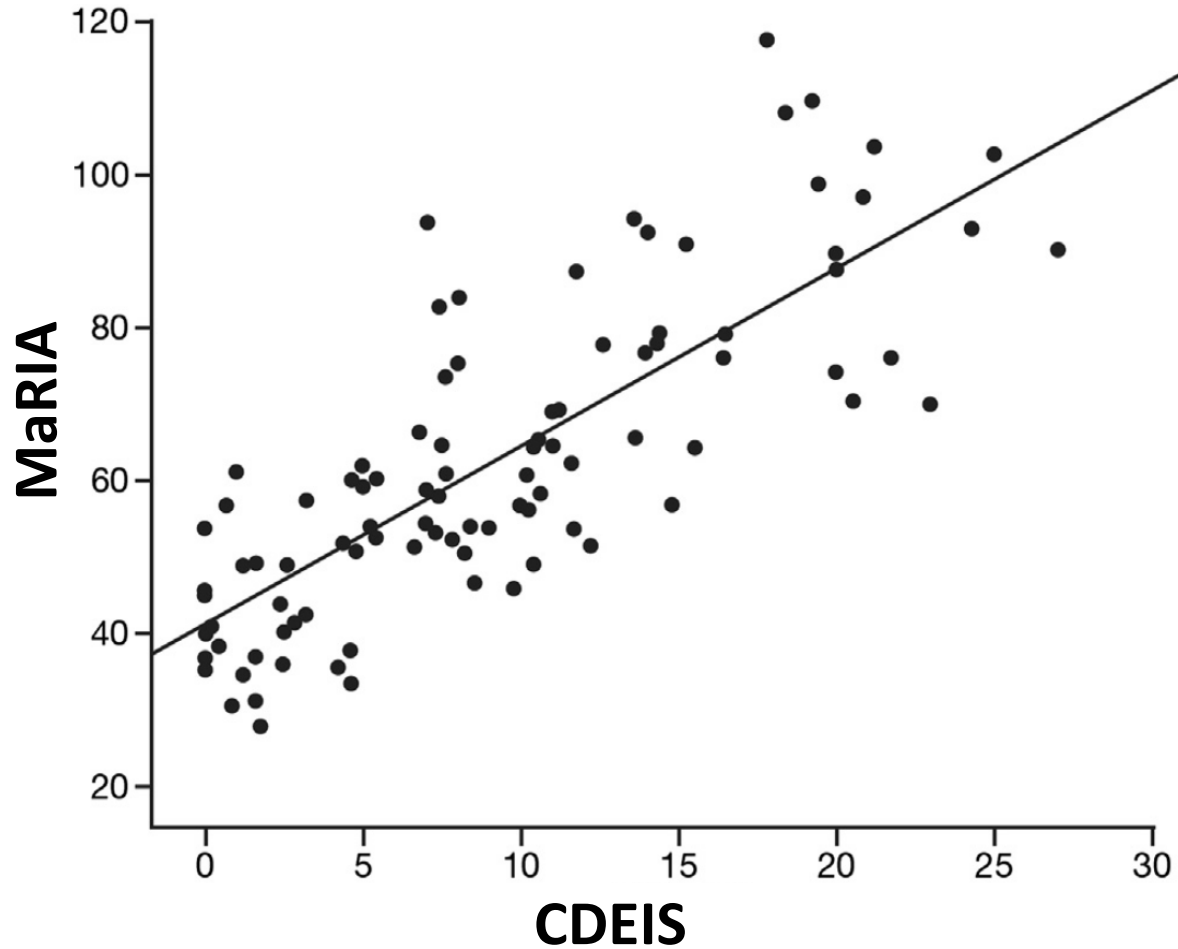


Wall Enhancement



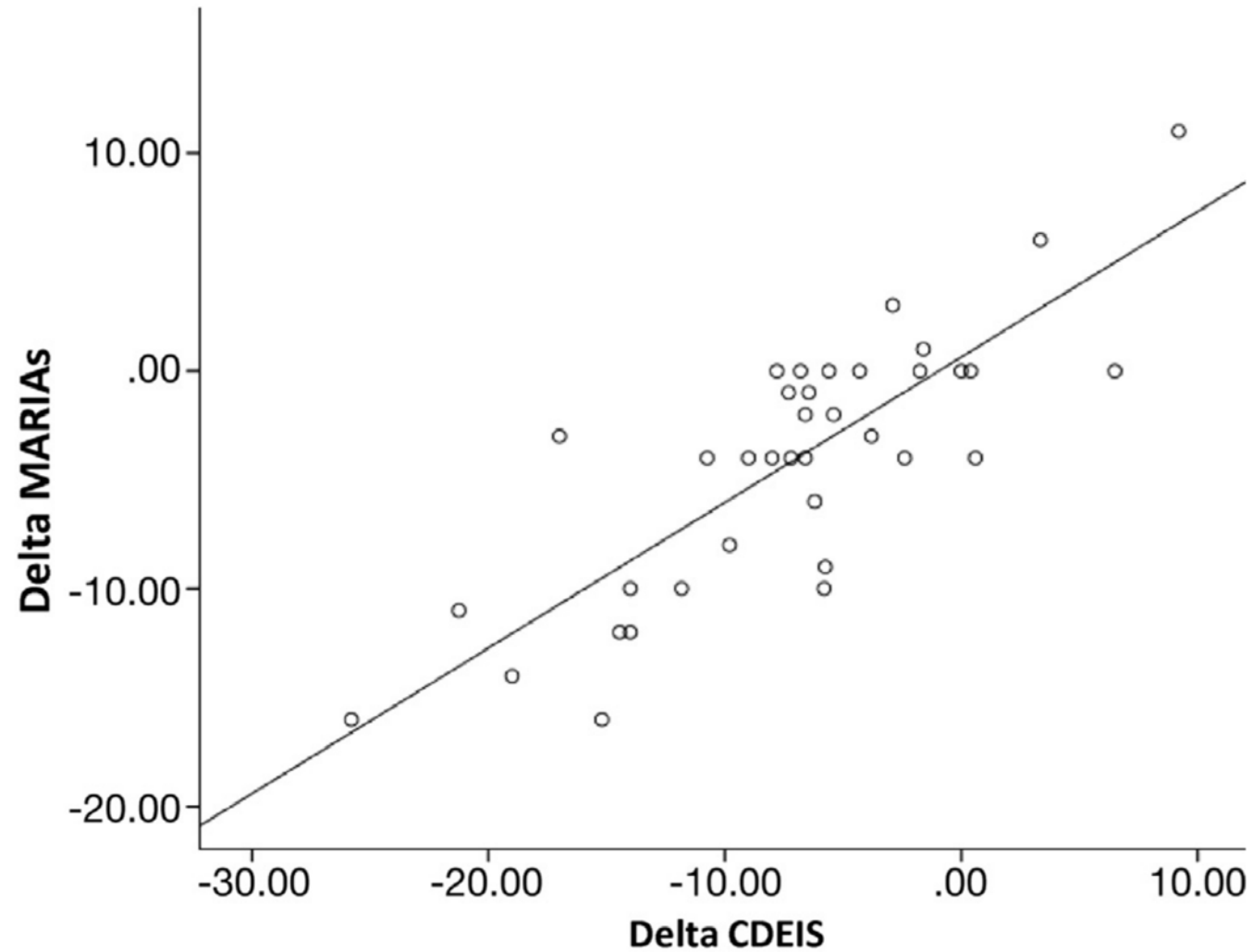
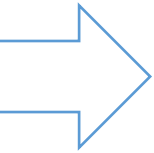
MRE is accurate

