

January 27th 2017,

8th Gastro Foundation Weekend for Fellows; Spier Hotel & Conference Centre, Stellenbosch



## New Horizons in Imaging

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# Clinical case

Female, 27 years of age

8 weeks: diarrhoea (4–6 liquid stools/day), abdominal pain, arthralgia

Medical history: no diseases, non-smoker

Lab parameters:

- Leucocytes: 12,380/mm<sup>3</sup>, lymphocytes: 1600/mm<sup>3</sup>
- CRP: 17 mg/L (normal <5 mg/L)
- Albumin: 31 g/L
- Stool culture including *Clostridium difficile* toxins A and B: negative

Colonoscopy: no specific findings; terminal ileum intubated for 5 cm; no further ileoscopy possible

## Clinical case

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WHAT NEXT ???



# Imaging modalities for IBD assessment

## Endoscopy

- Double-balloon enteroscopy
- Capsule endoscopy

## Ultrasound

## CT scan

## MRI



A white ceramic cup and saucer set. The cup is filled with a dark, thick, and textured substance, likely chocolate or a dessert. The saucer has a decorative border. The cup is positioned on the saucer, and the entire set is centered on a white background.

# Reading tea leaves

# Comparison of MRI and bowel ultrasonography

## Meta-analysis of 68 publications

	Mean sensitivity estimates for diagnosis of IBD	Mean specificity
<b>US</b>	<b>0.84</b>	<b>0.92</b>
<b>MRI</b>	<b>0.93</b>	<b>0.90</b>

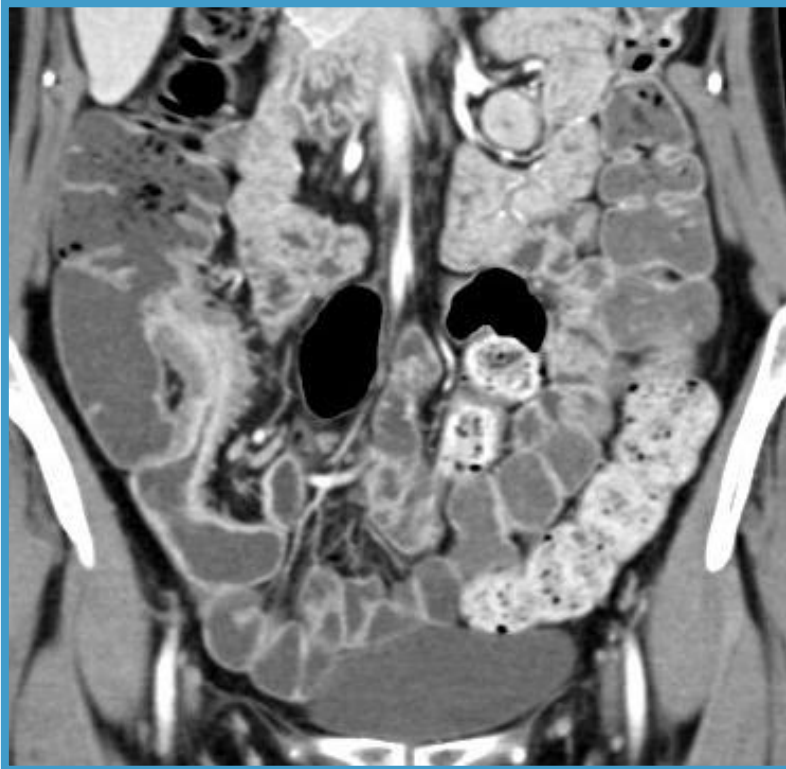
## MRI, CT, scintigraphy and ultrasound in IBD: Meta-analysis of prospective studies

