MRI small bowel for IBD: to give contrast or not, that is the question

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Background

MRI small bowel is a key modality in the investigation of IBD and its complications such as fistulae and abscess formation [1]

Contrast enhanced MRI better depicts the pathophysiological changes of bowel inflammation e.g. hyperaemia, increased enhancement and dilated mesenteric vessels [2]

Contrast is also useful for differentiating between abscess and inflammatory mass [1]

Numerous studies have shown contrast enhanced studies can identify disease activity, with significant correlation between histological inflammatory grade and degree of enhancement [1,2]

Background

- There is an increasing demand for MRI small bowel in the investigation and follow-up of IBD
- Giving contrast increases appointment times, creates delays in MRI and patient care
- Post-contrast MRE usefulness may only be limited to complex IBD patients with T2 and diffusion weighted sequences offering an acceptable alternative to those with non-complex IBD or first presentation of IBD

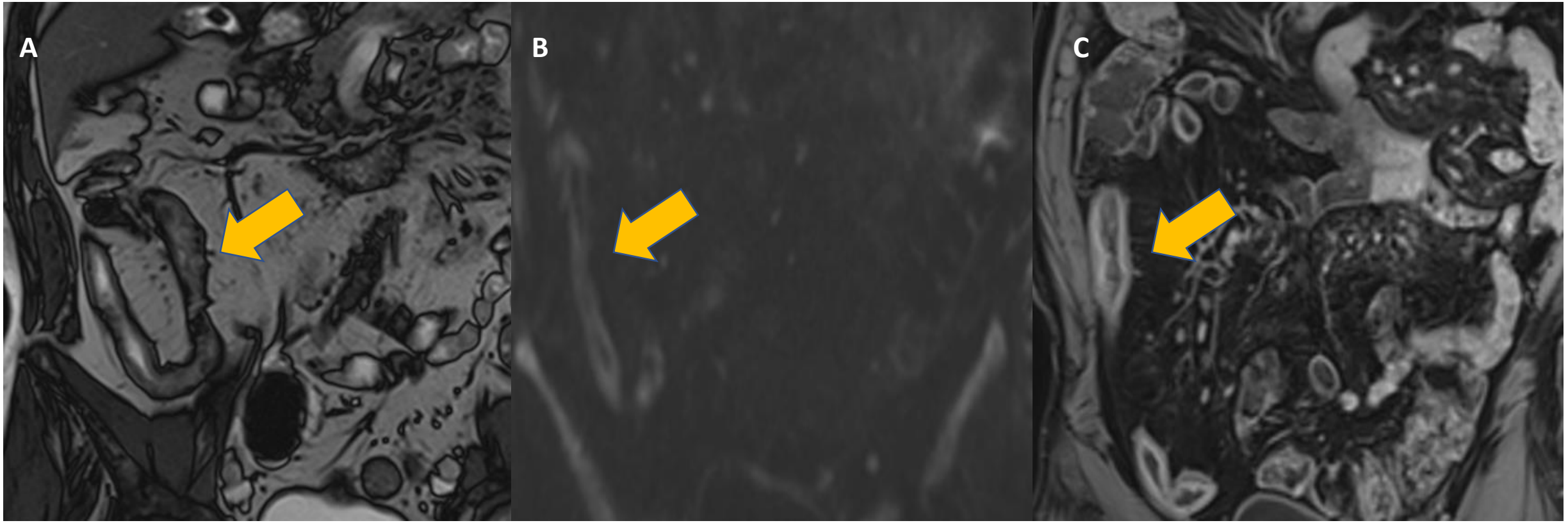
Background

- Mural hyperenhancement is non-specific in the absence of mural thickening and could be due to many causes [3]
- Studies have shown unenhanced diffusion weighted MRE has a moderate sensitivity and specificity for detection of ileal Crohn's disease [3]
- T2 hyperintensity and restricted diffusion at MRE correlates with moderate-severe endoscopic inflammation [3]