wall thickness
wall enhancement
wall edema
ulcers

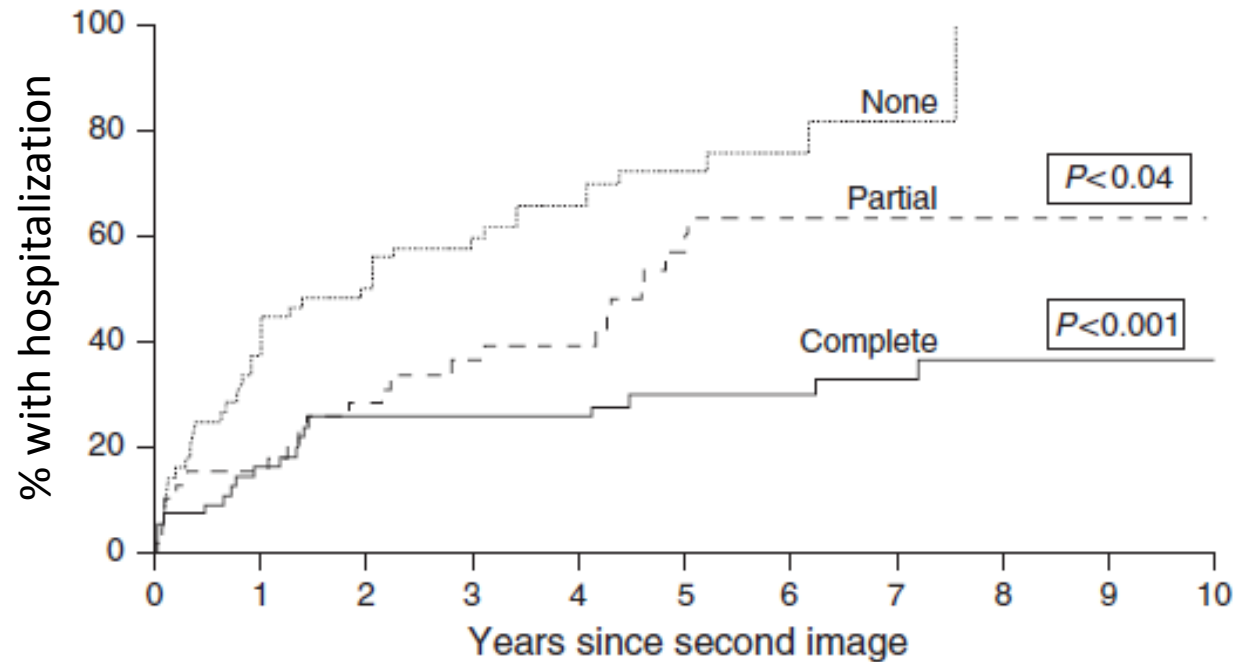
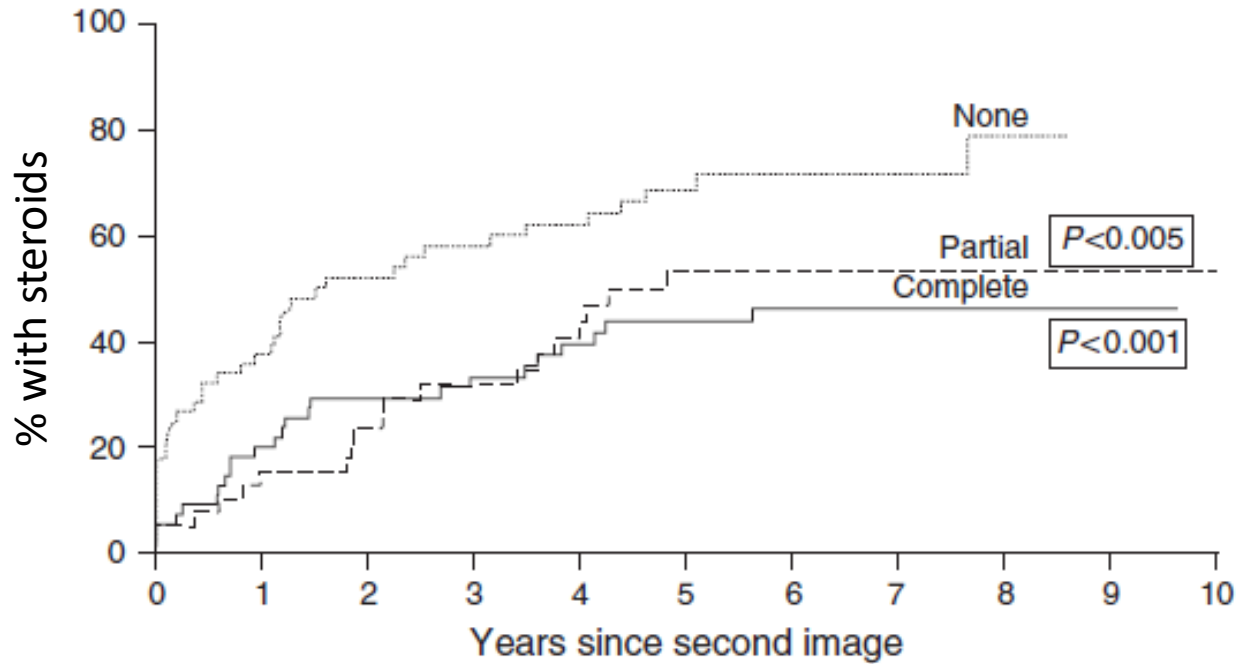
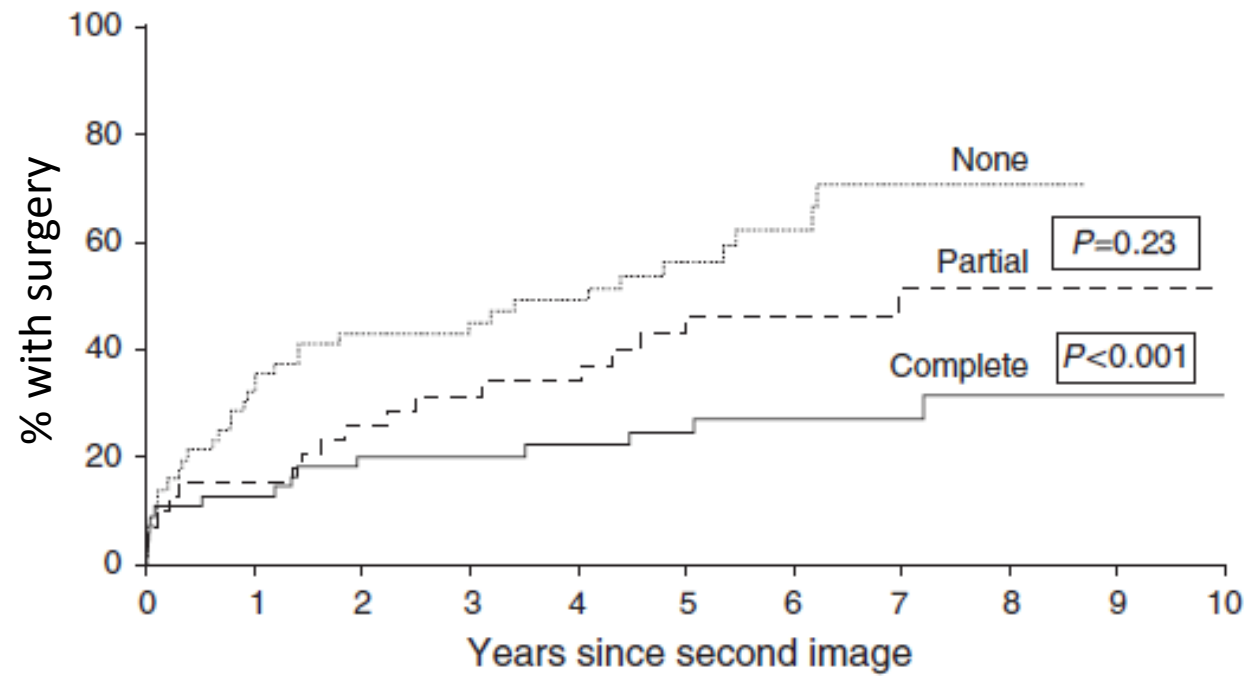