### Per Patient Sensitivity and Specificity

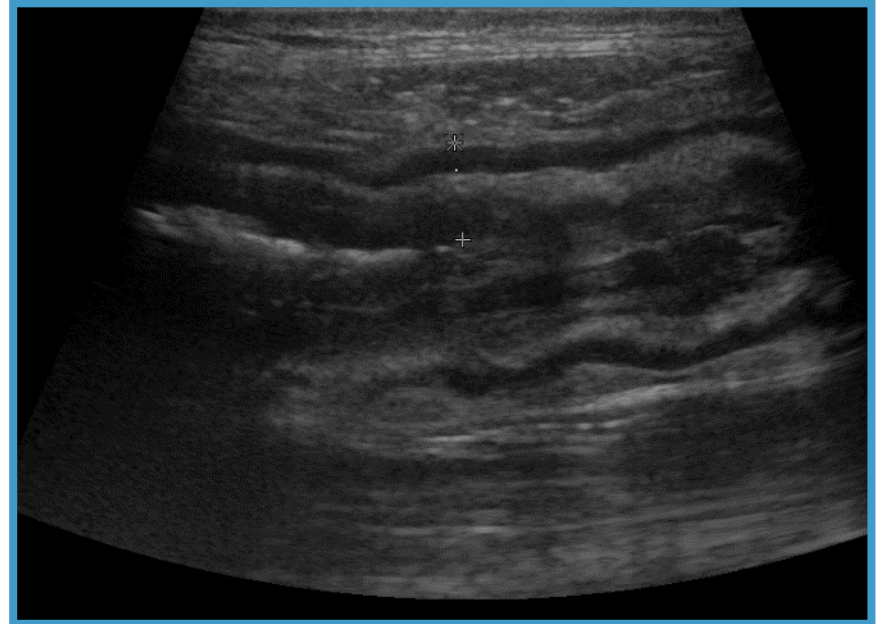
	<b>Studies</b>	<b>Patients (n)</b>	<b>Sensitivity % [range]</b>		<b>Specificity % [range]</b>	
<b>Ultrasound</b>	<b>9</b>	<b>1000</b>	<b>90</b>	<b>[78–96]</b>	<b>96</b>	<b>[67–100]</b>
<b>Scintigraphy</b>	<b>3</b>	<b>152</b>	<b>88</b>	<b>[76–95]</b>	<b>85</b>	<b>[78–93]</b>
<b>CT</b>	<b>4</b>	<b>113</b>	<b>84</b>	<b>[77–87]</b>	<b>95</b>	<b>[67–100]</b>
<b>MRI</b>	<b>7</b>	<b>292</b>	<b>93</b>	<b>[82–100]</b>	<b>93</b>	<b>[71–100]</b>

