Concordance and Accuracy of Intestinal Ultrasound and MR Enterography in Paediatric IBD

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Background

- Intestinal ultrasound (IUS) and MR enterography (MRE) are established in imaging IBD
  - METRIC study, Taylor et al. (2018): N=284, adults, new diagnosis/relapse
    - Small bowel disease presence: MRE Se 97%, Sp 96% vs IUS Se 92%, Sp 84%

- Limited data in a paediatric-specific cohort
  - Barber et al. (2017):

	TP	FP	FN	TN	Sensitivity[a]	Specificity[a]
Terminal ileum						
US	8	5	1	6	88.9 (51.8–99.7)	54.6 (23.4–83.3)
MRE	7	6	2	5	77.8 (40–97.2)	45.5 (16.7–76.6)

Aim

- To assess i) intermodality agreement & ii) diagnostic accuracy of IUS and MRE versus a composite clinical reference standard in paediatric IBD

Methods

- Retrospective single centre study (2019-2024)
  - Patients aged <18 years
  - IUS + MRE within ≤2 months for suspected **new IBD or follow-up**
- Imaging Review
  - 2 consultant GI radiologists performed independent, blinded reads
  - Disease segmental location, severity (mild/moderate/severe), complications
- Reference Standard
  - Composite clinical standard with **histology and endoscopy where available**

Results

- 24 patients included
  - Median 16 years (IQR 15-17)
  - 15/24 (63%) for new IBD diagnosis, 9/24 (37%) for IBD follow-up

- Median interval between IUS/MRE = 14 days (IQR 5-21)

- Endoscopy + histology available in 20/24 (83%)

Do IUS and MRE agree?

- **Good intermodality agreement between IUS and MRE**

- Disease presence: 100% agreement (24/24)
  - Disease severity grade: 58.3% (7/12)

- Segmental disease location:
  - **Terminal Ileum – 100%**
  - Proximal SB, Colon, Rectum – 87.5-95.8%

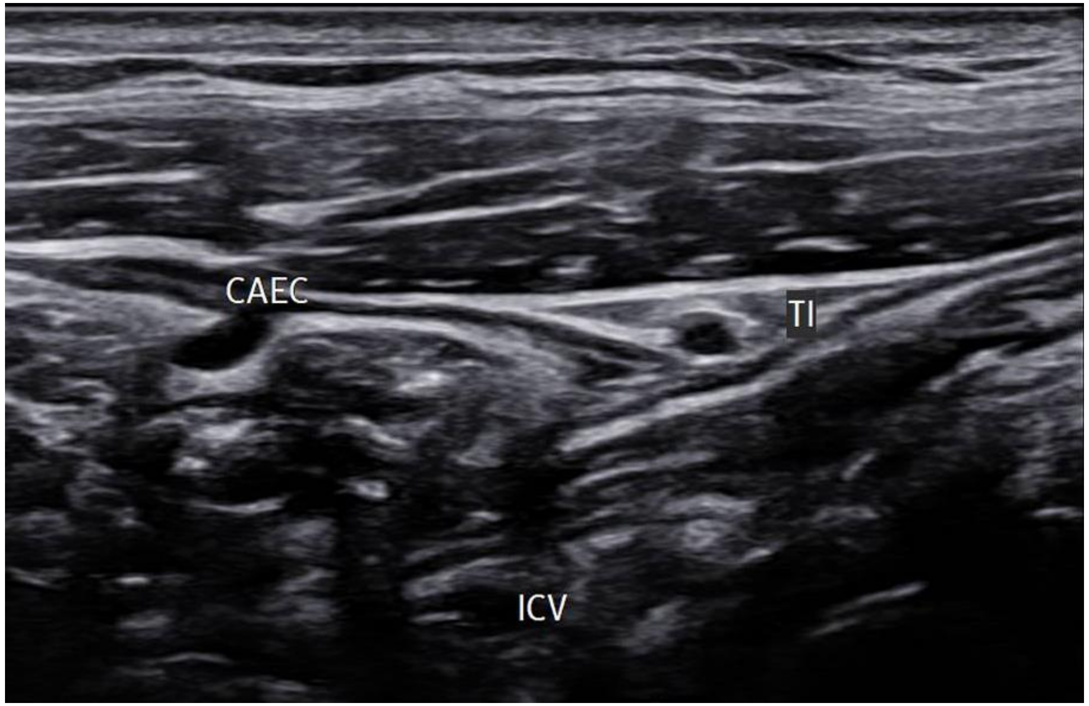
Jejunum	Proximal Ileum	Caecum	AC	TC	DC	Sigmoid	Rectum
95.8%	91.7%	95.8%	95.8%	87.5%	95.8%	95.8%	91.7%

