

## Value of abdominal ultrasound for evaluation of acute infectious ileitis in children<sup>☆</sup>



## Valor de la ecografía abdominal en la evaluación de la ileítis infecciosa aguda en niños

Dear Editor,

Infectious ileitis is an infrequent cause of abdominal pain in the paediatric population. It manifests with abdominal pain, diffuse or localised in the right iliac fossa (RIF), with or without diarrhoea, and it may mimic other causes of acute abdomen, such as appendicitis, intussusception or ovarian diseases.

Its characteristic sonographic appearance is the symmetrical thickening of the walls of the terminal ileum.<sup>1</sup> Depending on the causative agent, the inflammatory mucosal changes may extend to the caecum, appendix and right colon. In cases of exclusive involvement of the ileum and appendix, clinical and laboratory features alone do not allow differential diagnosis of infectious ileitis and acute appendicitis.

We conducted a retrospective study of the patients that received a diagnosis of ileitis in our emergency department between 2014 and 2019 (84 cases). We only included patients in whom stool samples had been collected for microbiological testing (41/84; 48.8%). The ultrasound examinations were conducted by different paediatric radiologists and later reviewed by a single radiologist. An ileum wall thickness greater than 2 mm<sup>2</sup> on ultrasound was considered pathological. Data were analyzed using student's t test and chi square test,  $p < 0.05$  considered significant.

The results of stool culture were positive in 51.2% of cases (21/41), confirming the diagnosis of infectious ileitis. *Campylobacter jejuni* was the enteric pathogen identified most frequently (Table 1). Fever was more frequent in patients with positive culture results (80.9% vs 50%;  $P = .037$ ). We did not find any significant differences in any of the other clinical and laboratory variables under study (Table 2).

The ultrasound examination revealed wall thickening in the terminal ileum in every patient (mean thickness,  $4.5 \pm 1.6$  mm; median, 4 mm; range, 2.3–9). Mesenteric lymph node enlargement, hyperechoic pericaecal fat, hypervascularization of the bowel wall, free fluid and involvement of the colonic mucosa were found more frequently in the group of patients with abnormal stool culture results (Table 2). Only 1 patient had an abnormal appendiceal diameter (>6 mm), which was associated with inflammation of the right colon, leucocytosis ( $24 \times 10^3/\mu\text{L}$ ) and elevation of acute phase reactants (C-reactive protein, 188 mg/L; fibrinogen >740 mg/dL). The patient was admit-

**Table 1** Enteric pathogens isolated in the group of patients with positive stool cultures ( $n = 21$ ).

	<i>n</i> (%)
<b>Bacteria</b>	
<i>Campylobacter jejuni</i>	8 (38%)
<i>Yersinia enterocolitica</i>	4 (19%)
<i>Stenotrophomonas maltophilia</i>	1 (4.7%)
<b>Viruses</b>	
Rotavirus	1 (4.7%)
Adenovirus	1 (4.7%)
<b>Parasites</b>	
<i>Endolimax nana</i>	1 (4.7%)
<b>Coinfections</b>	
<i>Blastocystis hominis</i> / <i>Dientamoeba fragilis</i>	2 (9.5%)
<i>Cryptosporidium</i> / <i>Dientamoeba fragilis</i>	1 (4.7%)
<i>Campylobacter jejuni</i> / <i>Dientamoeba fragilis</i>	1 (4.7%)
<i>Campylobacter jejuni</i> / <i>Dientamoeba fragilis</i> / <i>Giardia lamblia</i>	1 (4.7%)

ted to hospital for observation and pain management, and his stool culture turned out positive for *C. jejuni*.

Of all patients, 51.2% required hospital admission, in every case to monitor the course of the abdominal pain. Nine patients were referred for follow-up in the outpatient gastroenterology clinic, and 3 of them underwent a colonoscopy. The diagnosis of inflammatory bowel disease (IBD) was not confirmed in any of the patients.

In some instances, which in our series amounted to half the cases, a stool sample is not collected in children with acute ileitis. There may be 2 justifications for it: first, that diarrhoea is not always present, and second, that the turnaround time of stool culture is not quick enough to change the approach of the emergency care paediatrician, at least not immediately.

Given this, abdominal ultrasound can offer relevant information to guide the initial aetiological diagnosis. However, it is important to take into account that thickening of the ileal wall is not pathognomonic of infection. There are many other causes that can give rise to inflammation of the end of the small intestine, such as Schönlein-Henoch purpura, intestinal lymphoma or IBD.<sup>3</sup>

Based on our results, we cannot assert that mural thickness allows discrimination of the infectious aetiology of acute ileitis. The mean thickness in the group of patients with a positive stool culture ( $5.1 \pm 1.5$  mm) was very similar to the thickness found by other authors in children with IBD.<sup>4</sup>

Approximately one fourth of our patients presented to the emergency department with focalised pain in the RIF. This warranted performance of abdominal ultrasound to rule out acute appendicitis. In most cases, the appendiceal diameter neared the pathological threshold of 6 mm. It is important to remember that the mere presence of terminal ileitis does not rule out the possibility of acute appendicitis. Therefore, the presence of other sonographic features supporting the suspected diagnosis of infection could help avoid performance of unnecessary laparotomies. For ins-

<sup>☆</sup> Please cite this article as: Molina Gutiérrez MÁ, Pérez Vígara A, Martínez-Ojinaga Nodal E, Bueno Barriocanal M, López López R. Valor de la ecografía abdominal en la evaluación de la ileítis infecciosa aguda en niños. An Pediatr (Barc). 2022;96:360–361.

