

Radiologi av tynn- og tykktarm

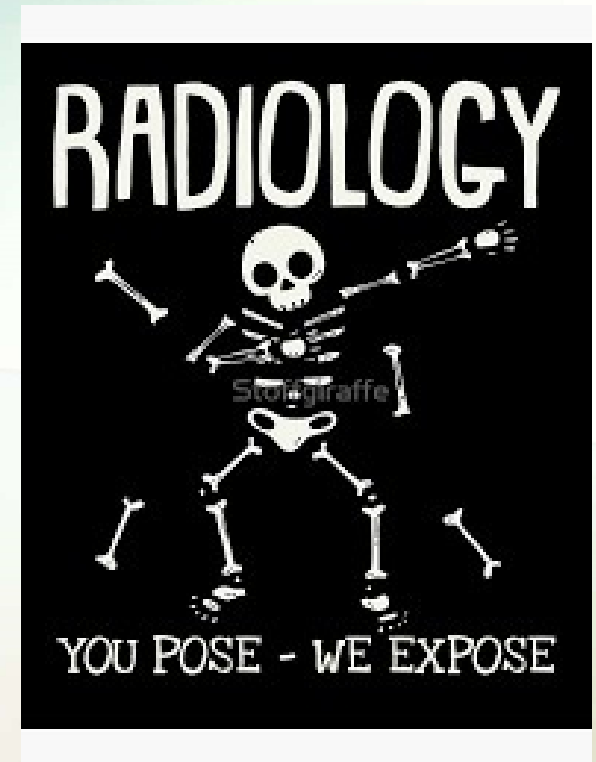
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Contents


Different imaging modalities:

- X-ray
- Fluoroscopy; Small bowel follow through
- CT enterography
- MR enterography
- CT colonography



Radiation dose



ABDOMINAL REGION 	Procedure	Approximate effective radiation dose	Comparable to natural background radiation for:
	Computed Tomography (CT)–Abdomen and Pelvis	7.7 mSv	2.6 years
	Computed Tomography (CT)–Abdomen and Pelvis, repeated with and without contrast material	15.4 mSv	5.1 years
	Computed Tomography (CT)–Colonography	6 mSv	2 years
	Intravenous Urography (IVU)	3 mSv	1 year
	Barium Enema (Lower GI X-ray)	6 mSv	2 years
	Upper GI Study with Barium	6 mSv	2 years

Chest x-ray (PA+lateral): 0,1 mSv

Abdominal x-ray: 0,7 mSv

Natural background dose 1 year Norge: on average 3,2 mSv

www.radiologyinfo.org

X-ray abdomen

- X-ray abdomen has no role in diagnosis or follow up of small or large bowel disease
- In acute setting: ileus or perforation/ free air (but CT strongly preferred)
- Oral-anal transittime: in patients with obstipation estimation of the bowel transittime using capsules with røntgen markers.

X-ray



Small bowel ileus

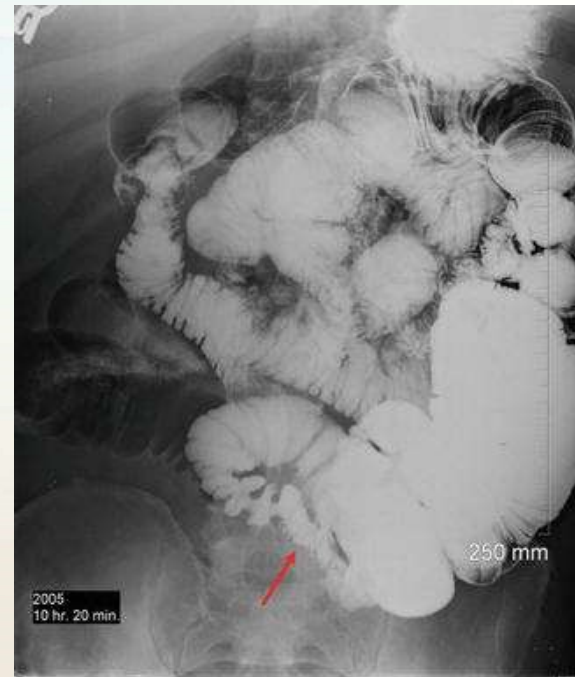
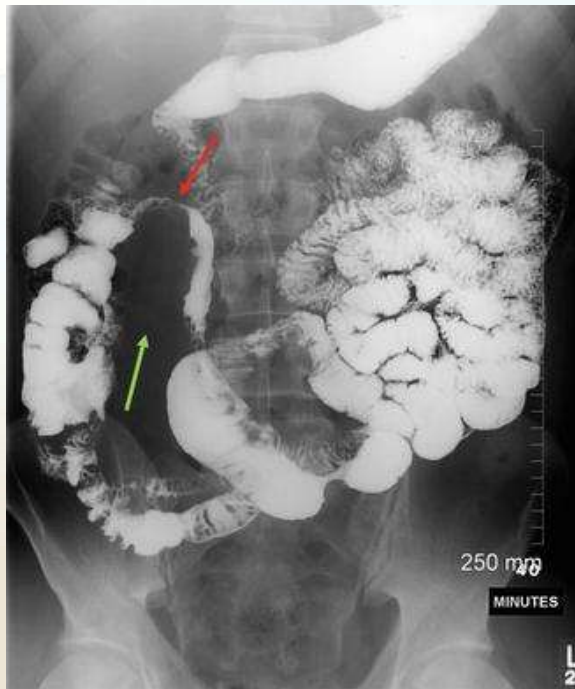


Coffee bean sign: sigmoid volvulus

Small bowel follow through

- After ingestion of barium fluoroscopic imaging (X-ray film) is done of the small bowel
- Enteroclyse: barium via sonde
- Disadvantages: relative high radiation dose and less sensitivity
- Nowadays hardly used, MR entrography is preferred

Small bowel follow through



Small bowel follow through

- In our practise only used in patients with a (sub)ileus diagnosed at CT
- Ingestion of gastrografin and X-ray abdomen at different time intervals up to 24 hours
- Evaluate passage of contrast to the colon

