ORIGINAL ARTICLE

Ultrasonographic Patterns of Non-neoplastic Small Bowel Diseases

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Background: Ultrasonography is a valuable tool in the evaluation of gastrointestinal disease by directly imaging the gut wall and the peri-gut region. With the recent improvement of ultrasonic machines, bowel disorders can be detected by ultrasonography prior to other imaging modalities. In this study, abdominal ultrasonography was used as the first-line tool to detect non-neoplastic small bowel disorders. Our goal was to classify the ultrasonographic patterns of diseased small bowel walls and to analyze the groups of these small bowel diseases.

Patients and Methods: A total of 66 patients with suspected small bowel pathology were enrolled in this study between August 1995 and February 2006. They received abdominal ultrasonography due to acute abdomen in the emergency department of National Taiwan University Hospital. Ultrasonographic patterns of diseased small bowel walls were classified as follows: Type A—palisade arrangements of edematous folds of Kerckring; Type B—short, mildly edematous, and scattering loss of folds of Kerckring; Type C1—mucosal thickening only and folds of Kerckring are not apparent; Type C2—mucosal and submucosal thickening; Type D—loss of layering structure of wall with occasional bright flecks within the wall.

Results: Type A included 16 patients with systemic lupus erythematosus enteropathy and one cytomegalovirus enteritis. Type B included five *Aeromonas* and two non-typhoid enteritis patients. Type C1 included one ischemic bowel, one protein-losing enteropathy and one *Klebsiella oxytoca* enteritis. Type C2 included three non-typhoid, three Henoch-Schonlein purpura, two tuberculosis enteritis, two eosinophilic enteritis, one Behcet's disease, and one *Vibrio parahaemolyticus* enteritis. Type D included 11 ischemic bowel, eight Crohn's disease, two tuberculosis enteritis, two nonspecific vasculitis, two nonspecific inflammation, one amyloidosis, and one case of *Ascaris* infestation.

Conclusion: Anatomic changes in the small bowel can be demonstrated by ultrasonography. However, ultrasonographic patterns are nonspecific as correlated with etiologies of non-neoplastic small bowel disease. In our study, most cases of systemic lupus erythematosus enteropathy were of ultrasonographic Type A pattern, while those of ultrasonographic Type D pattern included ischemic bowel and Crohn's disease.

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Introduction

Ultrasonography (US) is a valuable tool in the evaluation of gastrointestinal diseases by directly imaging the gut wall and peri-gut region [1–5]. The ultrasonographic features of small bowel disorders have been increasingly studied in the literature [6–8]. Thickening of the bowel wall, which results in a target lesion, has been the predominant and most frequent finding [9]. However, our studies show that some patterns are discernible, especially in patients with lupus enteropathy. Small bowel series can usually show the mucosal change in the small bowel, but the diagnostic yield is unsatisfactory [10]. US provides a safe, noninvasive and readily available tool for the evaluation of small bowel. In this study, US was used as the first-line tool to detect any non-neoplastic small bowel disorders. Our goal was to classify the ultrasonographic patterns of diseased small bowel walls and to evaluate the role of abdominal US in differential diagnosis.

Patients and Methods

A total of 66 patients with suspected small bowel pathology were enrolled in this study. They received abdominal US due to acute abdominal pain in the emergency department of National Taiwan University Hospital between August 1995 and February 2006. For those with gastrointestinal symptoms, the whole colon was first examined from cecum to rectum in sequence and the small bowel was subsequently checked. Furthermore, bowel loop diameter, bowel wall thickness, surrounding lymph nodes, preservation of layering, folds of Kerckring and peri-bowel fluid accumulation were also investigated. These patients were initially diagnosed with non-neoplastic small bowel lesions by abdominal US. The final diagnoses were all confirmed by pathology, culture and/or other imaging studies. For infective patients diagnosed with non-typhoid enteritis, *Vibrio parahaemolyticus* enteritis and *Klebsiella oxytoca* septicemia were supported by stool culture and/or blood culture. Other patients were all proven pathologically by enteroscopic biopsy or specimen from laparotomy-assisted bowel resection.

All ultrasonographic scans were performed by a convex probe with a 3.5-MHz frequency transducer, machine type SSA-250A, SSA-340A or Nemio 20 (Toshiba Co., Tokyo, Japan). Ultrasonographic patterns of diseased small bowel walls were classified as follows: Type A—palisade arrangements of edematous folds of Kerckring; Type B—short, mildly edematous, and scattering loss of folds of Kerckring; Type C1—mucosal thickening only and folds of Kerckring are not apparent; Type C2—mucosal and submucosal thickening; Type D—loss of layering structure of wall with occasional bright flecks within the wall.

Results

Type A ultrasonographic patterns included 16 patients with systemic lupus erythematosus (SLE) enteropathy (Fig. 1) and one cytomegalovirus enteritis. Type B included five *Aeromonas* and two non-typhoid enteritis patients (Fig. 2). Type C1 included one ischemic bowel, one protein-losing enteropathy and one *K. oxytoca* enteritis. Type C2 included three non-typhoid enteritis, three Henoch-Schonlein purpura, two tuberculosis enteritis, two suspected eosinophilic enteritis, one Behcet's disease, and one *V. parahaemolyticus* enteritis (Fig. 3). Type D included 11 ischemic bowel, eight Crohn's disease, two tuberculosis enteritis, two nonspecific vasculitis, two nonspecific enteritis, one amyloidosis and one *Ascaris* infestation (Fig. 4). The correlation between ultrasonographic pattern and diagnosis is summarized in the Table.