# Imaging

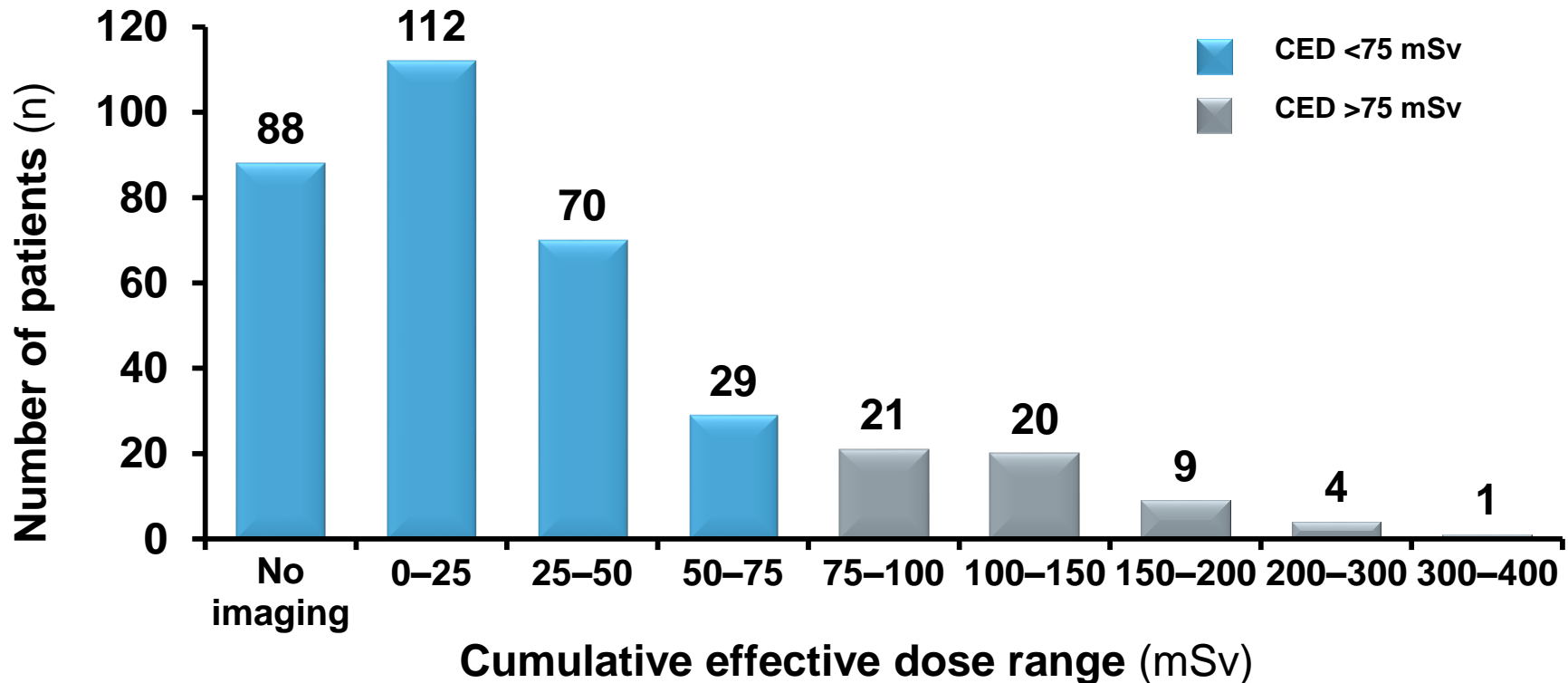
## MRI



## Ultrasound



## “Theoretic” Cumulative Effective Dose of diagnostic radiation exceeds 75 mSv in 15.5% of patients with Crohn’s disease