CT enterography

Scan of the abdomen with distended bowel

Technique:

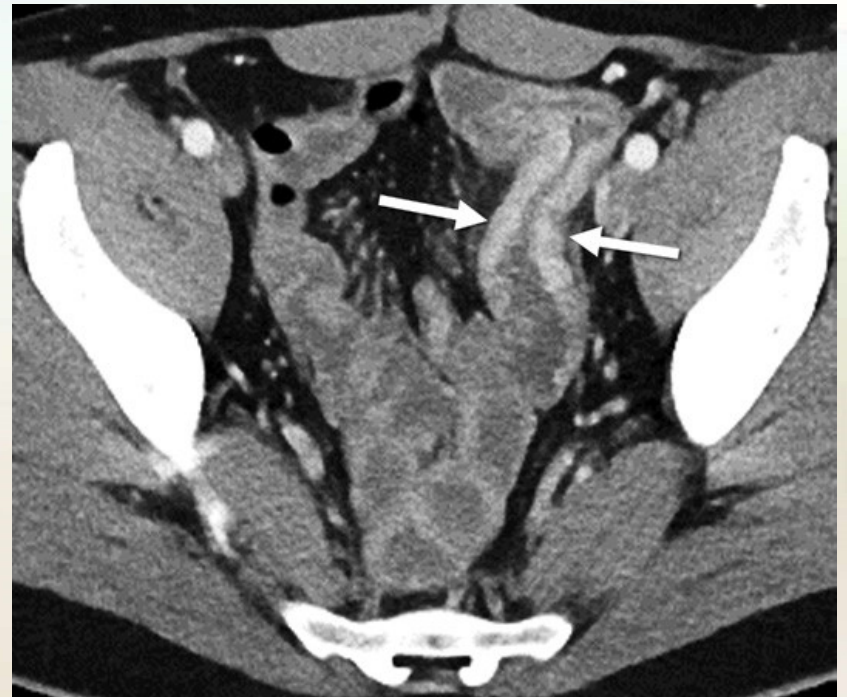
- Use of negative oral contrast (Sorbitol)
- Use of spasmolytic (Buscopan) and antiemeticum (Afipran)
- Scan about 45 minutes after start drinking
- Scan without contrast and one with iv contrast in portalvenous phase

CT enterography

- CTE is only limited used because of radiation dose
- MR enterography has similar sensitivity and specificity
- CTE can be used when MR is not possible (f. ex. Incompatible pacemaker or claustrophobia)

CT enterography

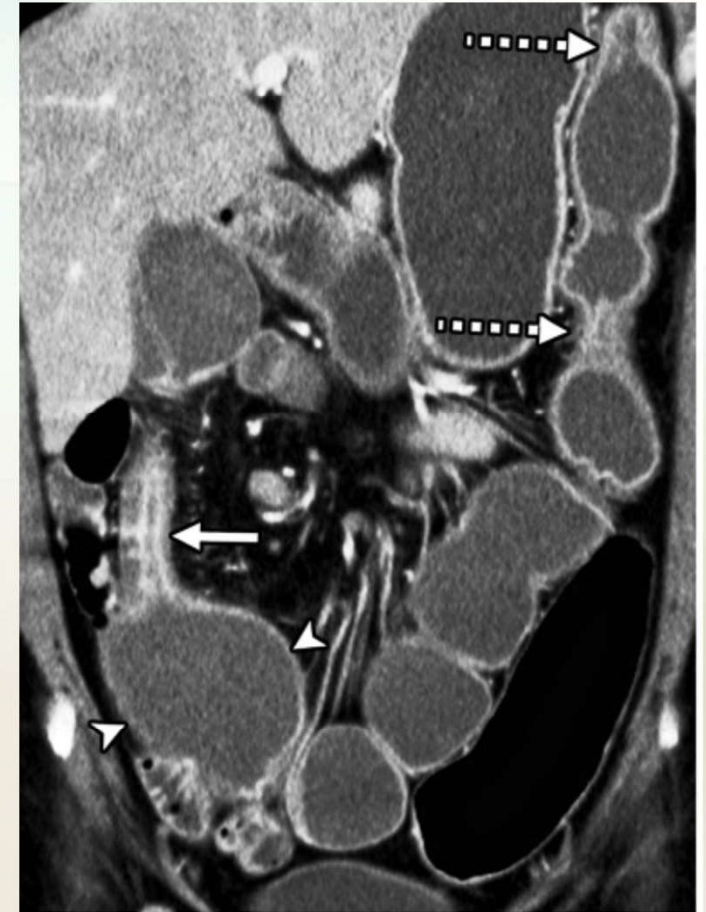
- Imaging features in inflammatory small bowel disease:
 - Bowel wall hyperenhancement
 - Bowel wall thickening
 - Intramural edema
 - Stricture