MRE is responsive

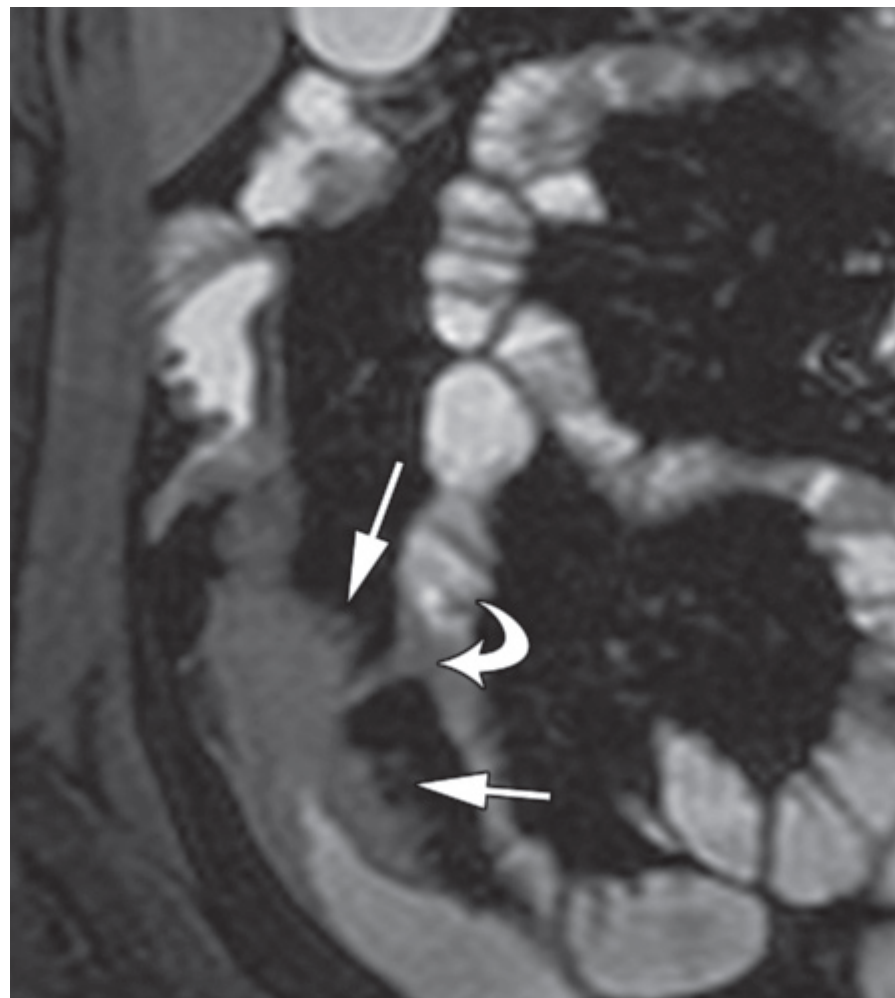
wall thickening
wall edema
fat stranding
ulcers



- Complete healing on imaging predicts best prognosis
- Partial healing on imaging isn't so bad



Fistula

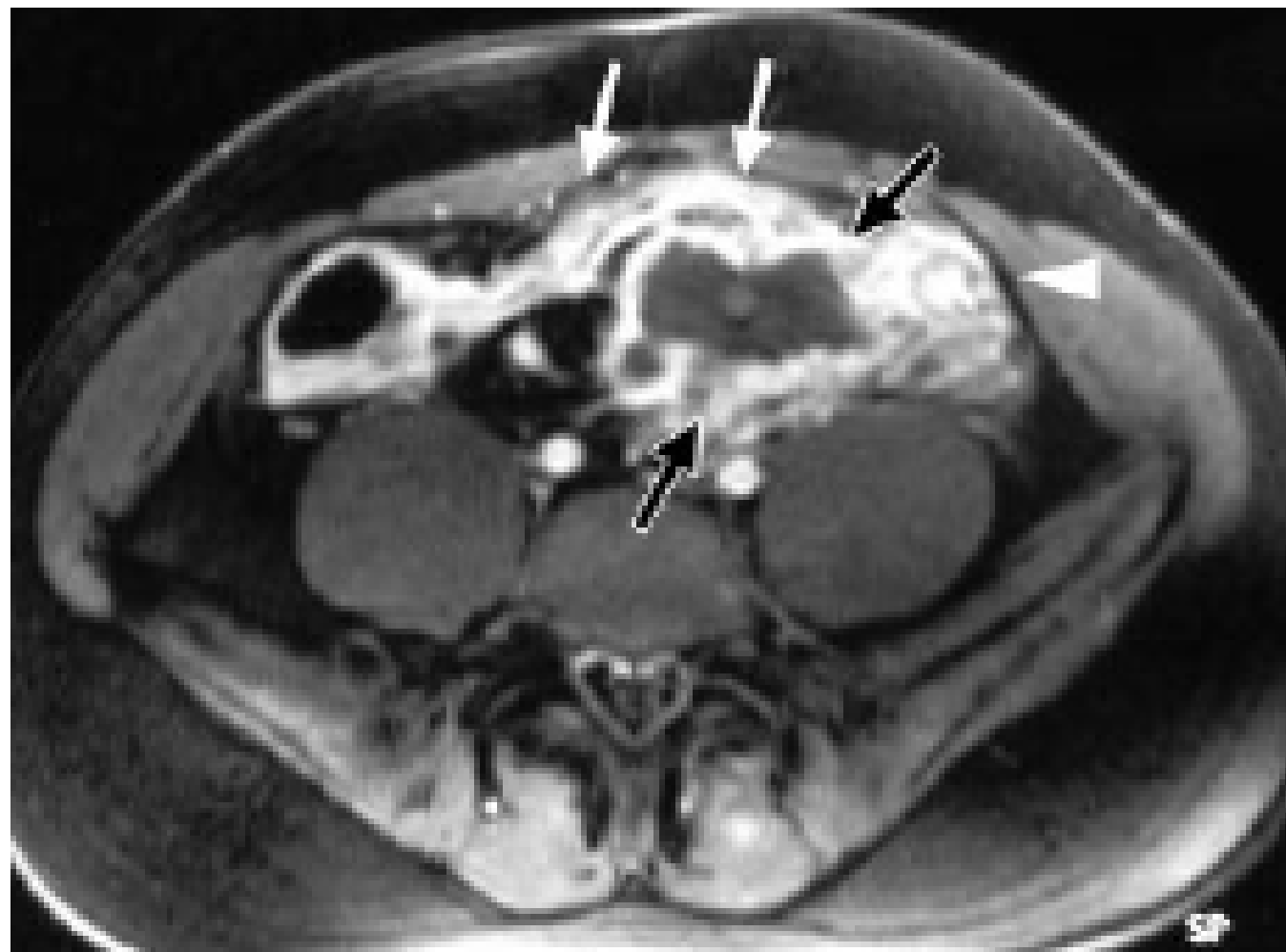


Sinha, R., P. Rajiah, et al. *Radiographics* **29**(6): 1847-1867.



Herrmann, K. A., H. J. Michaely, et al. *Scand J Gastroenterol* **41**(2): 239-241.

