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Authors: Maryla Kuczyńska, Anna Drelích-Zbroja, Paulina Furtak, Halina Cichoż-Lach

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Exacerbation of Crohn’s disease mimicking menstrual cramping: the diagnostic value of contrast-enhanced ultrasound in assessing acute inflammatory lesions

Maryla Kuczyńska¹, Anna Drelich-Zbroja¹, Paulina Furtak², Halina Cichoż-Lach²

1 Department of Interventional Radiology and Neuroradiology, Medical University of Lublin, Lublin, Poland
2 Department of Gastroenterology with Endoscopic Unit, Medical University of Lublin, Lublin, Poland

**Short title:** Contrast-enhanced ultrasound in patients with Crohn’s disease

**Corresponding author:**
Maryla Kuczyńska, MD
Department of Interventional Radiology and Neuroradiology
Medical University of Lublin
Jaczewskiego 8, 20-954 Lublin, Poland
Phone: +48 81 72 44 154
E-mail: maryla.kuczynska@gmail.com

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Inflammatory bowel disease has become a global problem with the highest prevalence (often exceeding 0.3%) in Europe and North America [1]. Current international guidelines and recommendations (European Crohn’s and Colitis Organization, European Society of Gastrointestinal and Abdominal Radiology, American College of Gastroenterology) underline the role of diagnostic imaging both in initial and periodic evaluation of patients with Crohn’s disease (CD). Magnetic resonance (MRE) and computed tomography enterography (CTE) exhibit similar diagnostic characteristics, with MRE being preferred due to absence of radiation. Authors aim to prove equally high diagnostic value of the contrast-enhanced ultrasound (CEUS) in imaging patients with CD [2-4].

A 43-year-old female patient presented to the emergency room due to exacerbation of persistent bile-stained vomiting (8 episodes at the day of admission) and acute abdominal pain within right lumbar and iliac regions. No symptom alleviation was observed after intravenous administration of antispasmodic agents (drotaverine hydrochloride) and nonsteroidal anti-inflammatory drugs (metamizole). She was in the first phase (period) of the menstrual cycle. The patient was diagnosed with Crohn’s disease 12 years before, had a history of multiple perianal fistulae removal and appendectomy at the age of 15. She has recently finished biologic treatment (infliximab), and at the time of admission was treated with azathioprine and mesalazine.

Physical examination revealed blood pressure of 95/78 mmHg, pain on palpation limited to previously mentioned abdominal regions with moderate bloating, no muscle guarding or peritoneal symptoms. Digital rectal exam was unremarkable except for scarring related to healed perianal fistulae. Abdominal X-ray depicted single intestinal air-fluid level in the mid abdomen. Laboratory testing indicated elevated C-reactive protein level 61.343 mg/L [norm
leukocytosis (white blood cell count 7.65 [norm 4.00-10.00x10^9]). Consulting surgeon assessed the clinical findings as menstrual-related.

However, given the previous medical history and poor clinical condition, the patient was transferred to gastroenterology department where abdominal ultrasound was performed indicating mild jejunal distension, bowel wall thickening with preserved mural stratification and hyperaemia within both the terminal ileum and angulated ileal loop in lower abdominal region. Increased hyperechogenicity of surrounding mesenteric fat and peri-intestinal trace of fluid within hypogastrium were reported as well. There was no apparent lymphadenopathy. It was decided to include CEUS and MRE in the diagnostic imaging protocol. CEUS confirmed prior ultrasound findings; additionally it revealed asterisk shaped configuration of both the previously reported ileal loop localized within hypogastrium and adjacent large intestine, raising a suspicion of fistula with surrounding inflammatory process (Figure 1A-B).

Following the initial anatomic assessment, the patient was injected with contrast agent (SonoVue, Bracco, Milan); the examination depicted vivid enhancement of the abnormal, tethered ileal loop’s wall particularly within the mucosal and submucosal layers, suggestive of active inflammatory process (Figure 1C-E). All of the above outcomes were further confirmed with a reference method – MRE (Figure 1F-H).

The patient received optimal medical treatment, including intravenous corticosteroids, mesalazine, azathioprine and metronidazole, due to her Crohn’s disease activity index (CDAI) score of 459.82 indicating acute exacerbation of CD. Based on imaging findings she was qualified for an elective surgery of the complex ileo-sigmoid fistula.

Presented case proves that CEUS might be an effective and reliable diagnostic modality in evaluating activity and severity of Crohn’s disease.
References:


Figure 1  Contrast-enhanced ultrasound was performed using Hitachi Aloka Arietta 850 ultrasound setup with L441 2-12 MHz linear transducer. Ileal and sigmoid loop tethering (A) with preserved mural stratification and apparent wall thickening (especially within mucosa and submucosa); trace of free fluid visible as well (arrow). Low velocity blood flow signals (arrows) depicted using novel Detective Flow Imaging – DFI option, indicative of bowel wall hyperemia (B). Vivid enhancement of the ileal wall with prominent cumulation of SonoVue (Bracco, Milan, Italy) microbubbles within mucosal and submucosal layers (arrows) seen in both real-time dynamic Contrast Harmonic Imaging – dCHI (C) and accumulation Motion-Compensated Microbubble Trace Imaging – MC MTI modes (D). This was numerically confirmed as seen in time-intensity curves generated for two distinct regions of interest (ROI); ROI 1 represents poorly enhancing muscular layer (peak enhancement level 7.3) and
ROI 2 represents the affected mucosal/submucosal region (peak enhancement level 16.1) (E). All the above findings were further verified with a reference method – magnetic resonance enterography. (F) Dynamic coronal T1w vibe sequence with fat-saturation depicting ileal and sigmoid loop tethering with early contrast enhancement of the mucosal/submucosal layer of the affected ileum (arrow), indicative of acute inflammation. (G) Axial STIR images indicate discrete ileo-sigmoid fistula (arrow); prominent edema of the ileal wall and surrounding fatty tissue is seen as well (star). Axial diffusion-weighted imaging (DWI) sequence (ASSIST perfusion color settings) highlights most severe edematous lesions limited mostly to mucosal/submucosal layers (arrow) (H).