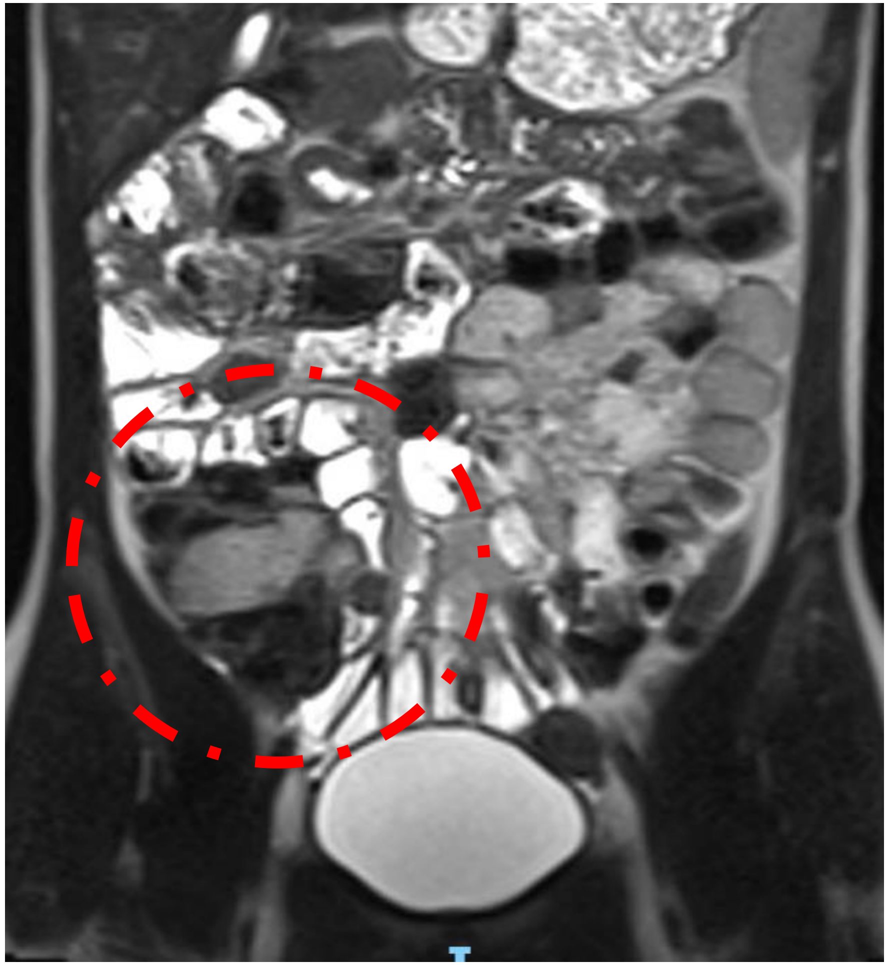
Do IUS and MRE agree?

- Penetrating/Stricturing complication: 100% agreement (4/4)

- MRE and IUS detected proximal small bowel disease not detected endoscopically in **5/20 patients (25%)** with 100% agreement
  - MRI superior for accurately *localising* affected proximal small bowel and transition points