**Table 2** Patients given a diagnosis of acute ileitis in the emergency department (2014–2019).

	Group 1 (n = 20)	Group 2 (n = 21)	P
Age in years, median (range)	8.6 (1.1–14.8)	10.1 (3.1–15.9)	.233
Male sex (%)	11/20 (55%)	14/21 (66.6%)	.444
Symptoms (%)			
Fever	10/20 (50%)	17/21 (80.9%)	.037
Pain in RIF	5/20 (25%)	5/21 (23.8%)	.929
Diarrhoea	6/20 (30%)	9/21 (42.8%)	.393
Peritoneal irritation	6/20 (30%)	7/21 (33.3%)	.819
Laboratory findings			
Leucocytes/ $\mu\text{L}^{\text{a}}$	12,747.1 $\pm$ 6724.4	1.4430 $\pm$ 6.356	.458
Neutrophils (%)	70.9 $\pm$ 17.2	76.1 $\pm$ 10.6	.326
CRP (mg/L)	37 $\pm$ 55	76.5 $\pm$ 62.4	.07
Sonographic findings (%)			
Inflammation of mesenteric lymph nodes	18/20 (90%)	21/21 (100%)	.157
Diameter of mesenteric lymph nodes (mm) <sup>a</sup>	7 $\pm$ 2.4	8.4 $\pm$ 3.5	.346
Thickness of ileal wall (mm) <sup>a</sup>	4 $\pm$ 1.5	5.1 $\pm$ 1.5	.09
Appendiceal diameter (mm) <sup>a</sup>	4.9 $\pm$ 1.1	4.7 $\pm$ 0.7	.09
Hyperechoic pericaecal fat	2/20 (10%)	6/21 (28.5%)	.387
Mural hypervascularization	3/12 (25%)	11/16 (68.7%)	.02
Free fluid	4/20 (20%)	6/21 (28.5%)	.414
Involvement of colonic mucosa	3/20 (15%)	9/21 (42.8%)	.05

Group 1: patients with negative stool culture. Group 2: patients with positive stool culture. CRP, C-reactive protein; RIF, right iliac fossa.

<sup>a</sup> Values expressed as mean  $\pm$  standard deviation.

tance, the extension of inflammation beyond the terminal ileum suggests an infectious aetiology, and inflammation of the ileum and the caecum or the right colon are characteristic of infection by *Salmonella* and *Campylobacter* species.<sup>5</sup>

The main limitation of our study is that ultrasound is an operator-dependent technique. As concerns this study in particular, the definition of mural hypervascularization varies between authors, as some consider the presence of any Doppler signal abnormal, while for others, a certain threshold of signals per  $\text{cm}^2$  needs to be met to consider the finding abnormal.<sup>6</sup>

## References

1. Puylaert J. Ultrasonography of the acute abdomen: gastrointestinal conditions. *Radiol Clin North Am.* 2003;41:1227–42.
2. van Wassenae EA, de Voogd FAE, van Rijn RR, van der Lee JH, Tabbers MM, van Etten-Jamaludin FS, et al. Bowel ultrasound measurements in healthy children — systematic review and meta-analysis. *Pediatr Radiol.* 2020;50:501–8.
3. Kanik A, Kose E, Baran M, Sirin Kose S, Eliacik K, Sayan A, et al. Henocho-Schönlein purpura in two pediatric patients presenting as terminal ileitis. *Dig Dis Sci.* 2015;60:269–71.
4. Chiorean L, Schreiber-Dietrich D, Braden B, Cui X, Dietrich CF. Transabdominal ultrasound for standardized measurement of bowel wall thickness in normal children and those with Crohn's disease. *Med Ultrason.* 2014;16:319–24.
5. Puylaert JB, Van der Zant FM, Mutsaers JA. Infectious ileocecolitis caused by *Yersinia*, *Campylobacter*, and *Salmonella*: clinical, radiological and US findings. *Eur Radiol.* 1997;7:3–9.
6. Epifanio M, Baldisserotto M, Spolidoro JV, Gaiger A. Grey-scale and colour Doppler sonography in the evaluation of children with suspected bowel inflammation: correlation with colonoscopy and histological findings. *Clin Radiol.* 2008;63:968–78.

Miguel Ángel Molina Gutiérrez<sup>a,\*</sup>, Ana Pérez Vigar<sup>b</sup>,  
Eva Martínez-Ojinaga Nodal<sup>c</sup>, Marta Bueno Barriocanal<sup>a</sup>,  
Rosario López López<sup>a</sup>

<sup>a</sup> Servicio de Urgencias Pediátricas, Hospital Universitario La Paz, Madrid, Spain

<sup>b</sup> Servicio de Radiología Pediátrica, Hospital Universitario Infantil La Paz, Madrid, Spain

<sup>c</sup> Servicio de Gastroenterología Pediátrica, Hospital Universitario Infantil La Paz, Madrid, Spain

\* Corresponding author.

E-mail address: malacatin@hotmail.com

(M.Á. Molina Gutiérrez).

<https://doi.org/10.1016/j.anpede.2020.12.021>

2341-2879/ © 2022 Asociación Española de Pediatría. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).