Abscess



Stenosis



MR Enterography

Pros

- No ionizing radiation
- Reproducible
- Excellent accuracy
- Extraluminal pathology

MR Enterography

Pros

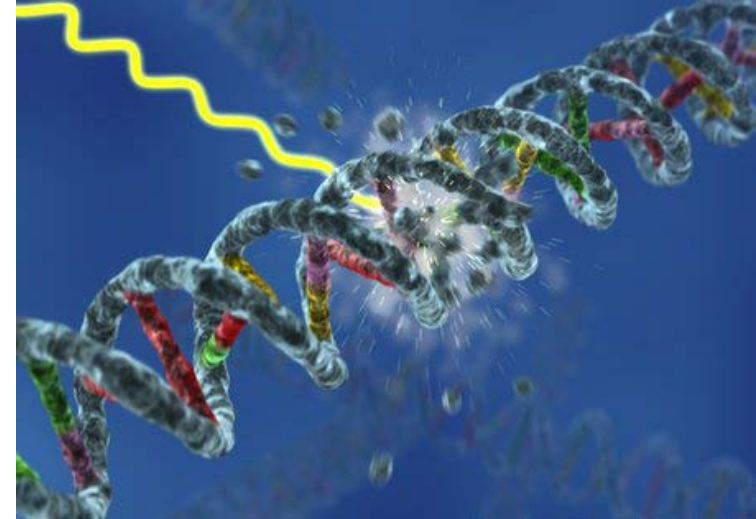
- No ionizing radiation
- Reproducible
- Excellent accuracy
- Extraluminal pathology

Cons

- Slow
- Artifact
- Availability
- Expensive
- Distension of bowel
- Patient cooperation

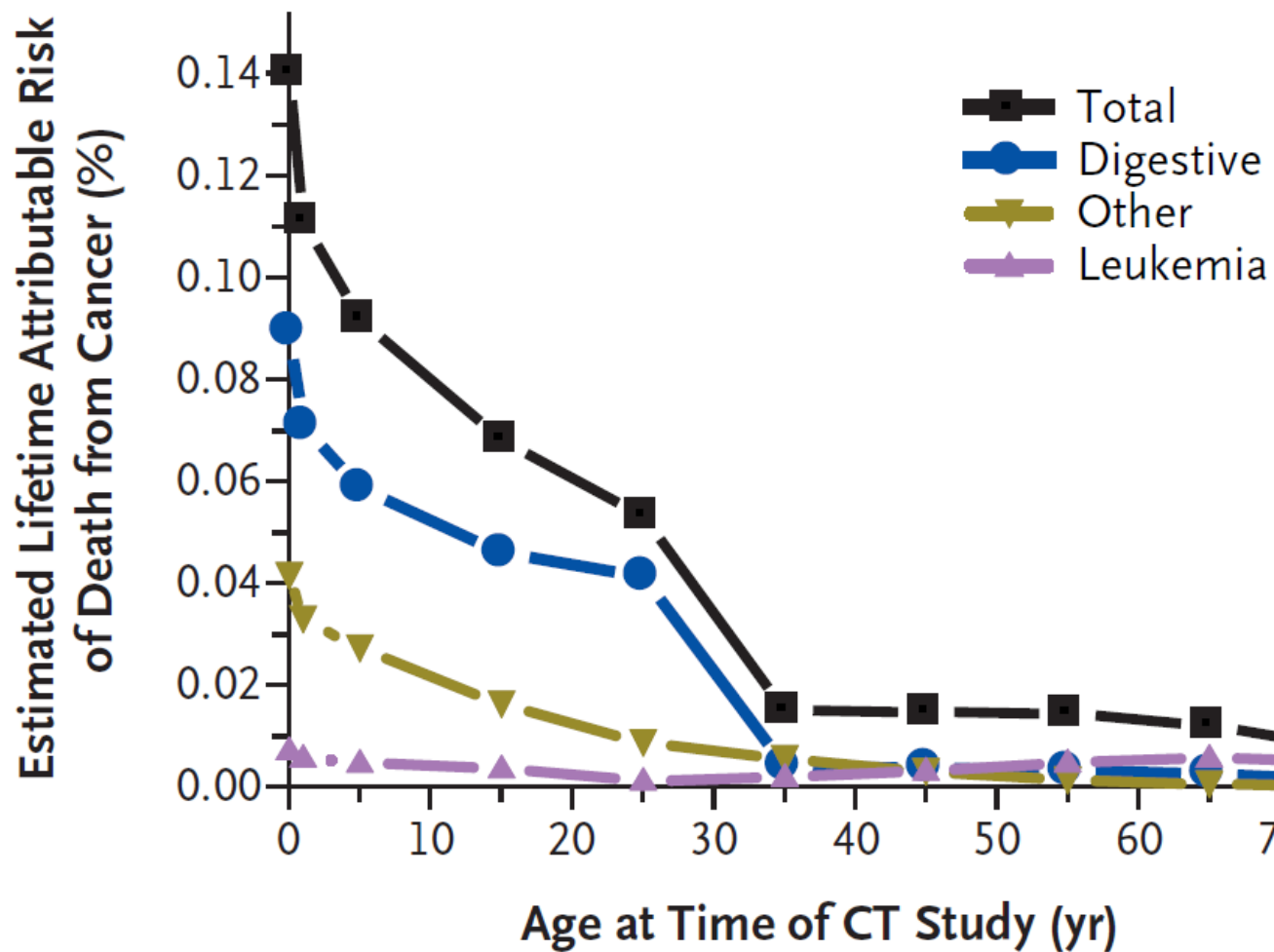
CT Abdomen is a lot of radiation

Test	Radiation (mSv)
Chest X-ray	0.02
Abdominal X-ray	0.07
Small bowel follow-through	3
CT Abdomen	10-25