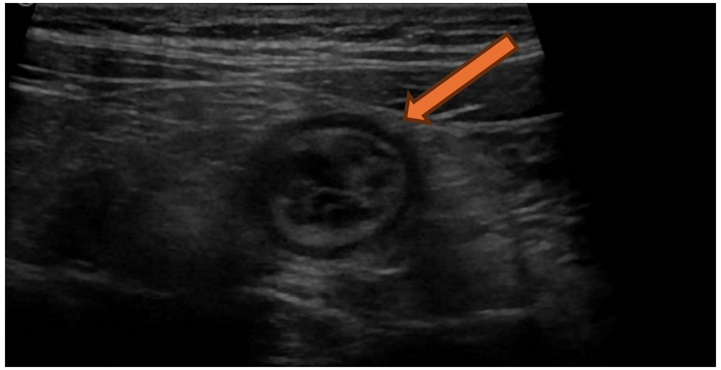
Example – Normal TI

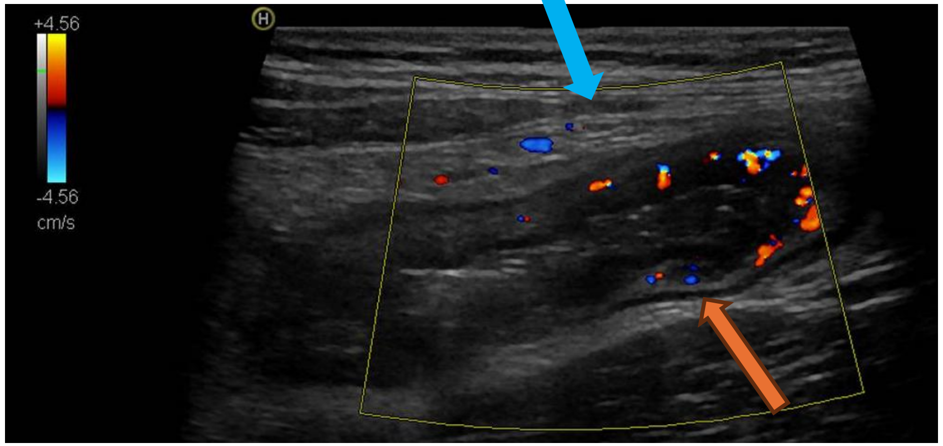


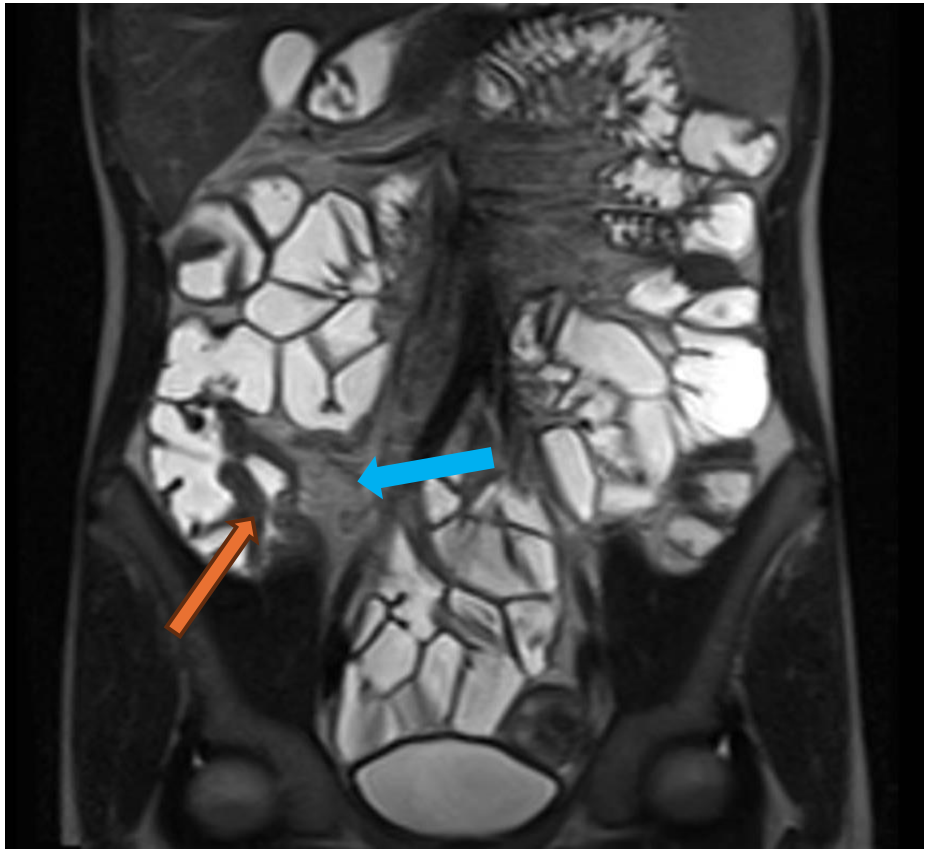


Example – active disease TI

Inflamed terminal ileum with mesenteric fat wrapping