Background

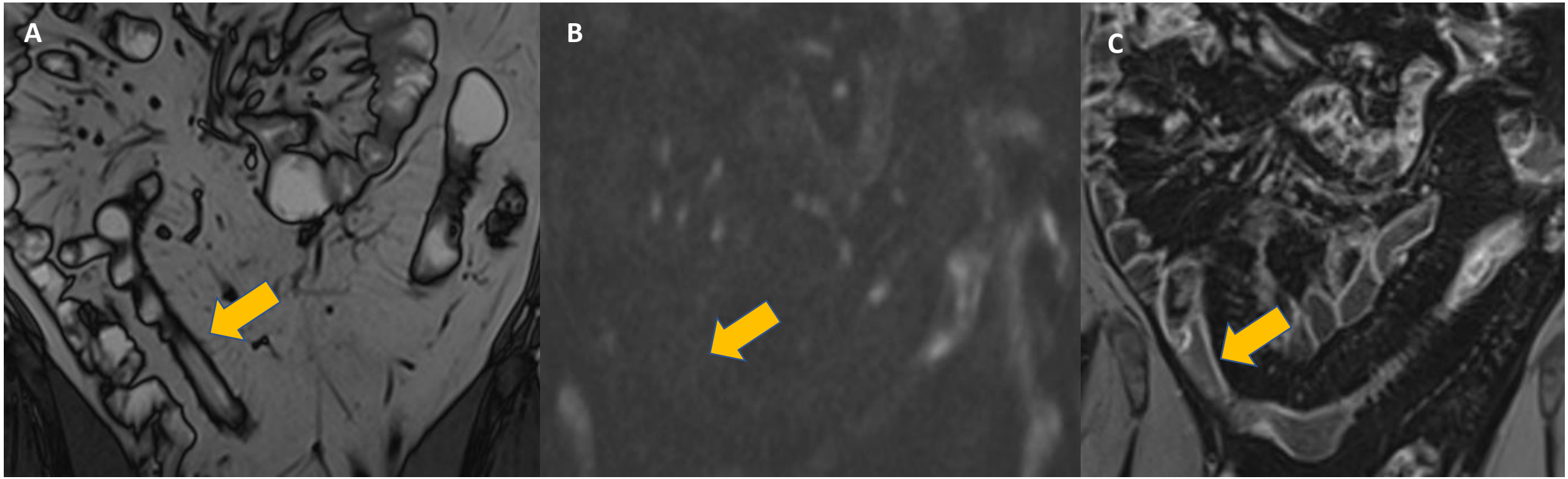
- Recent concerns have been raised regarding gadolinium chelates accumulating in the brain in patients undergoing repeated contrast enhanced studies and DW MRI may be a suitable alternative [2]
- Fat suppressed T2-weighted sequences, Balanced Steady-State Free Precession Sequences and Cine sequences can demonstrate mural oedema, ulceration and active inflammation [1]

DWI and post-contrast images in a patient with active TI disease



A) T2 coronal B) DWI coronal C) Post-contrast coronal sequences demonstrating a 25 cm length of terminal ileum with mural thickening, restricted diffusion and mural hyperenhancement in keeping with moderately active Crohn's disease.

DWI and post-contrast images in a patient with fibrostenotic disease



A) T2 coronal B) DWI coronal C) Post-contrast coronal sequences demonstrating a 30 cm length of terminal ileum with mural thickening and fat wrapping. Minimal diffusion restriction or enhancement is suggestive of predominantly fibrostenotic disease.