Risks of ionizing radiation

Abdominal CT, 240 mAs



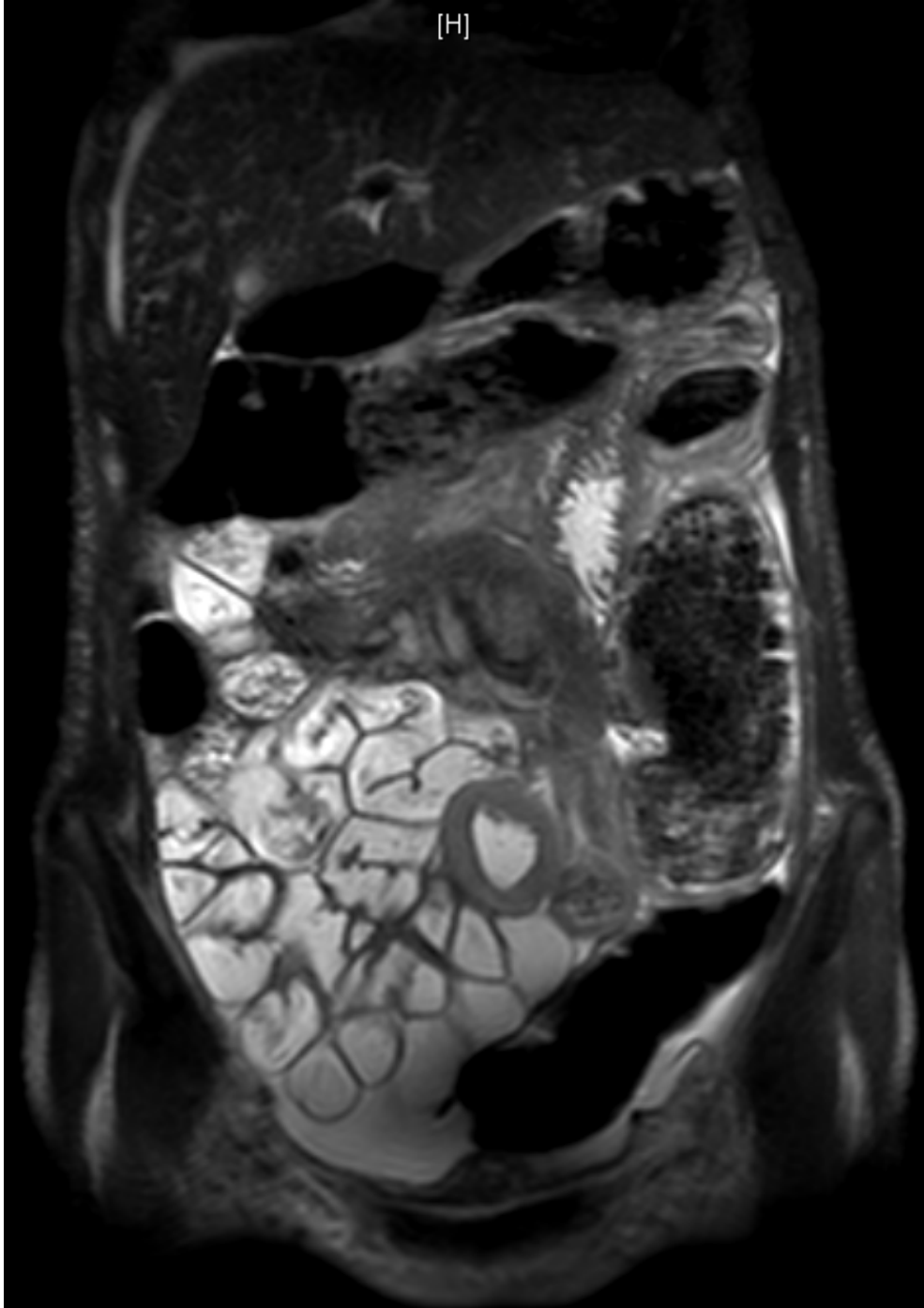
MR Enterography



- LLQ small bowel loops abnormal
 - >10cm long
 - Increased enhancement
 - Restricted diffusion
 - Edema
 - Wall thickening, circumferential

- Moderate ascites

[H]

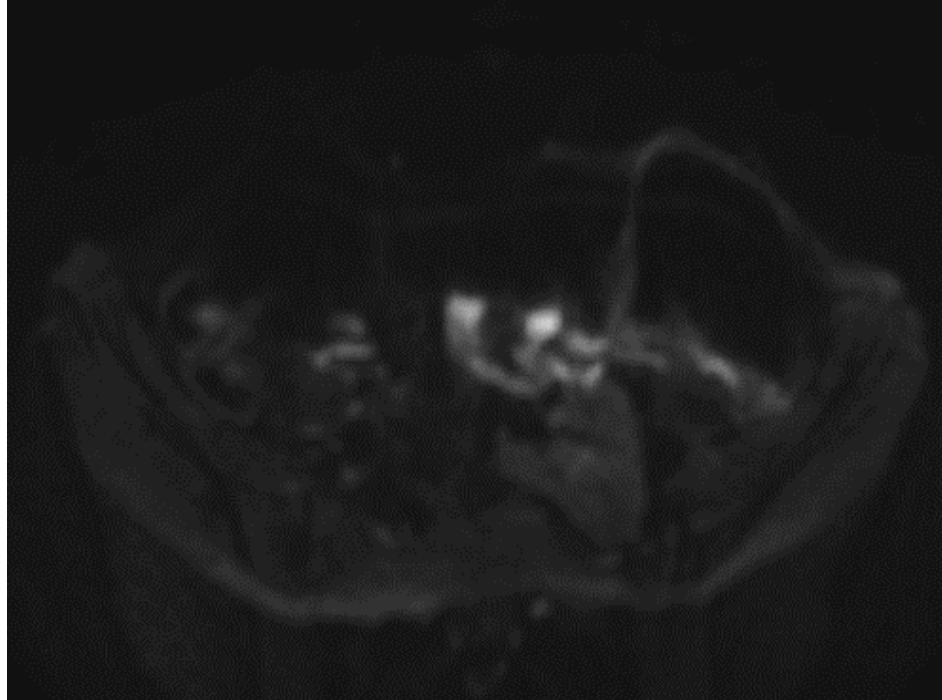
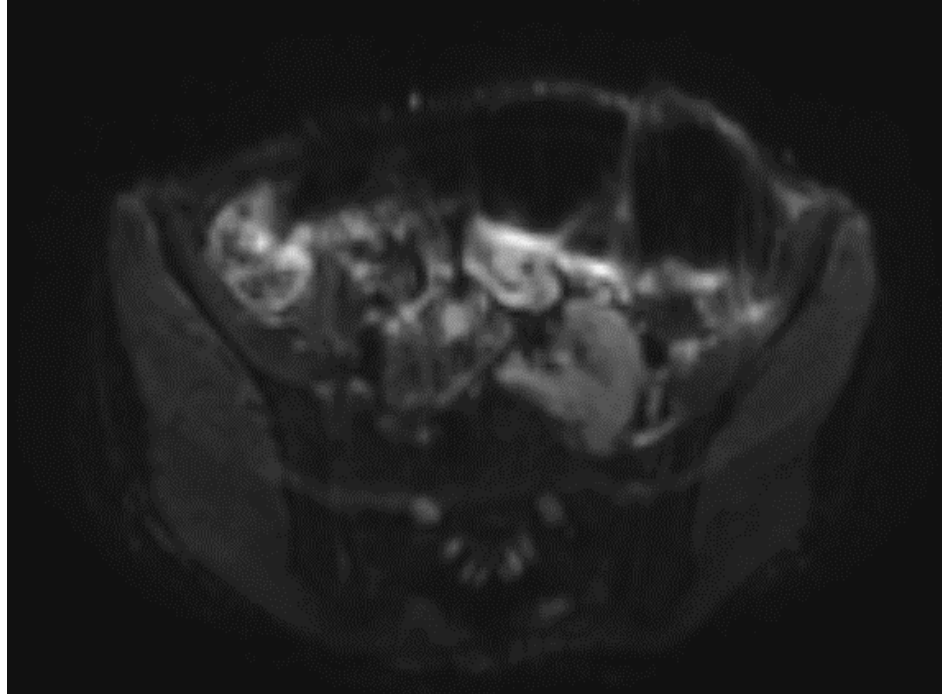
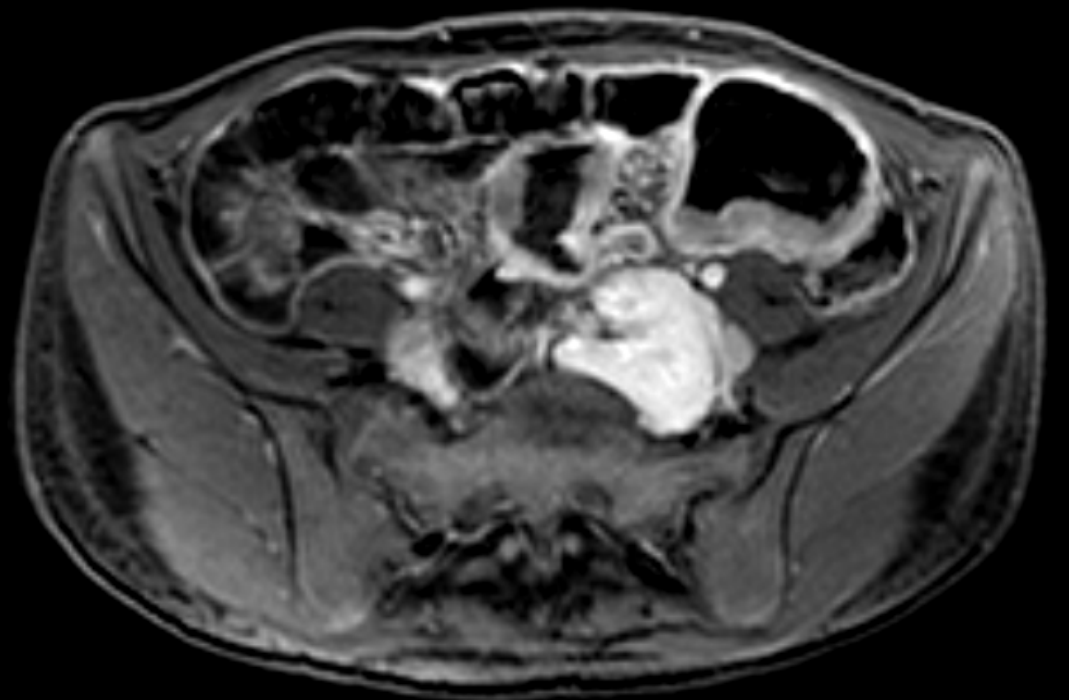
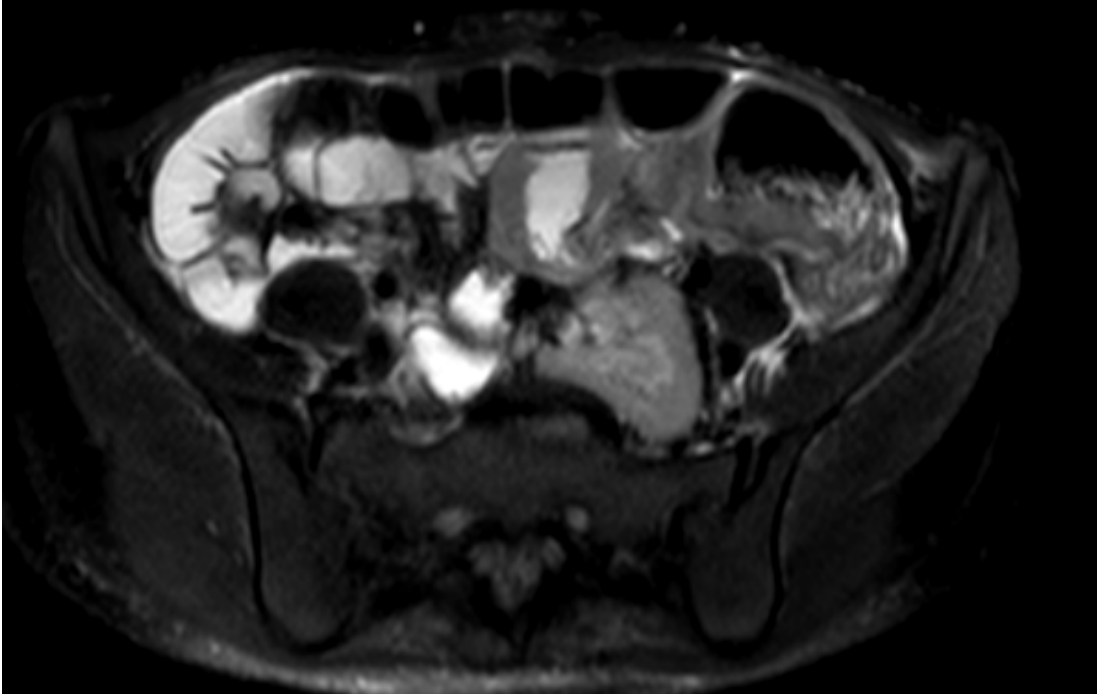