Wall thickening and hyperenhancement

CT enterography

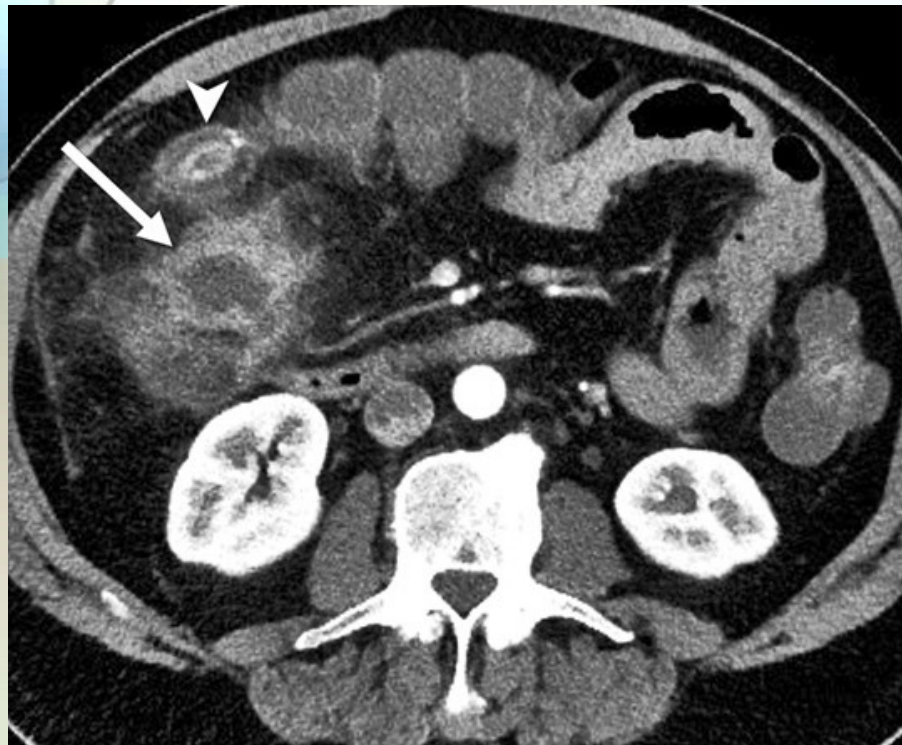
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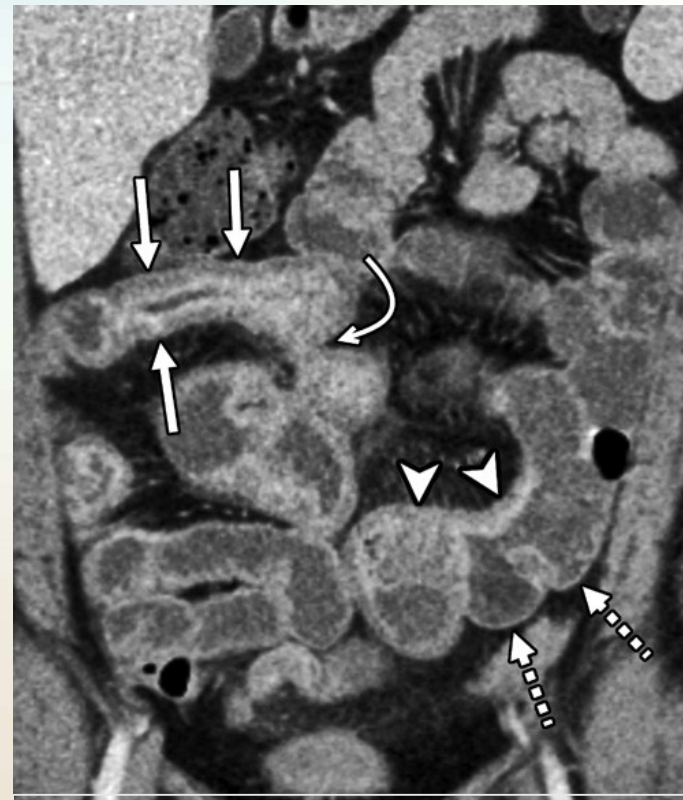
Stricture in distal ileum and severe upstream dilatation

CT enterography

Penetrating disease:



abscess



Moderate wall thickening (>5-9 mm)
and enteroenteric fistula

MR enterography / enteroclysis

- MR enterography: oral administration of contrast
less patient burden
- MR enteroclysis: contrast via nasojejunal tube
better distention of proximal bowel

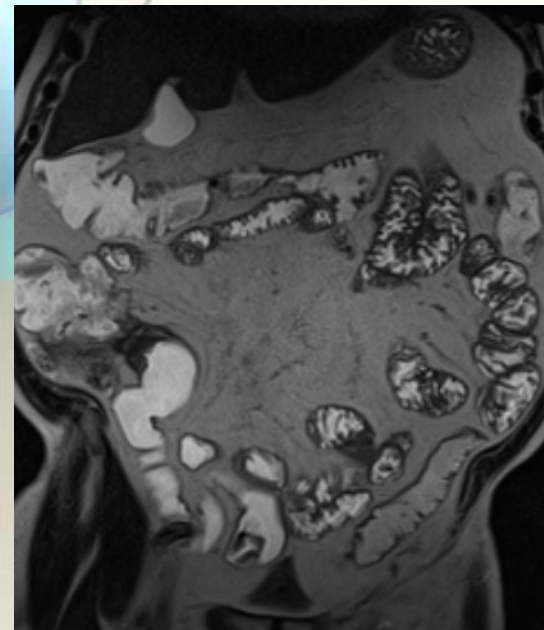
Similar
accuracy

MR enterography

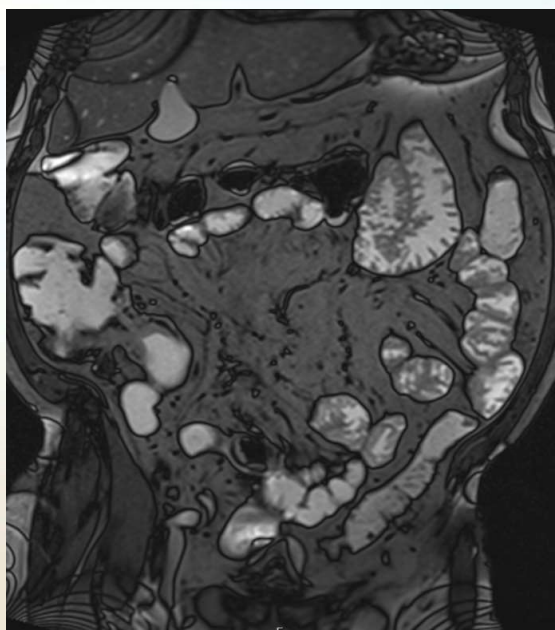
Technique

- Use of oral contrast (Sorbitol)
- Use of spasmolytic (Buscopan) and antiemeticum (Afipran)
- Scan about 45 minutes after start drinking
- Scan contains:
 - T2 (fatsatt) imaging (water is hyperintense=white)
 - T1 fatsatt imaging before and after iv contrast (water is hypointense=black, contrast is hyperintense)
 - (diffusion imaging)
 - (dynamic imaging)