Background

Our centre currently uses one protocol regardless of whether inpatient/outpatient/complex disease status:
Mannitol
TrueFISP/Fiesta Ax, Cor, Sag
TrueFISP/Fiesta fs Ax, Cor, Sag
Cine cor
DWI cor
Give Buscopan
SPGR fs cor
Post contrast: SPGR fs cor at 30s, 60s, 90s

Aim

1) To identify the number of outpatients undergoing an MRI small bowel study for the investigation or follow-up of IBD in a 9-month period (January 2023 – September 2023) in a busy teaching hospital

2) To identify the number of outpatients who had an MRI small bowel with and without contrast within this period

3) To identify the number of outpatients who had a correctly vetted MRI small bowel study (with or without contrast) according to disease complexity (i.e known or suspected fistulation, abscess or inflammatory mass formation)

Method

Retrospective CRIS search from 1/1/23 – 30/9/23

Codes used: MSMBO and MSMBOC

Identify patients who were given contrast in the vetting information

Identify patients who had established complex disease (i.e. fistulae, abscess or inflammatory mass), those without complex disease and those with first presentation of possible IBD from the clinical information

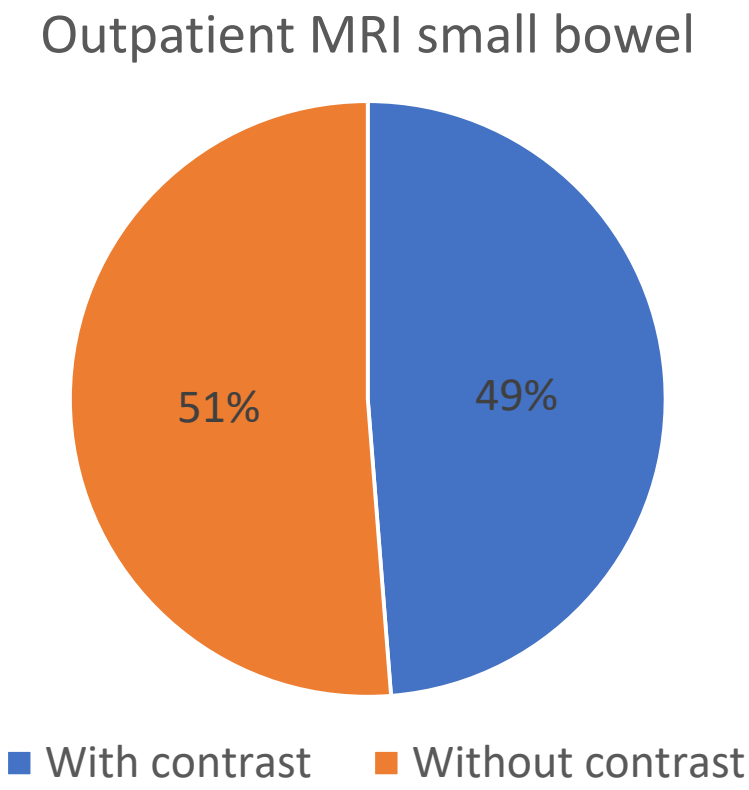
Results

A total 378 outpatients underwent an MRI small bowel study with or without contrast

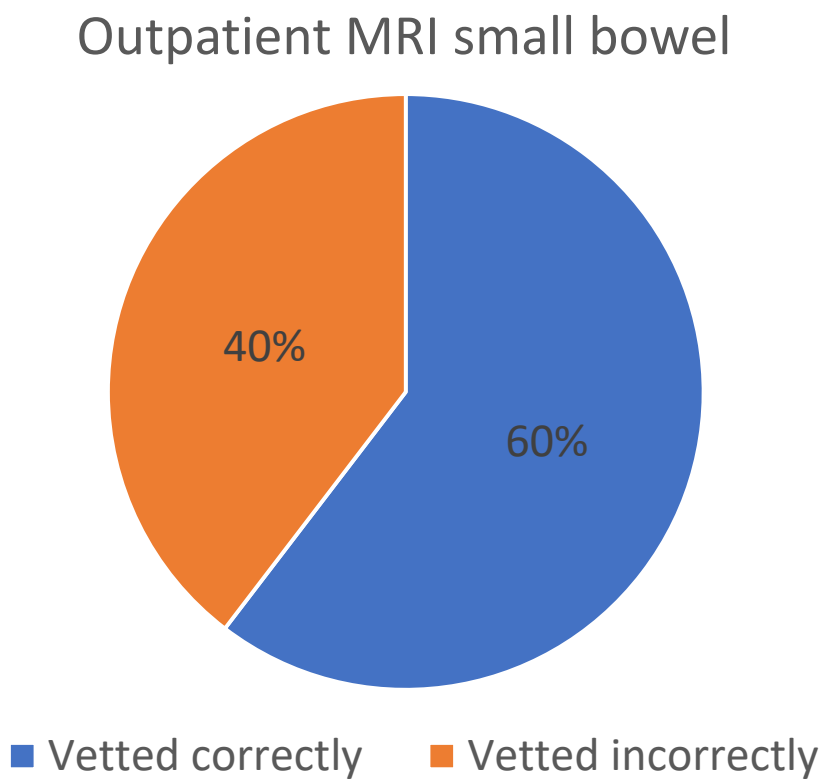
17 out of the 378 outpatient studies were not for IBD and therefore excluded (indications on excluded studies included malignancy, TB and appendicitis follow-up)