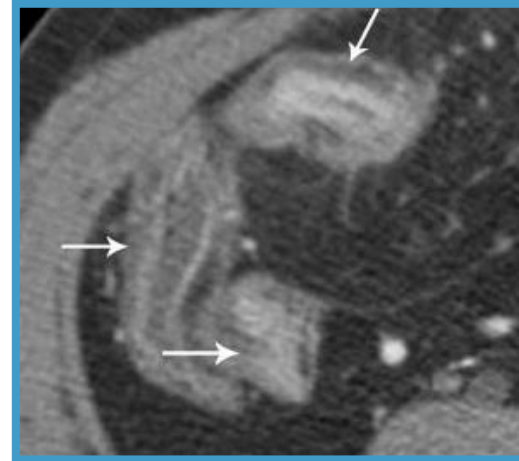


Desmond AN, et al. *Gut* 2008;57:1524–1529

# Safety



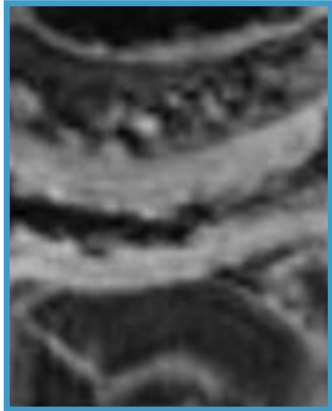
**CT scan**



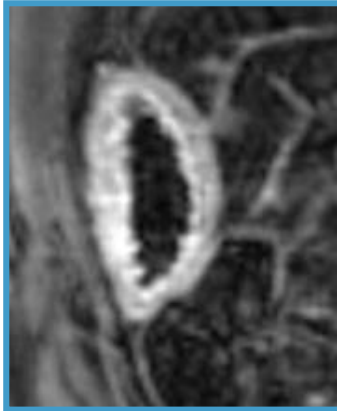
**10 – 17 mSv**

**Conservative estimate – 10 mSv:  
1 carcinoma in 5000 patients**

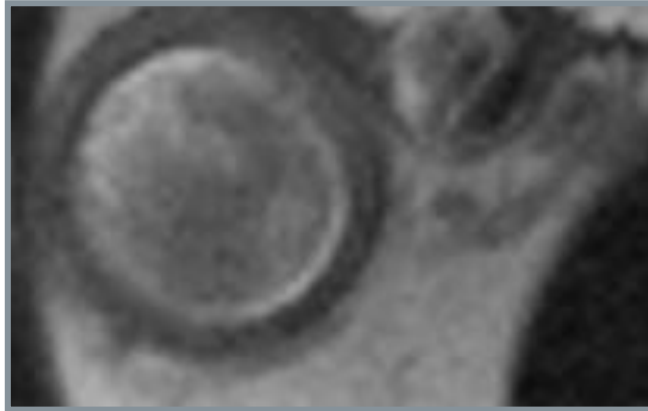
## MRI parameters activity in CD



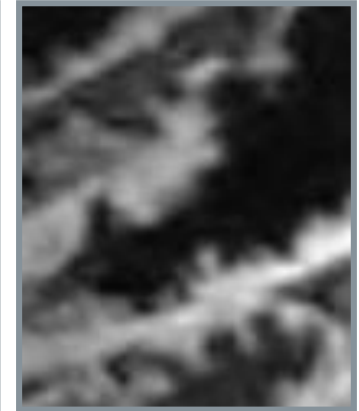
Thickening



Hyper-  
enhancement



Edema



Ulcers

**Disease activity**

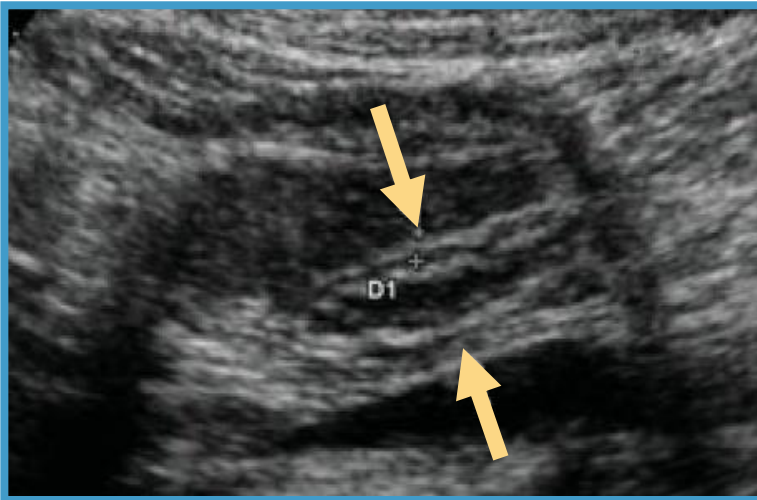
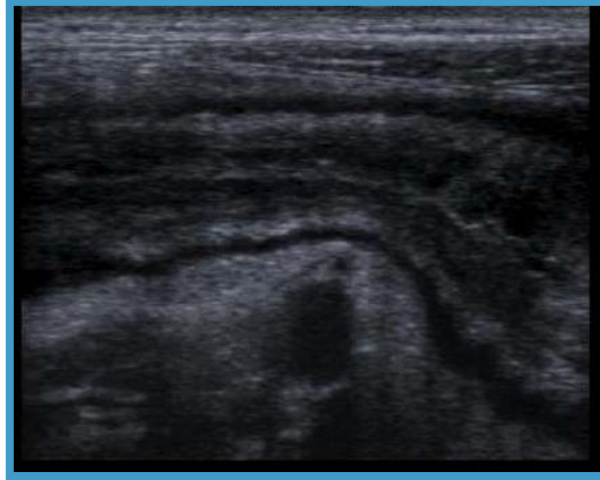
**Disease severity**

$$\text{MaRIA} = 1.5 * \text{wall thickness (mm)} + 0.02 * \text{RCE} + 5 * \text{edema} + 10 * \text{ulcers}$$

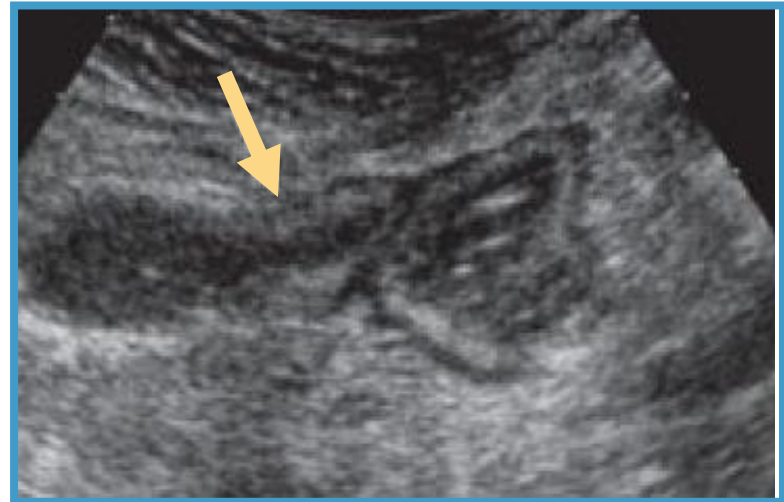
MaRIA, Magnetic Resonance Index of Activity