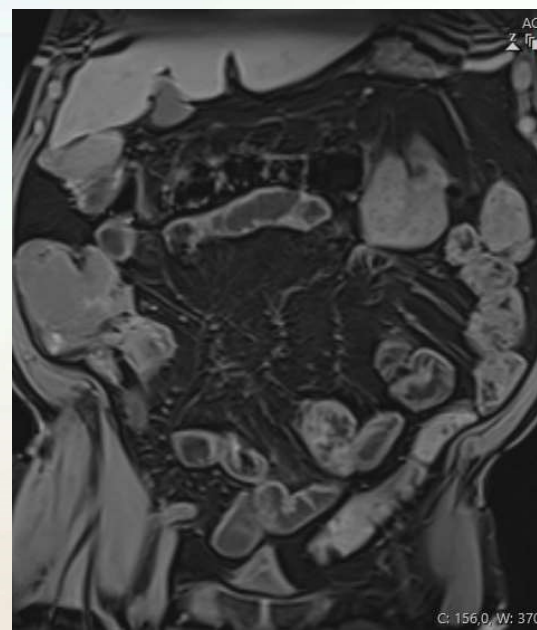
MR enterography



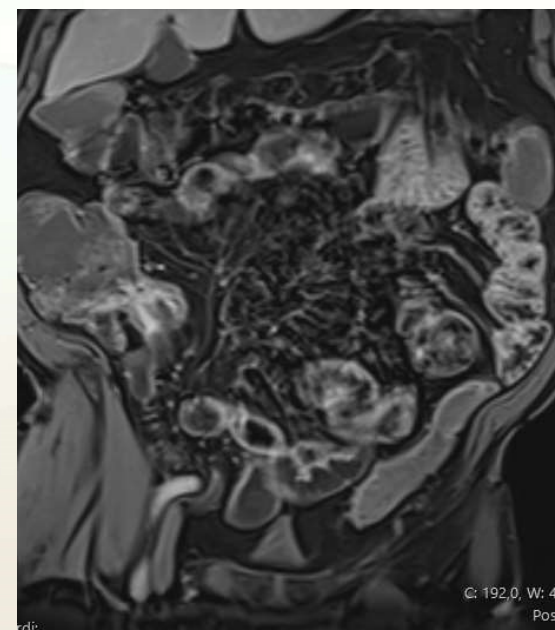
T2 haste



T2 fatsat

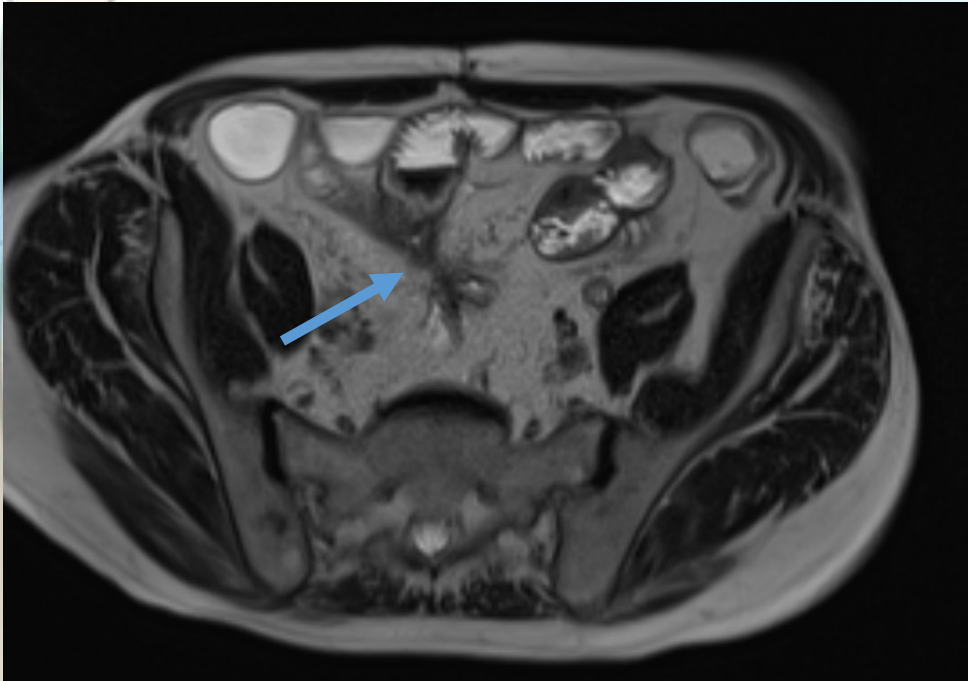


T1 fatsat – contrast

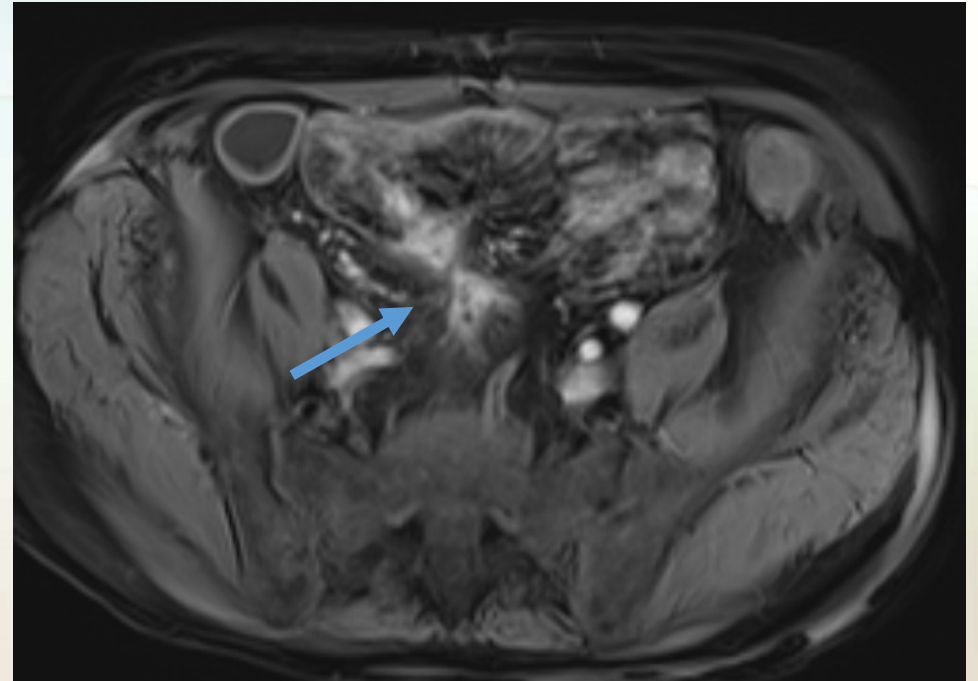


T1 fatsat + contrast

MR enterography

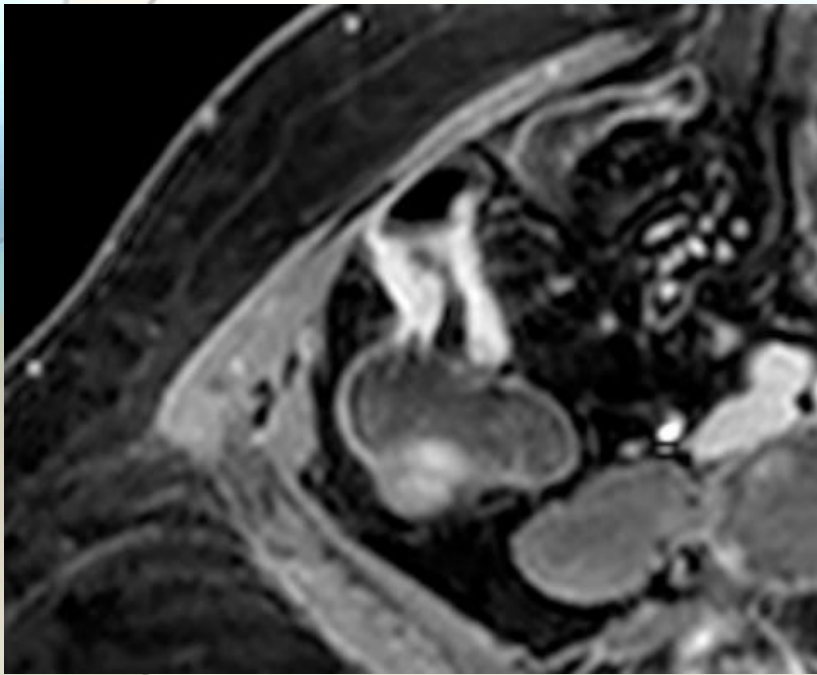


T2 haste trans: enteroenterisk fistel



T1 fatsat +c trans: enteroenterisk fistel

MR enterography

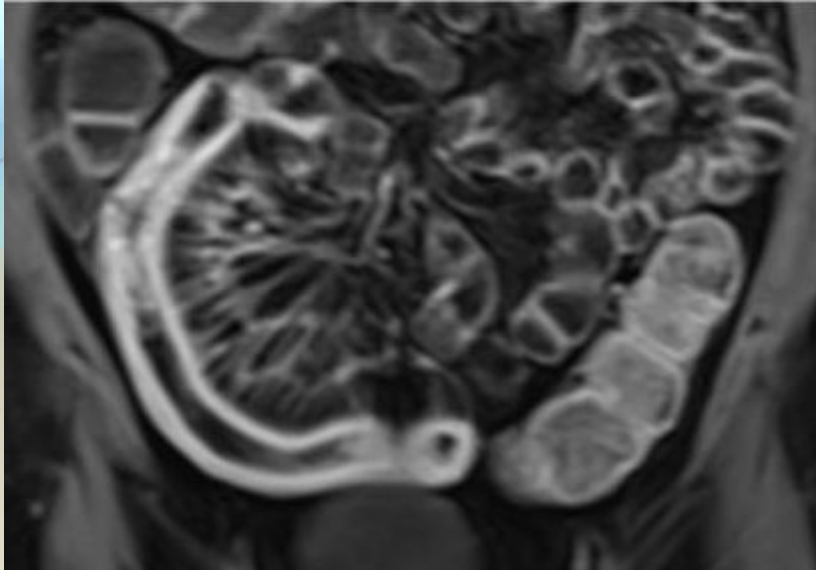


T1 contrast image: thickened ileal wall with increased contrast enhancement

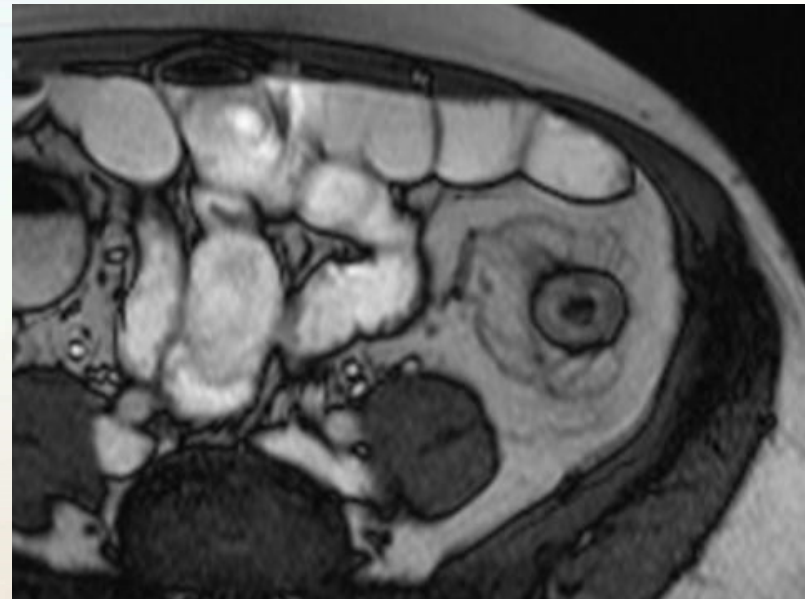


T2 fatsatt image: thickened ileal wall with edema