1 outpatient was recalled for IV contrast to assess disease activity as diffusion weighted sequences were non-diagnostic. The patient did not attend the follow-up

Results cont.



Results Cont.

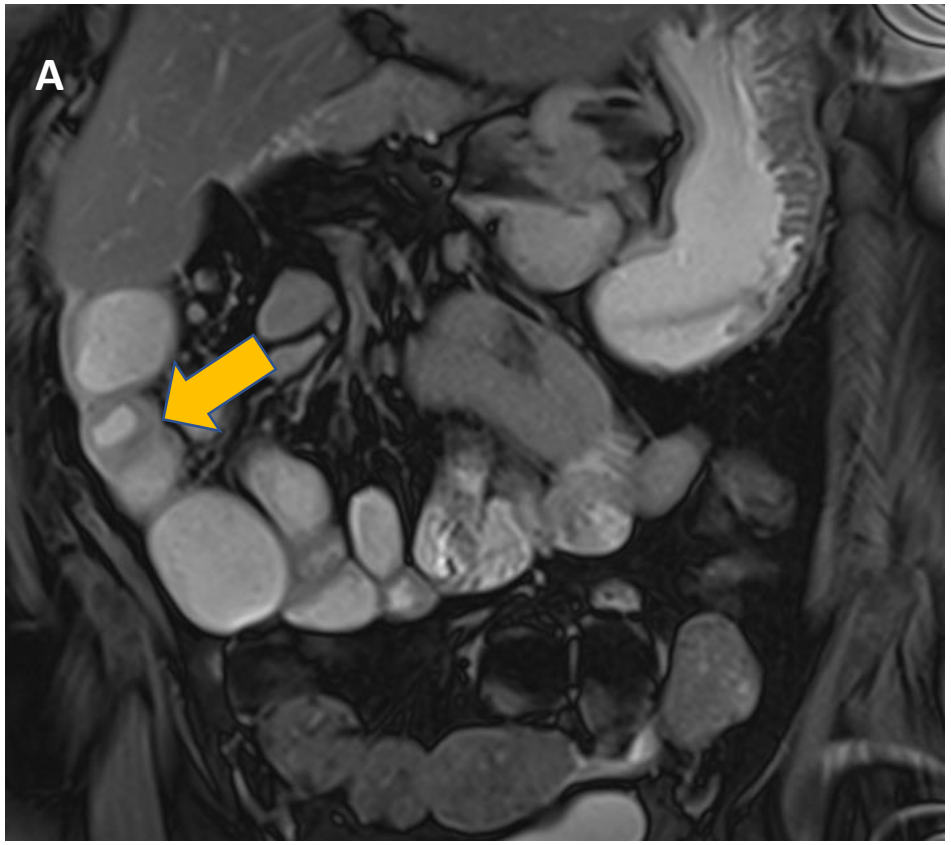


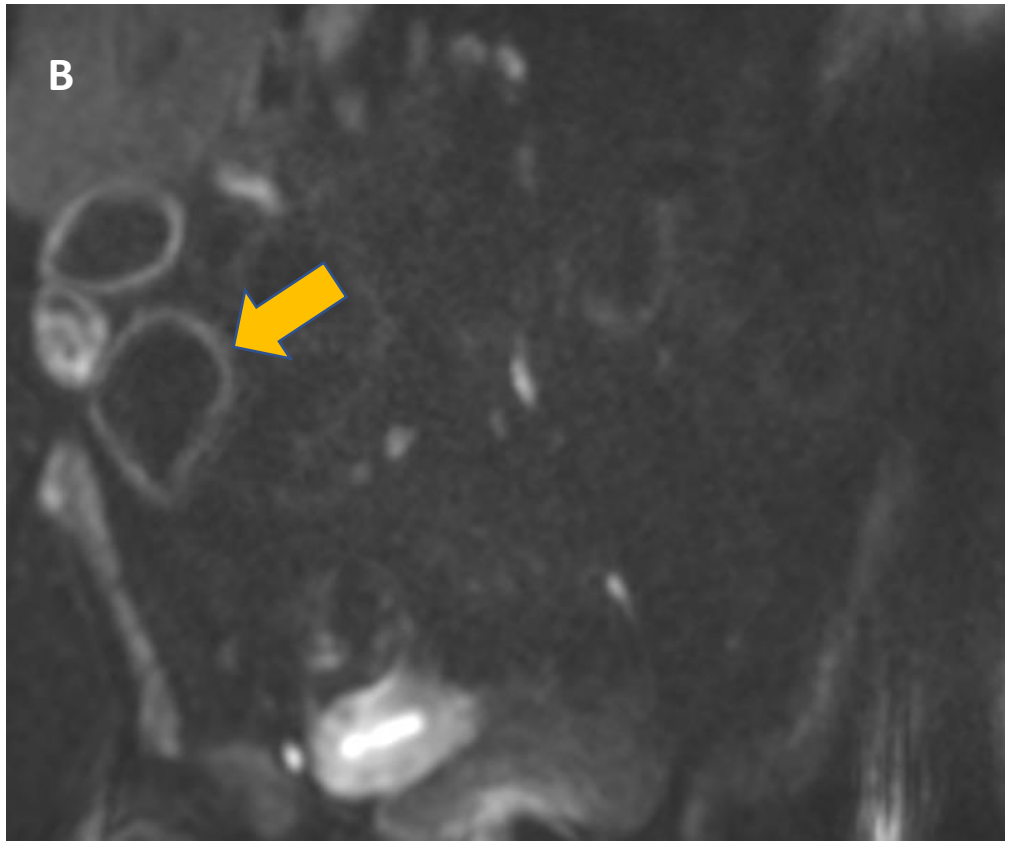
Conclusion

T2 and diffusion weighted sequences are sufficient in identifying IBD and active disease
IV contrast is useful in patients with known or suspected complex IBD
In our centre, 49% of outpatients had contrast enhanced MRI small bowel
60% of outpatient MRI small bowel studies were correctly vetted
Alternate protocols for inpatients and outpatients depending on history and disease status may help to reduce scan time, cost and unnecessary contrast administration to patients
Increasing education and awareness in the department regarding when to give contrast is of utmost importance

Cases at UHL after implementing non-contrast MRI small bowel for non-complex disease