[F]

[H]



[F]



Diagnosis? Next steps?



PET CT



- Multiple bowel loops with markedly increased activity corresponding to thickened distal ileum and mesenteric lymph nodes on CT.
- DDx: Lymphoma >> IBD

Surgical excision

- Diffuse large B-cell lymphoma

Surgical excision

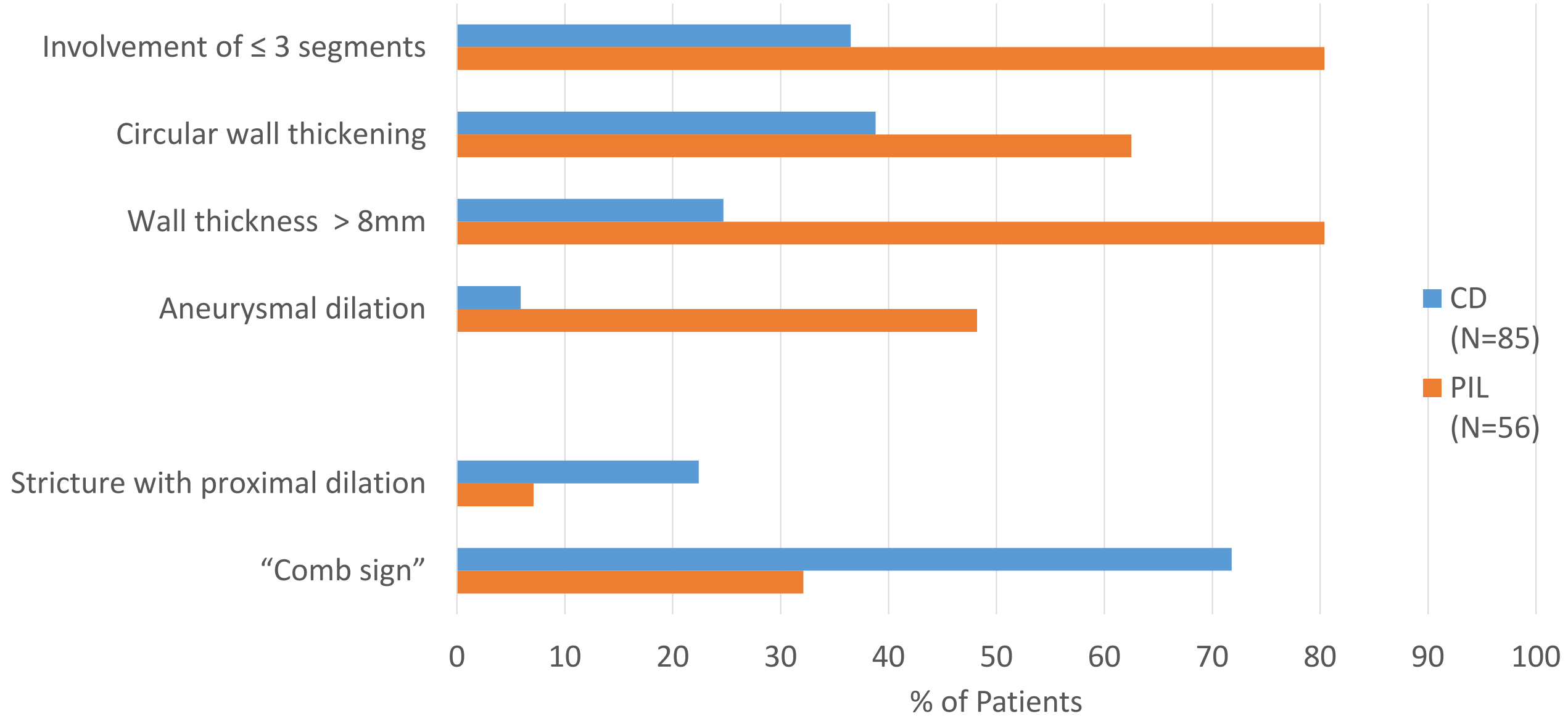
- Diffuse large B-cell lymphoma
- Receives chemotherapy and remains in remission 6 years later

Surgical excision

- Diffuse large B-cell lymphoma
- Receives chemotherapy and remains in remission 6 years later



CT findings of CD vs. Primary intestinal lymphoma





Case 2

- 7 year old boy presented with 6 weeks of:
 - bloody diarrhea
 - mild abdominal pain
 - elevated inflammatory markers

Diagnostic evaluation



- Continuous superficial colitis to splenic flexure.
- Biopsies show mild/moderate chronic colitis in macroscopically affected areas
- US showed left sided colitis
- Normal TI
- Starts 5-ASA for UC