MR enterography

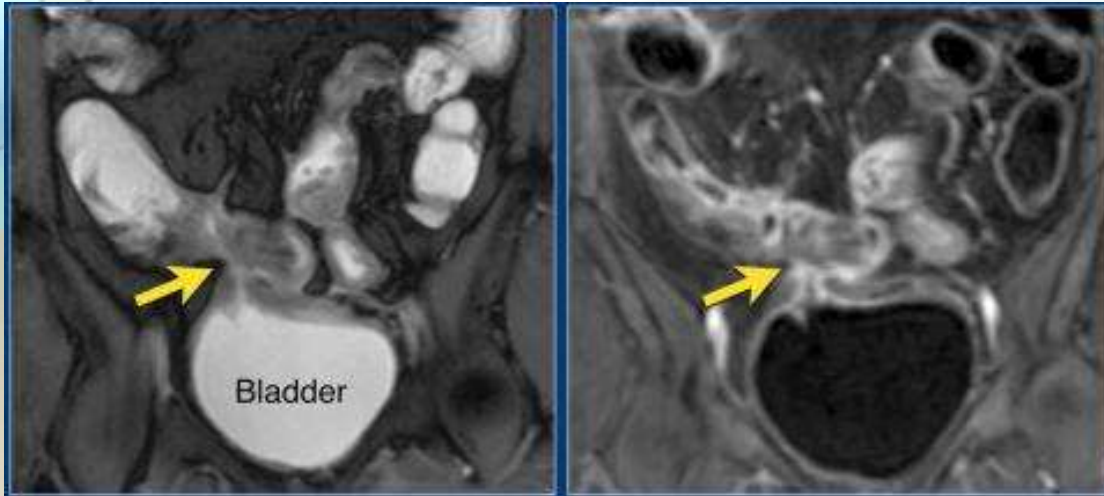


T1 contrast: Marked enhancement of bowel with comb sign

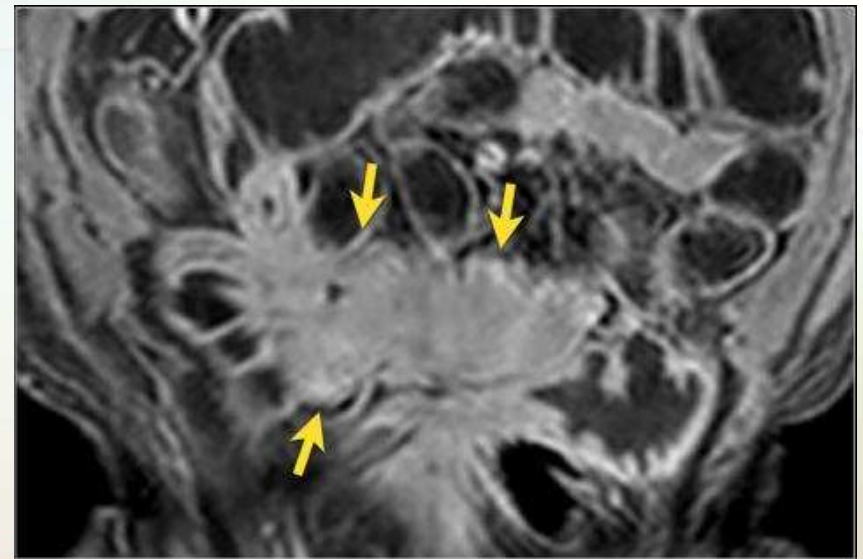


T2: creeping fat around colon descendens, longstanding Crohn`s disease

MR enterography complications



T2 fatsatt and T1 contrast image:
enterovesical fistula



T1 image: large enhancing infiltrate

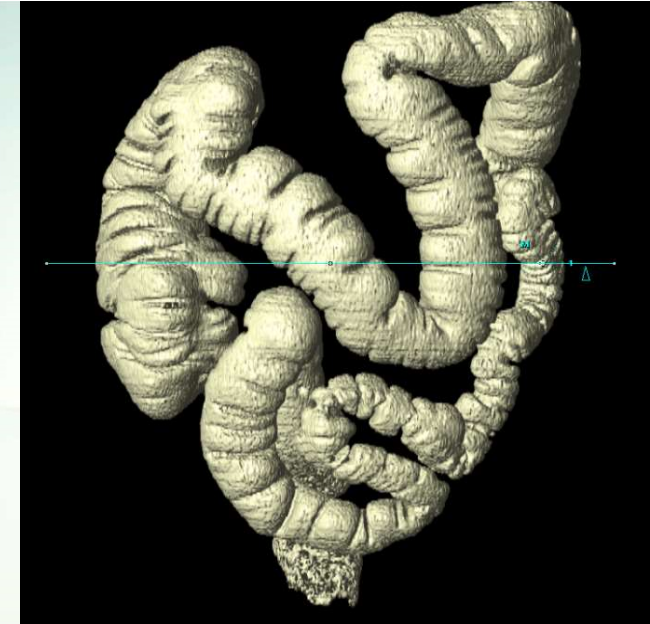
MR enterography scoring system

Score	0	1	2	3
Thickness	≤ 3 mm	> 3 - 5 mm	> 5 - 7 mm	> 7 mm
T2-signal on fatsat	Normal	Minor increase dark grey	Moderate increase light grey	Marked increase high signal
T1 Enhancement	Normal	Minor increase less than vessels	Moderate increase less than vessels	Marked increase ± vessels
Pattern	Normal	Homogeneous	Mucosal	Layered
Length	0 cm	≤ 5 cm	5 - 15 cm	> 15 cm
Comb sign	No	Yes		

Grading Crohn's disease activity	
None	No signs of disease activity
Mild	Signs of activity. No features with score 3. <i>No complications.</i> Total score ≤ 8.
Moderate	Score 9-13 or contains a feature with score 3. <i>No complications.</i>
Severe	Total score ≥ 14 <i>or</i> Presence of at least one complication: Infiltrate - Abscess - Fistula - Total stenosis