Rimola J, *et al. Gut* 2009;58:1113–1120

# Bowel ultrasonography

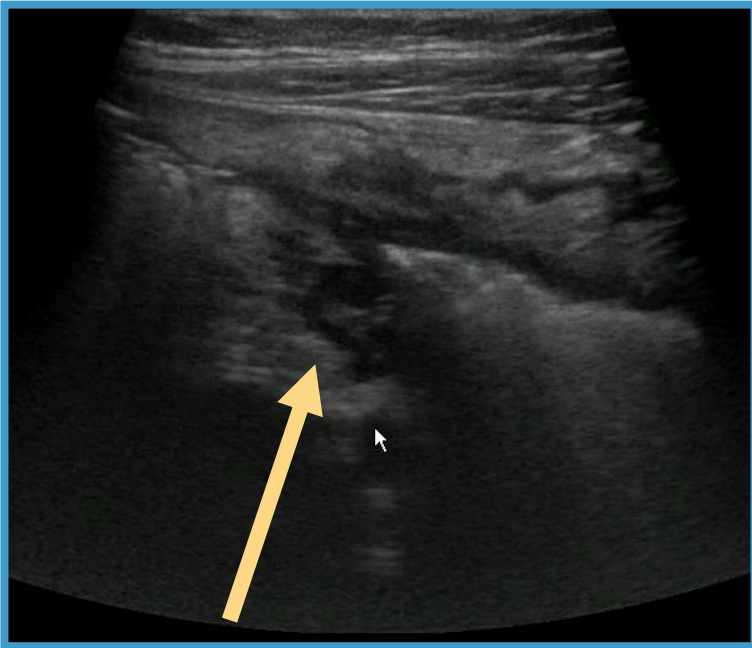


**Terminal ileitis**

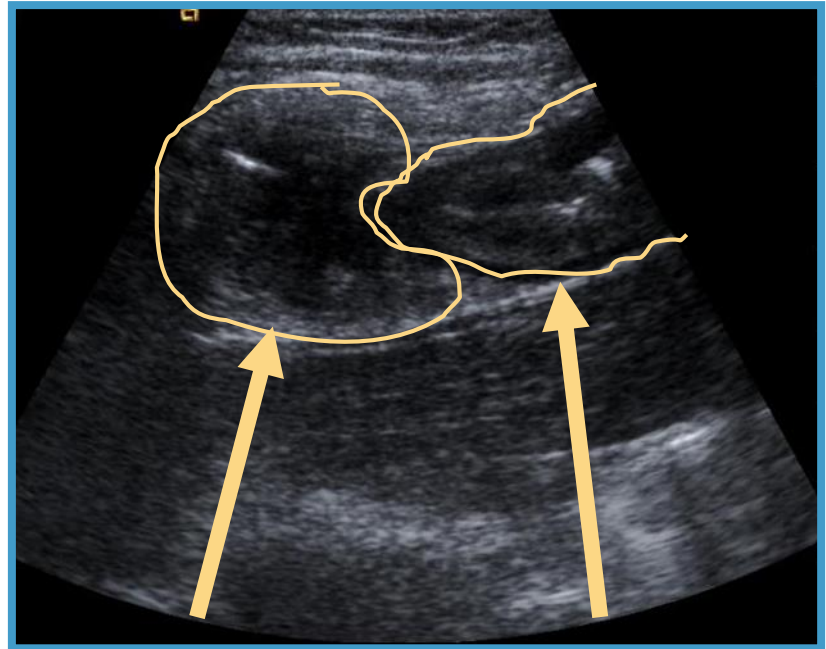


**Ileocolonic anastomosis**

## Bowel US features: fistula and abscess



**Fistula**



**Abscess**

**Ileum**

# Bowel US in clinical practice

High sensitivity and specificity for assessment of IBD manifestations, disease activity and complications

## Main uses:

Initial evaluation of suspected IBD

Follow up for assessment of disease activity and complications

## Advantages:

Quick and easy, non-invasive, no preparation, no sedation, broadly available, inexpensive, no radiation, real-time movement, structures outside the gut

## Limitations:

Sometimes limitations in assessing the jejunum, proximal ileum and pelvis

Sometimes impaired by gas-filled bowel and by large body habitus



## Summary: small bowel examinations in CD

### Initial diagnosis:

MRI, US, (SBCE)