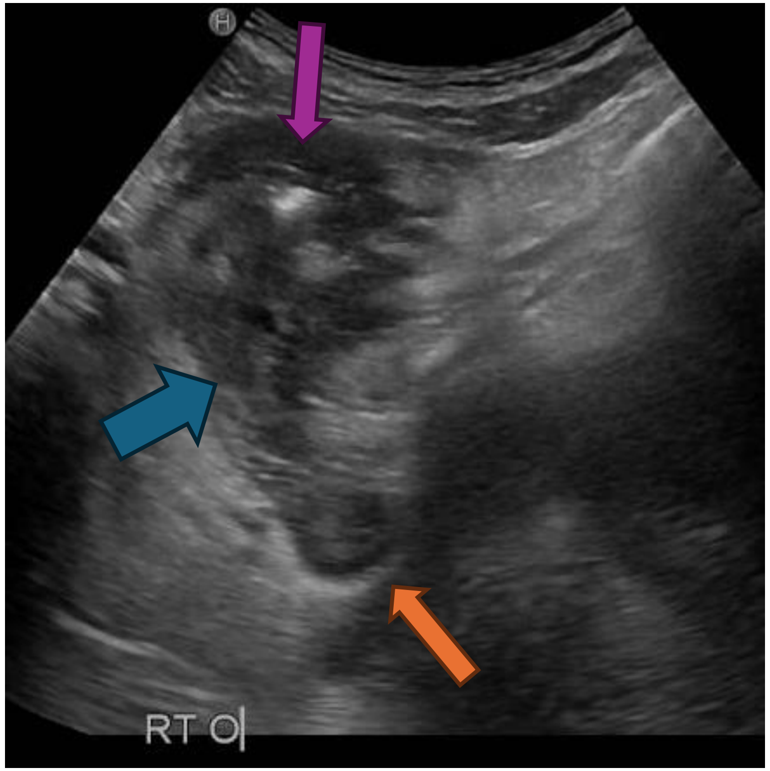


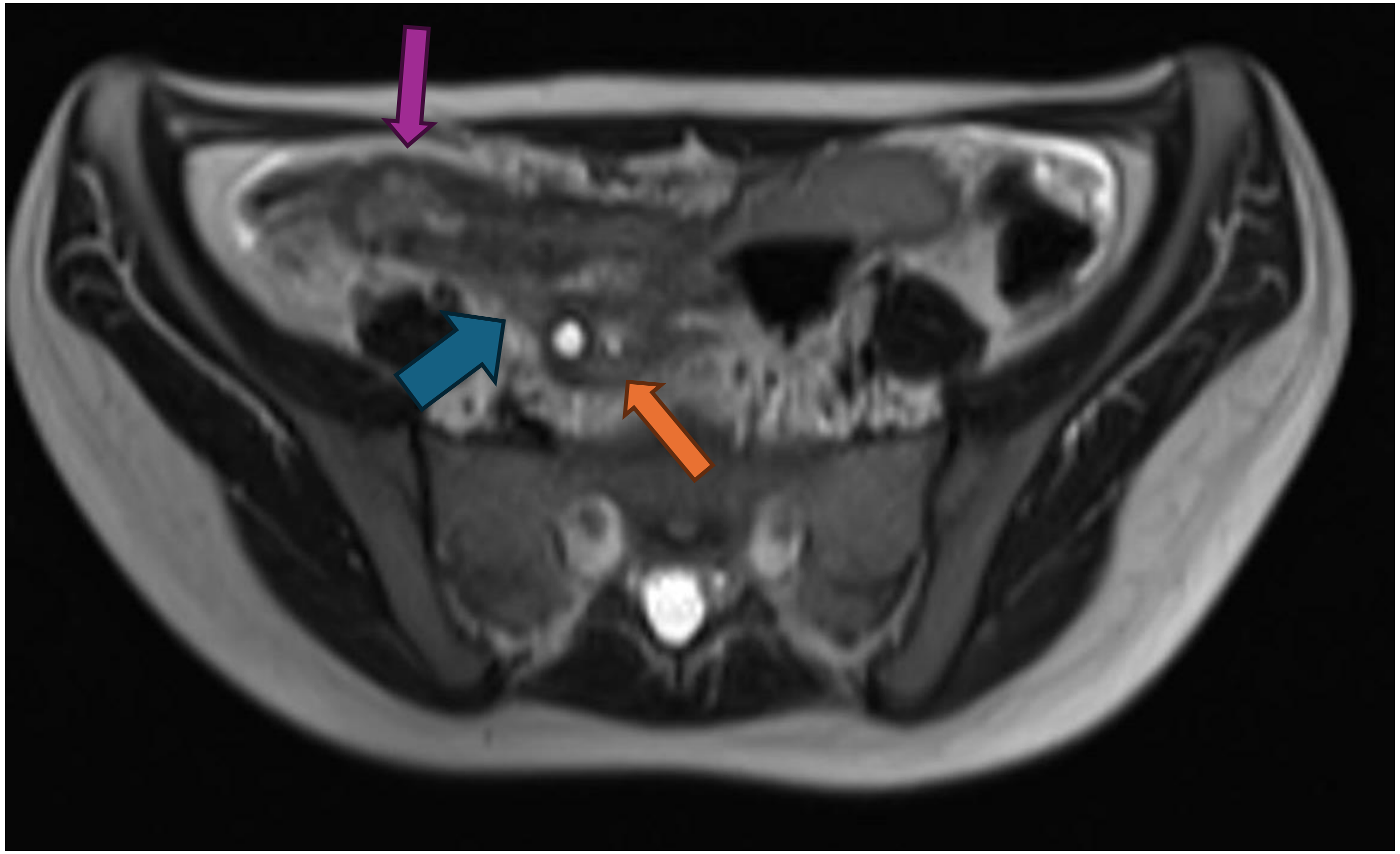




Example – Penetrating Disease

Inflamed Caecum/TI, with inflammatory tract extending to the right ovary

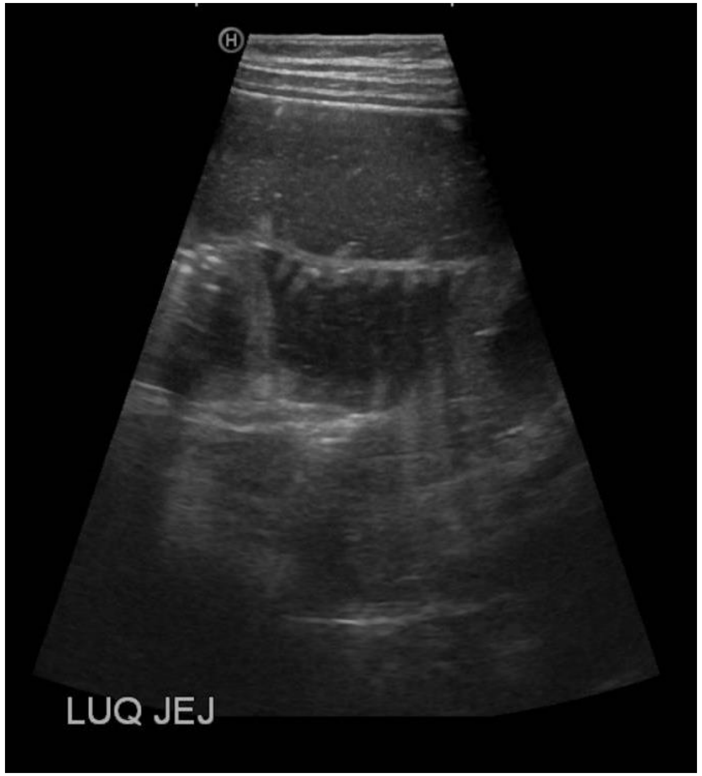