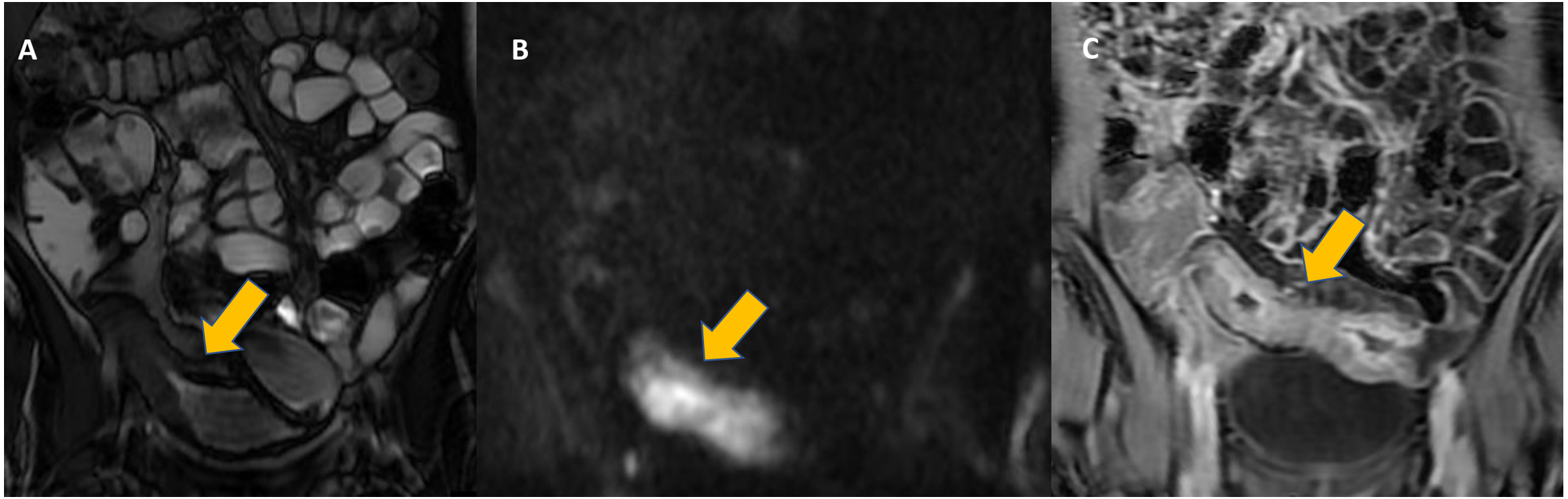
Patient X: non-contrast MR small bowel showing active disease





A) T2 coronal B) DWI coronal demonstrating active disease in a 15 cm length of terminal ileum with mural thickening and diffusion restriction.

Patient Y contrast MRI small bowel, contrast given due to incorrect protocolling



A) T2 coronal B) DWI coronal C) Post-contrast coronal sequences demonstrating significant active inflammation in a 12 cm segment of the terminal ileum with marked circumferential mural thickening, moderate transmural T2 hyperintensity, restricted diffusion and hyperenhancement. Contrast was not required in this case.

Proposed protocols

- Inpatient – abbreviated protocol:

Small oral fluid load

Limited protocol: T2, T2FS AX/COR, DWI, CINE, ?T1FS

- Outpatient – 2 pathways:

1. Standard: as current protocol without IV contrast
2. Known complex/penetrating disease: as current with IV contrast

Since changing practice…

- In the 9 months of introducing these changes, the Trust has saved approximately £30,000.
- Approx. 1-2 hours of MRI scanner time has been saved per week.

References

1. Chatterji M, Fidler JL, Taylor SA, Anupindi SA, Yeh BM, Guglielmo FF. State of the Art MR Enterography Technique. Top Magn Reson Imaging. 2021 Feb 1;30(1):3-11. doi: 10.1097/RMR.0000000000000263. PMID: 33528207.
2. 2. Sinha R, Stephenson JA, Rajesh A. Optimising MRI small bowel techniques. Clin Radiol. 2019 Aug;74(8):592-602. doi: 10.1016/j.crad.2019.03.007. Epub 2019 Apr 6. PMID: 30967243.
3. 3. Bruining DH, Zimmermann EM, Loftus EV Jr, Sandborn WJ, Sauer CG, Strong SA; Society of Abdominal Radiology Crohn's Disease-Focused Panel. Consensus Recommendations for Evaluation, Interpretation, and Utilization of Computed Tomography and Magnetic Resonance Enterography in Patients With Small Bowel Crohn's Disease. Radiology. 2018 Mar;286(3):776-799. doi: 10.1148/radiol.2018171737. Epub 2018 Jan 10. PMID: 29319414.

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