### Follow up, disease activity:

US

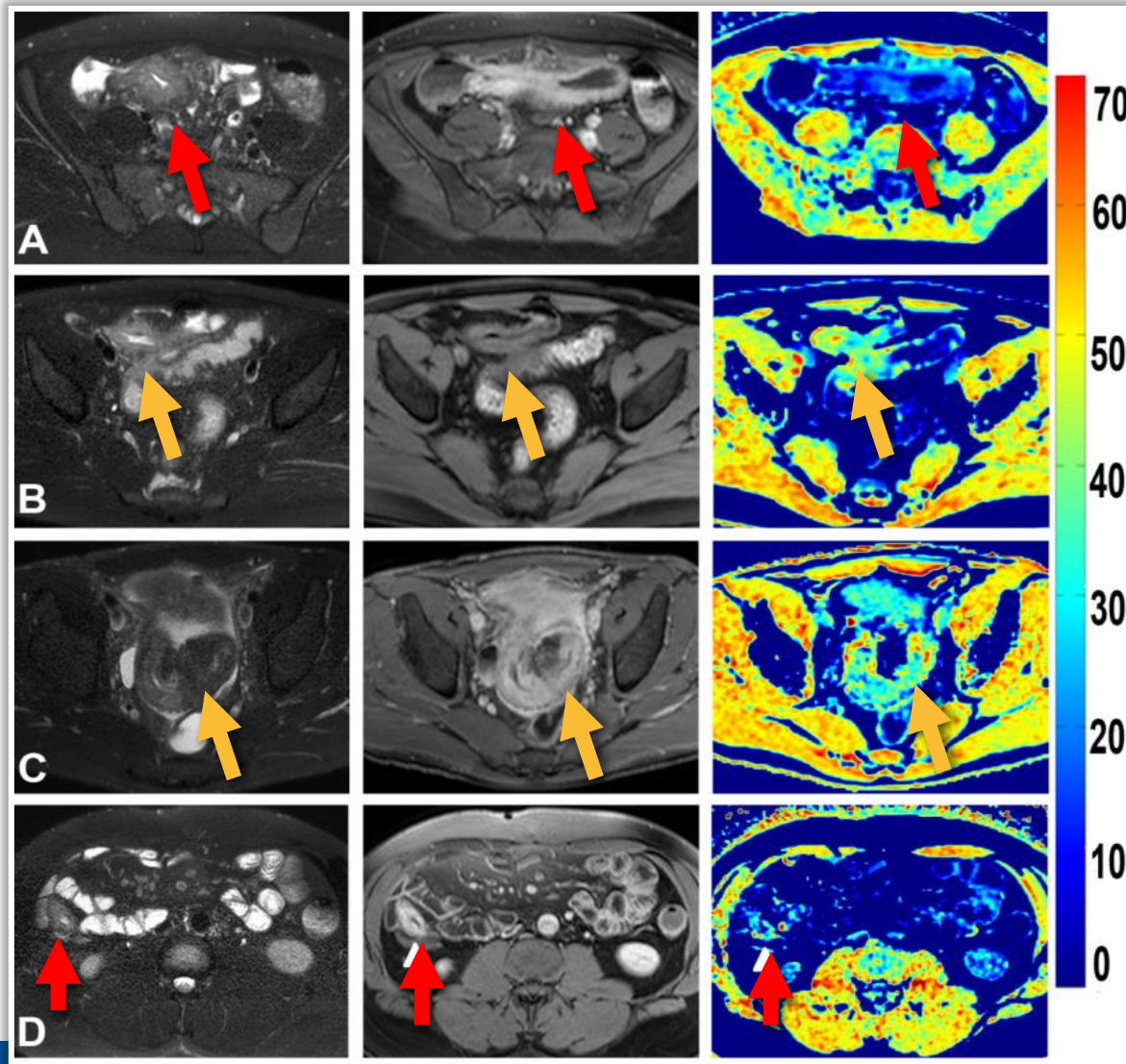
Negative findings: MRI

In case of complications: US, MRI, CT



# Magnetisation transfer MRI: examples

**T2 images (left column), contrast-enhanced T1 images, and parametrical MTR maps (right column)**



A) Female patient (18 years of age), with **acute inflammation** in the terminal ileum

B) Male patient (29 years of age) with **chronic-fibrotic stricture** (high MT)

C) Male patient (45 years of age), with **chronic stricture** (high MT)

D) Male patient (37 years of age), with **acute inflammation** (low MT)

## Summary

Imaging for monitoring will be an essential component of future IBD patient care

However, imaging should be problem-driven (“is there a question to answer?” “Will the results of imaging change treatment?”), and not on a strict regular basis

Ultrasound may be used instead of endoscopy in many situations for the monitoring of patients with IBD

MRI – if available – should be preferred over CT scans

New MRI techniques will soon be available



# Thank you for your attention



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