CT colonography

- 3 dimensional imaging of the colon using CT
- Bowel preparation is important
- Protokoll Haukeland: laxans and oral contrast agent
- Insufflation of CO₂ in the colon
- Scanning in prone (bukleie) and supine (ryggleie)



Indications CTC (ESGE/ESGAR)

- Incomplete colonoscopy
 - Dolichocolon
 - Preoperative contrast CTC with obstructing tumor → double tumour?
- When endoscopy contraindicated in symptomatic patients
- 1^e choice examination in patients that refuse to undergo colonoscopy
 - screening
 - FIT positives
 - surveillance because of positive family-history
 - surveillance because CRC in history

CT colongraphy vs colonoscopy

	FIT	CTC	Colonoscopy
Sensitivity CRC ¹	78% ³	96%	95%
Sensitivity polyps > 10mm ²	25-40% ⁴	83%	87%

¹Pickhardt et al. Radiology 2014 meta-analysis

²De Haan et al. Eur Rad 2011 meta-analysis

³Lee et al. Ann Int Med 2014 meta-analysis

⁴ Imperiale et al. Ann Int Med 2019 meta-analysis

CT colography examination

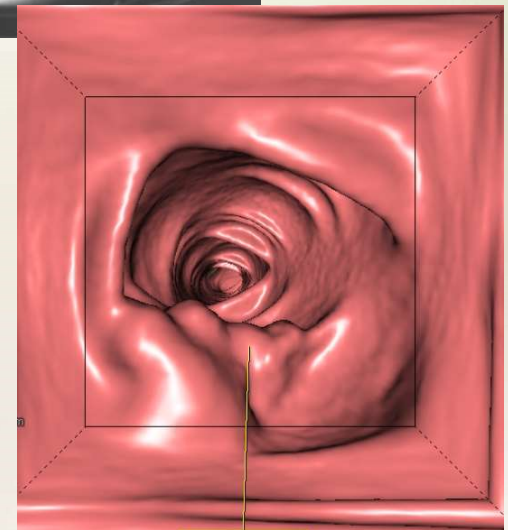
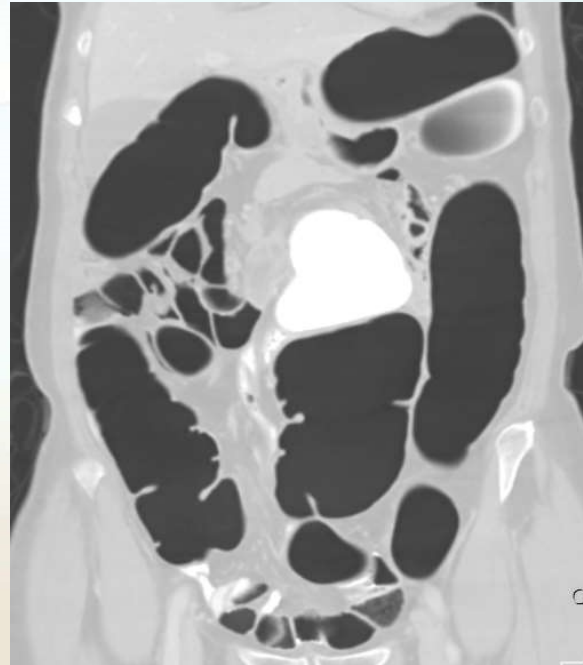


Prone scan



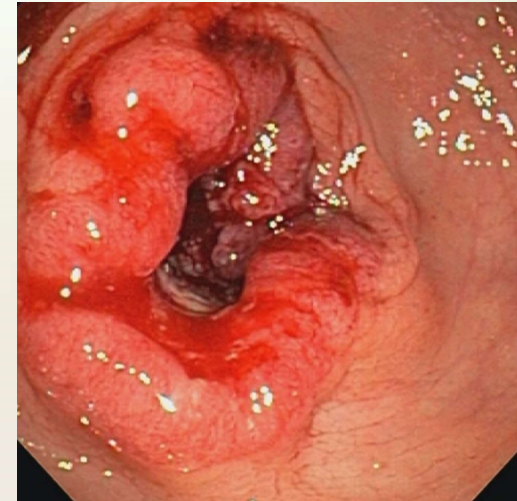
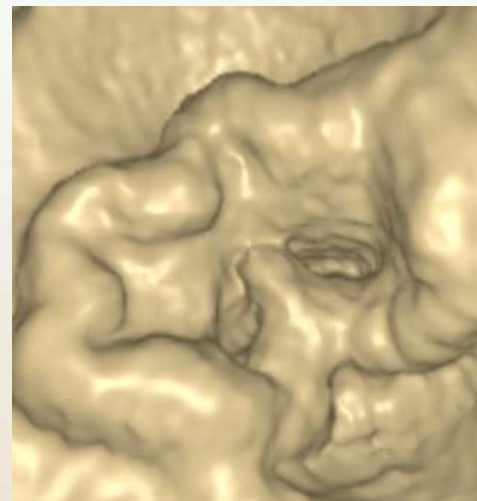
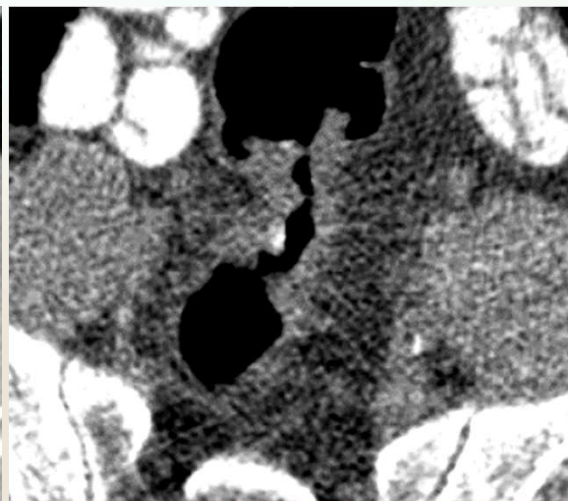
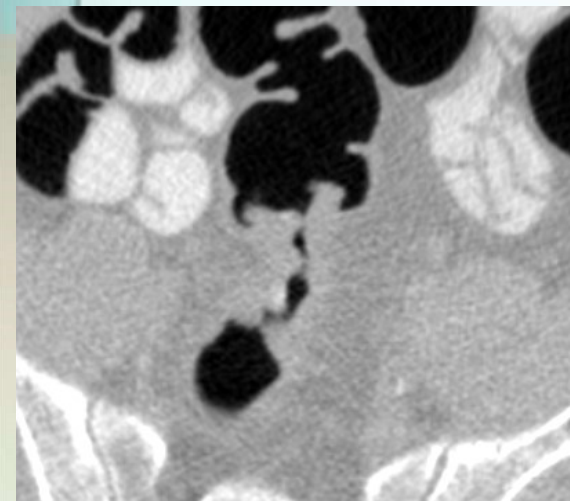
Supine scan usually with iv kontrast