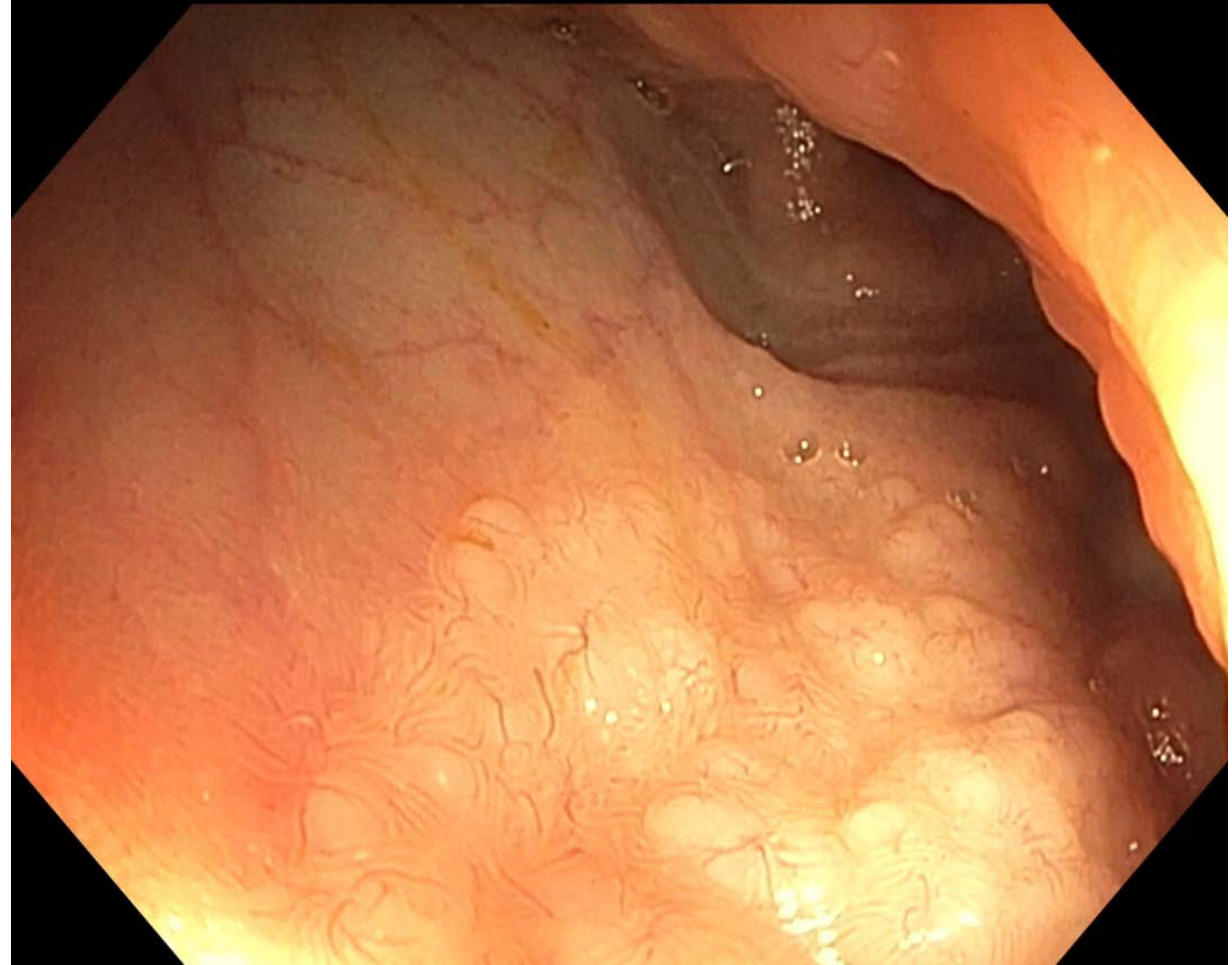
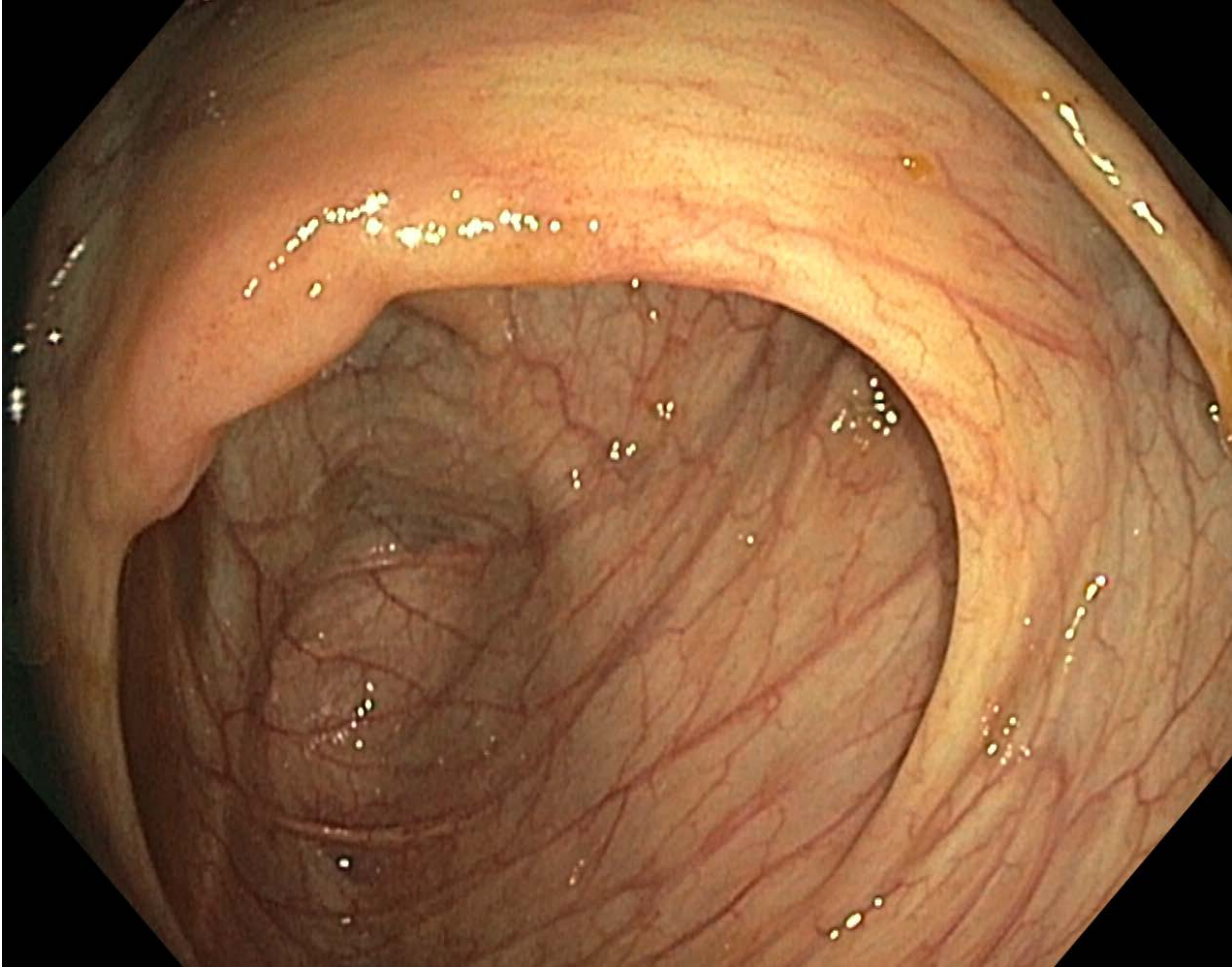
Interval history

