Checklist for US of the bowel in children with inflammatory bowel disease

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Objective of the checklist

This outline is intended to serve pediatric sonographers as a checklist for the following:

- (1) Discussion with clinicians regarding the introduction of US of the bowel in children
- (2) Training of pediatric sonography technologists and pediatric radiologists
- (3) Bed-(scanner)-side guide during the performance of bowel US

Indications for US of the bowel in inflammatory bowel disease (IBD)

- (1) Suspected IBD, initial screening
- (2) Follow-up evaluation after conservative or surgical treatment
- (3) Evaluation of drug treatment response
- (4) Differentiation between hyperemic stenosis (=conservative treatment) and non-hyperemic fibrotic stenosis (=surgery)

Practical advantages of US of the bowel in children

- (1) Elimination of exposure to ionizing radiation (*CT enterography: 2–6× higher than small bowel follow-through [SBFT]; repeated studies raise lifetime cumulative dose*)
- (2) Diagnostic accuracy is relatively high (*sensitivity: 74–88%; specificity 78–93%*)

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- (3) Early changes easier to appreciate (*mild focal bowel wall thickening and hyperemia*)
- (4) Rapid and effective complement to clinical decision-making (*positive predictive value 99.5%: positive blood work-up with bowel wall thickening*)
- (5) Preparation for US not obligatory (*avoid oral contrasts and enteric tubes*)
- (6) Fastest imaging modality (*15 min*)
- (7) Widespread availability of US scanners and easier accessibility (*"while-the-clinician-is-waiting" and same-day studies*)

Practical limitation of US of the bowel in children

May not be able to visualize adequately all segments of the small and large bowel all the time

Bowel US settings and modalities

A. Minimum requirement

- (1) High-frequency imaging (*transducers: linear >10.0 MHz and convex >5 MHz*)
- (2) Color Doppler (*setting: lowest. CHECK: color bar's flow setting at the bottom*)

B. Optional

- (1) Harmonic imaging (*type: wide band better than narrow band. CHECK: type of harmonic varies with transducer*)
- (2) Panorama imaging (*extended field-of-view*)
- (3) Clips (*bowel movement*)

Bowel US method of scanning

- A. Compression technique (*graded from ventral ± dorsal*)
- B. Scan planes: 2 (*transverse and longitudinal*)

Fig. 1 A color Doppler image of an inflamed terminal ileum. Numbers correspond to the findings outlined in the list of pathologies

C. Measurements

- (1) bowel wall thickness (≥ 3 mm)
- (2) inflamed segment length (*CHECK: use panoramic image*)

D. Steps

- (1) Linear transducer
 - (a) right psoas muscle and iliac vessels
 - (b) terminal ileum
 - (c) cecum
 - (d) colon: ascending–transverse–descending–sigmoid
 - (e) duodenum–jejunum–ileum (*LUQ, LLQ, RUQ, RLQ*)
- (2) Convex transducer
 - (f) rectum

E. Pathological findings: gray-scale, color Doppler ($\pm$ measurement, $\pm$ clip)

- (3) echogenicity: hypoechogenic, hyperechogenic
- (4) disruption: no, yes (*incomplete: ulcer; complete: phlegmon, enteromesenteric fistula*)
- (5) color signal: normal, increased (*hyperemic*)

B. Bowel loop

- (1) narrowing (*stenosis*) $\pm$ pre-stenotic dilatation
- (2) peristalsis (*present, decreased, absent*)
- (3) inflammatory conglomerate, abscess: no, yes

C. Mesentery

- (1) thickening: no, yes: mild, moderate, severe ($\pm$ *bowel loops separation*)
- (2) echogenicity: normal, hyperechogenic
- (3) color signal: normal, increased (*hyperemic, +ve comb sign*)
- (4) fistula: no, yes (*internal: enteromesenteric, enteroenteric; external: enterocutaneous, enterovesical, enterovaginal*)
- (5) lymph node: normal, enlarged $\pm$ hyperemic

Pathological findings in bowel US of inflammatory bowel disease (Fig. 1)

A. Bowel wall

- (1) thickening: no, yes (*mild, moderate, severe*)
- (2) stratification: present, decreased, absent

Bowel US reporting

- A. Evaluation form (*systematic and objective, better follow-up*)
- B. Dedicated macro for dictation