CT Colonography



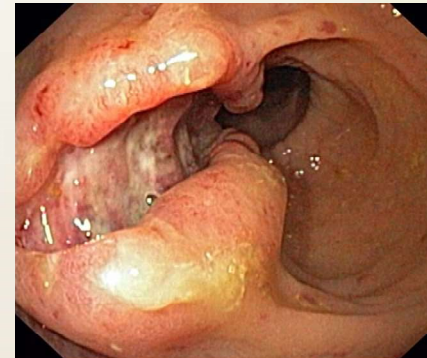
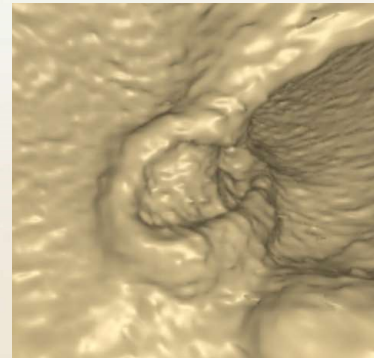
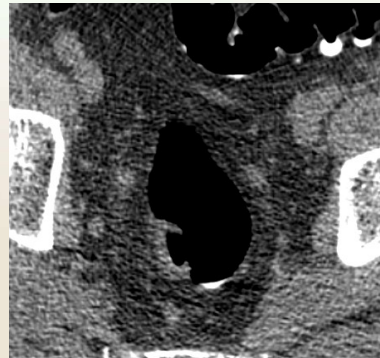
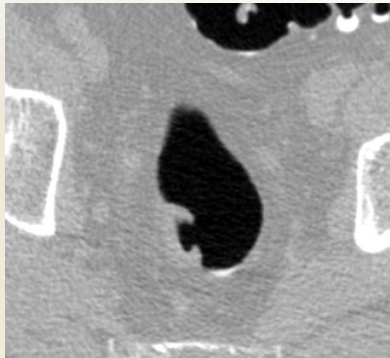
CT colonography

- Big apple core tumor in the sigmoid colon



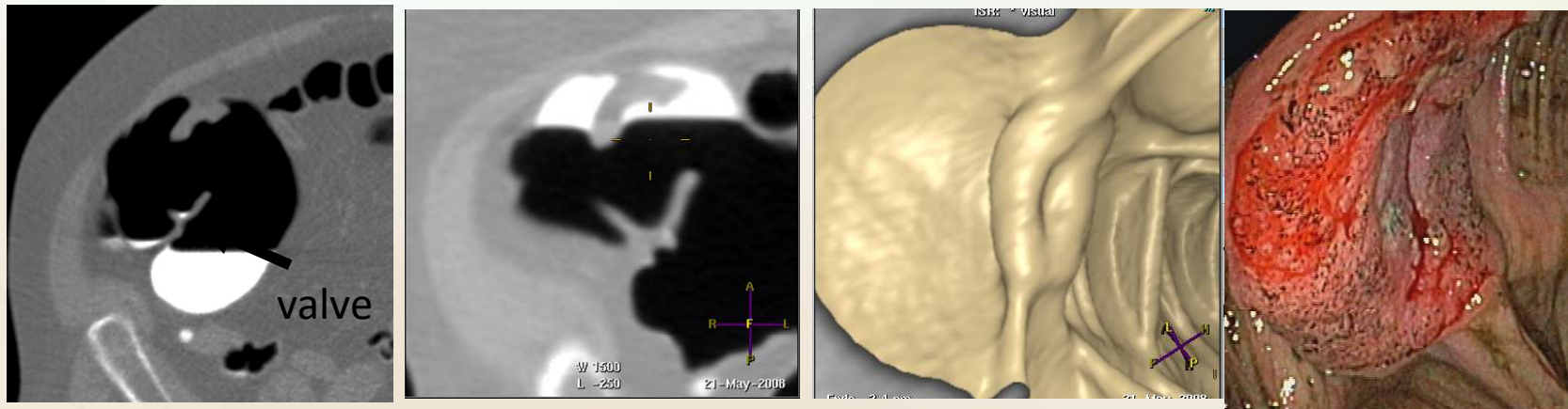
'Easy' to detect tumors

- Saddle shape tumor in the recto-sigmoid



Cecal tumors

- More easily missed because of: confusion with the ileocecal valve and difficult to evaluate in 3D mode



Possible complications CTC

- 0,02-0,04% bowel perforation in 100.000 patients
- In patients with:
 - Acute bowel inflammation (diverticulitis, colitis)
 - recent polypectomy
 - or with manual insufflation
- 0,008% needed surgery

Take home messages

- X ray and fluoroscopy hardly used for imaging of the bowel
- MR enterography: preferred method evaluation of small bowel
- CT enterography: only used in evaluation of inflammatory bowel disease when MR is not possible
- CT colonography: preferred method when colonoscopy is incomplete or contra-indicated

Takk for oppmerksomheten