- Continues to grow and gain weight well!
- BM formed, non-bloody
- Labs normal

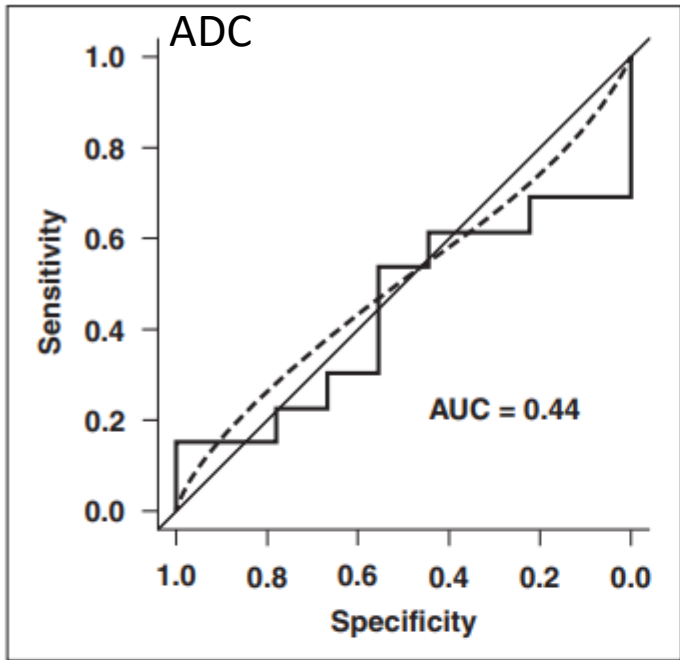
- Complains of ongoing non-descript abdominal pain

- MRE shows TI thickening x 7cm, mild wall enhancement, mild restricted diffusion, minimal T2 hyperintensity

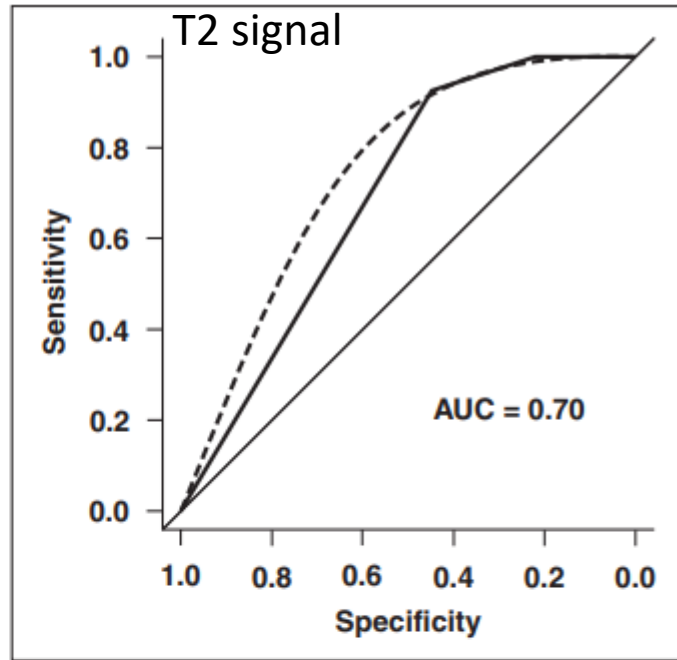
Follow-up endoscopy



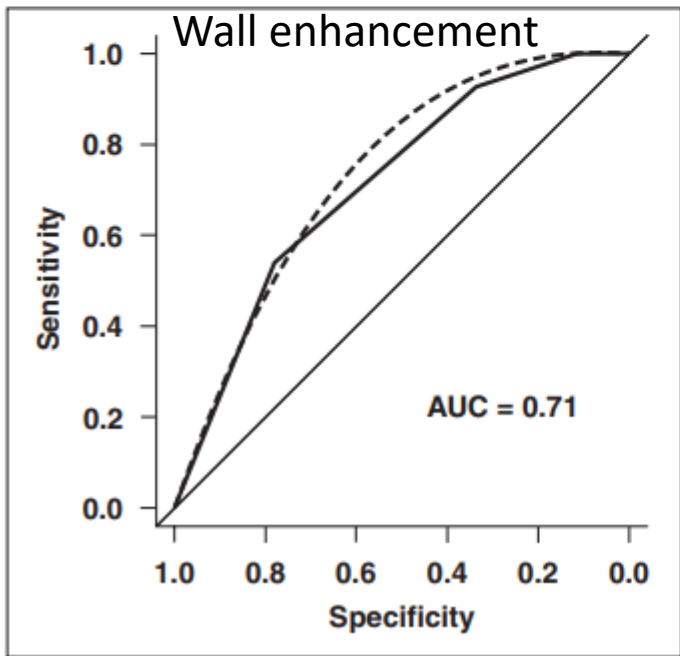
Biopsies of cecum and TI normal



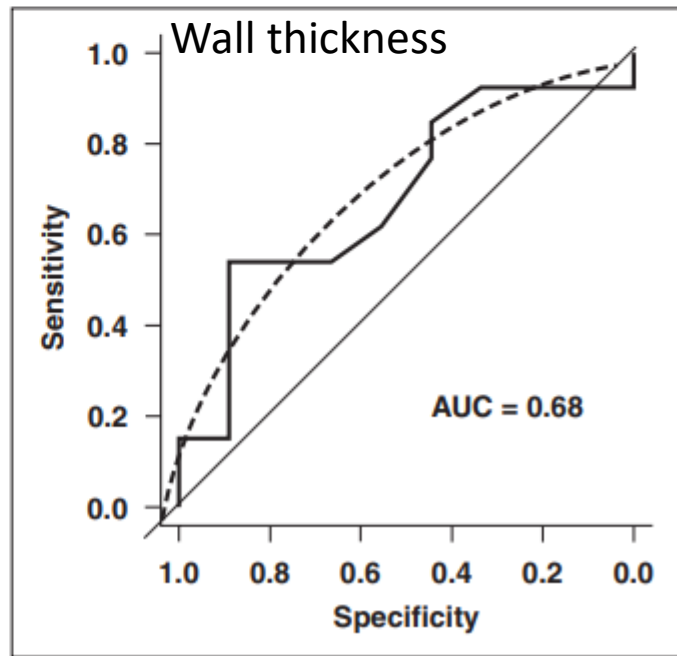
A



B



C



D

MRE features are mildly more prominent for CD (N=13) vs. LNH (N=9)



Differential Diagnoses of Small Bowel Disease

- **Infectious**

- Yersinia spp.
- Salmonella spp.
- Clostridium difficile
- Typhlitis
- Mycobacterium tuberculosis
- Mycobacterium avium
- Actinomycosis
- Anisakiasis
- Cytomegalovirus
- Histoplasma capsulatum

- **Spondyloarthropathies**

- Ankylosing spondylitis
- Reactive arthritis
- Arthritis associated with inflammatory bowel disease
- Psoriasis with arthritis
- Undifferentiated spondylarthropathy

- **Vascular**

Vasculitides:

- SLE, PAN, HSP, Behcet's, rheumatoid arthritis vasculitis, Wegener granulomatosis, lymphomatoid granulomatosis, giant-cell arteritis, Takayasu arteritis, thromboangiitis obliterans

Ischemia

- **Small-bowel neoplasms**

- Cecal or small-bowel (ileal) adenocarcinoma
- Lymphoma
- Carcinoid tumor
- Lymphosarcoma
- Metastatic cancer

- **Drug-related**

- NSAID enteropathy
- Other drugs: KCL tablets, parenteral gold therapy, oral contraceptives, ergotamine, digoxin, diuretics, antihypertensives

- **Infiltrative**

- Eosinophilic enteritis
- Sarcoidosis
- Amyloidosis

- **Other causes**

- Backwash ileitis due to UC
- Endometriosis
- Radiation enteritis
- Lymphonodular hyperplasia