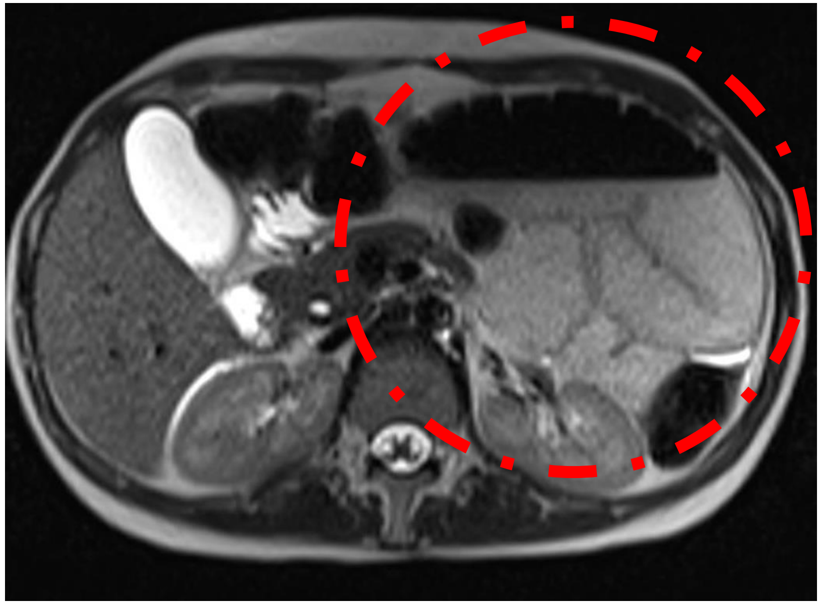


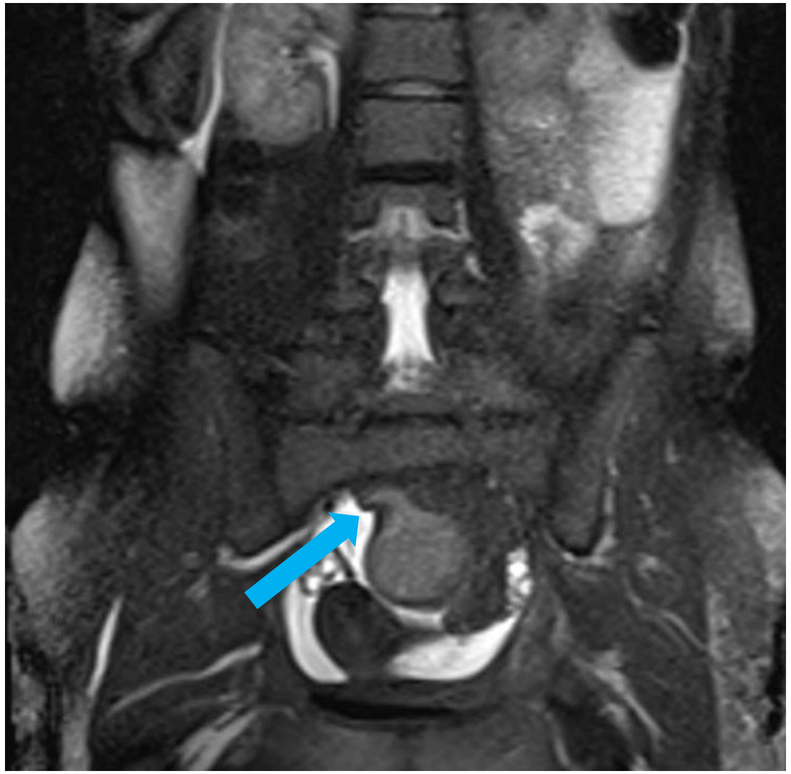
Example – Stricture with acute SBO

Obstructed small bowel loops seen both on US and MRE

*Only **MRE** identified transition point (10cm upstream of ICV)*

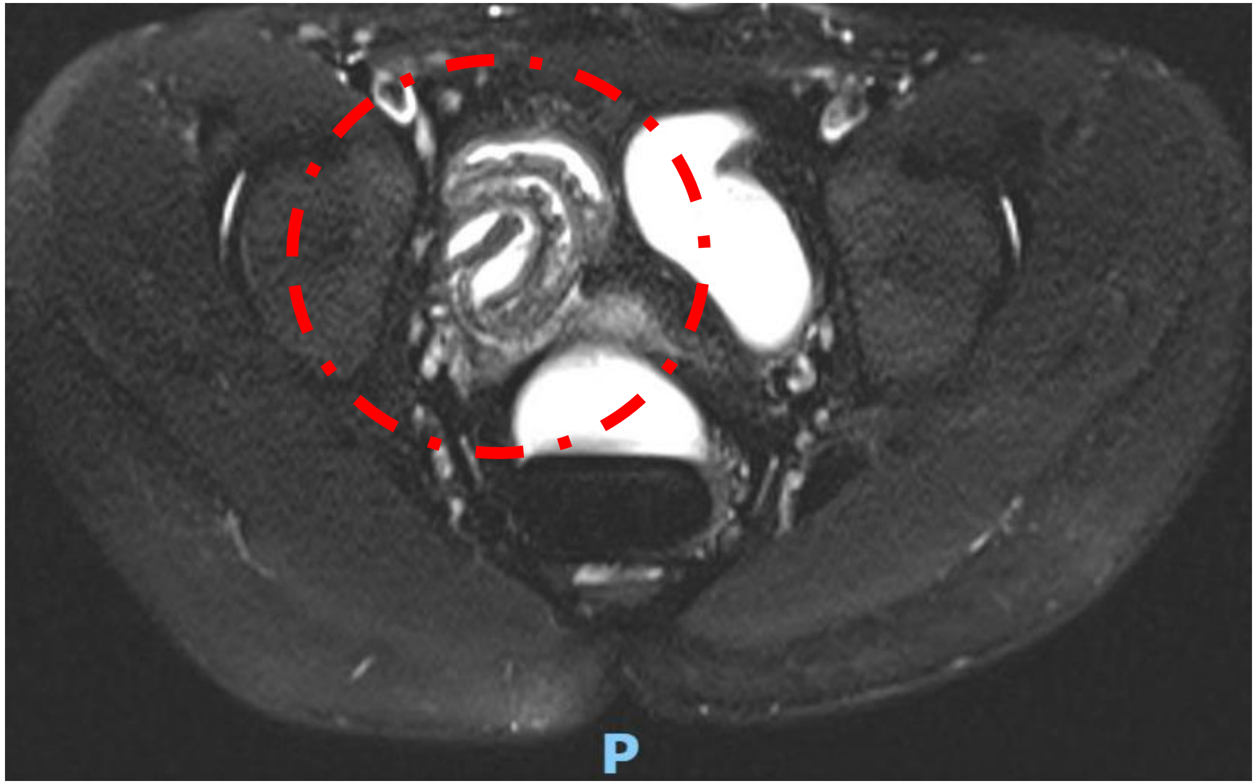






Example – non-TI SB Disease

Inflamed distal ileal loops seen within the pelvis



Diagnostic Accuracy

- Both IUS/MRE show high diagnostic accuracy for disease presence & activity, relative to the clinical reference standard

- Per patient IBD disease presence/activity:
  - **93% Sensitivity (95% CI: 66.1-99.8%)**
  - **100% Specificity (95% CI: 69.2-100%)**

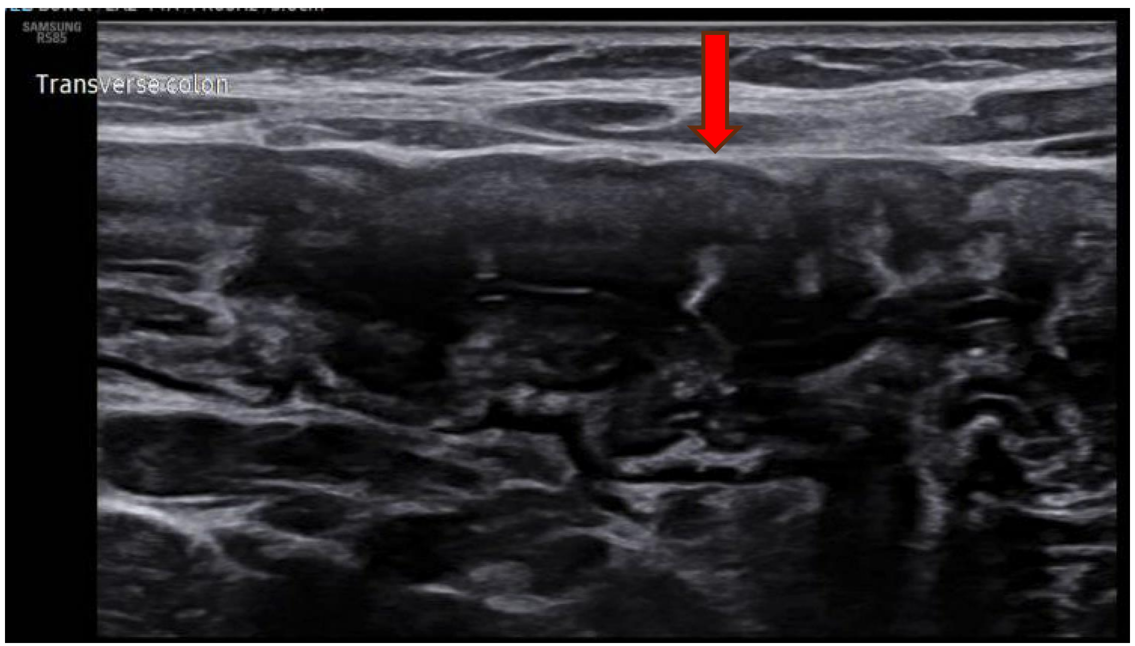
Diagnostic Accuracy

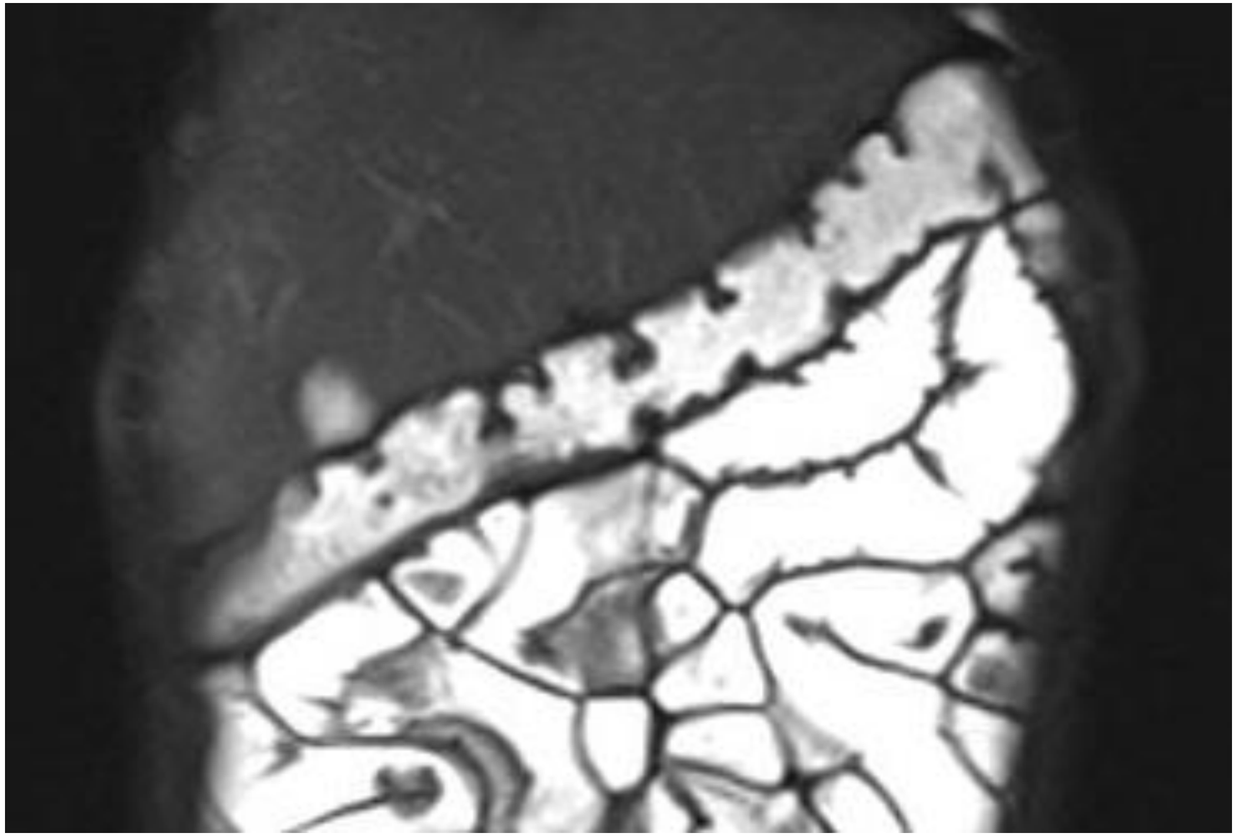
- IUS and MRE were 100% sensitive (95% CI: 65.5-100%) and 100% specific (95% CI: 78.5-100%) relative to reference standard **for terminal ileal disease**

- Colonic disease sensitivity was slightly better in IUS vs MRE
  - Caecum – 78% vs 67%
  - AC – 86% vs 72%
  - DC – 63% vs 50%

Example – Transverse Colon Disease

Inflamed *Transverse Colon* *seen on ultrasound, easier seen than on US rather than MRI*





Discussion & Conclusions

- IUS and MRE demonstrate good intermodality agreement & accuracy for IBD diagnosis and follow-up
  - Particularly for limited extent TI disease
  - Limited added value of MRE when IUS is normal
- Added value of MRE/IUS to detect proximal small bowel disease vs ileocolonoscopy
  - MRE superior to IUS at proximal disease mapping in stricturing disease
- Findings support use of both **IUS & MRE as first-line imaging options in paediatric IBD assessment**
  - Given necessity of preparation and possibly sedation/anaesthesia in MRE, IUS may be preferable – especially in younger children