Perforated jejunal diverticulitis: a rare but important differential in the acute abdomen

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Abstract

Background: Diverticulosis of the small bowel is rare and, in most cases, discovered incidentally. However, diverticulitis and other complications are important to consider in the differential of an acute abdomen, especially in the elderly population.

Case presentation: The patient was a 59-year-old female who presented with acute lower abdominal pain progressing to peritonitis. Computed tomography scan showed a large inflamed and perforated diverticulum on the mesenteric side of the jejunum. Exploratory laparotomy revealed a dilated proximal jejunum with a 5-cm inflamed and perforated mesenteric diverticulum. A small bowel resection with primary anastomosis was performed.

Conclusions: Jejunal diverticulitis remains a diagnostic challenge. Although uncommon, owing to its high mortality rate, it is an important clinical entity to consider and requires timely management.

Keywords: Jejunal diverticulitis, Abdominal pain, Acute abdomen, Perforation, Diverticulitis

Background

Jejunal diverticulosis is a relatively rare condition with a reported annual incidence of 0.3–2.3% [1]. The majority of cases are asymptomatic and found incidentally either on computed tomography (CT) scan or at the time of operation for an unassociated condition. In a percentage of patients, akin to colonic diverticulosis, they can become acutely inflamed (diverticulitis) or have a more complicated presentation including perforation, intestinal bleeding, or obstruction [2]. Owing to the rarity of this condition and varied presentation, clinical diagnosis alone remains challenging and adjunctive imaging techniques are commonly required in order to form a prompt diagnosis.

Case presentation

A 59-year-old female presented to the emergency department with 48 h of sudden onset abdominal pain. The pain began across the lower abdomen and subsequently became diffuse involving all four quadrants. Associated symptoms included nausea without vomitus and fever. Her past medical history was significant for hypertension, type II diabetes mellitus, depression, and one episode of colonic diverticulitis managed with antibiotics alone. Vital signs were abnormal with a fever of 102 °F and tachycardia of 121 bpm, but normotensive 129/75 mmHg. On physical examination, the patient was tender to palpation throughout the lower and mid abdomen without rebound or guarding and had some fullness over the umbilical region.

Diagnostic studies

Laboratory results were notable for an elevated white blood cell count (15.3) with 81% neutrophilia. All other labs were within normal limits including blood urea...
nitrogen (BUN) (13), creatinine (0.92), and lactic acid (1.27).

A CT scan of the abdomen with oral and intravenous (IV) contrast revealed a jejunal loop with a large diverticulum on the mesenteric side with associated diverticulitis and a 5.3 × 3.6 × 4.8 cm contained perforation. There was extensive edema of the entire jejunal loop and hazy infiltration of the adjacent mesentery (Fig. 1a, b). No arrowhead sign (an arrowhead-shaped collection of extraluminal air packed between the perforated diverticulum and inflamed mesentery) was seen in this case. There was also no lymphadenopathy or ascites seen. There were also multiple duodenal, jejunal, ileal, and colonic diverticula without evidence of diverticulitis.

The patient was admitted with the diagnosis of jejunal diverticulitis with perforation but without clinical peritonitis. She was taken emergently to the operating room and underwent an exploratory laparotomy via midline incision. On entering the abdomen, a small amount of serous fluid was encountered without frank purulence. The involved jejunal loop was found to have serosal purulent exudates as well as interloop adhesions. The proximal jejunum was dilated and the distal jejunum collapsed. Twenty-seven centimeters of the proximal jejunum was resected to healthy non-inflamed edges, and a stapled side-to-side functional end-to-end anastomosis was performed. The small bowel was run from the ligament of Treitz to the ileocecal junction, and 4 other large non-inflamed diverticula ranging from 0.5 to 3 cm in diameter were seen along the mesenteric border. These were widely spaced and therefore not excised, as this would have required multiple further small bowel resections and anastomoses with associated increased morbidity. The abdomen was lavaged and closed.

**Pathology**

Gross examination of the specimen revealed a 27-cm length of the jejunum with focal areas of fibrinous material. Within the specimen were three diverticula originating from the mesenteric side of the jejunal serosa. On microscopic examination, one diverticulum demonstrated transmural inflammation with acute inflammatory exudate and perforation. The other two appeared non-inflammatory. The surrounding omentum was thickened with fibrinous exudates and focal areas of hemorrhage (Fig. 2a, b).

**Postoperative course**

Postoperatively, the patient’s course was uncomplicated. She had return of bowel function, tolerated a regular diet, and was discharged on postoperative day 6.

**Discussion**

Diverticular disease is a relatively common disorder and may be multifocal throughout the intestinal tract. Most frequently, it affects the colon; however, other sites include the jejunum, ileum, and duodenum. Jejuno-ileal diverticulosis was first described in 1794 by Somerling. It is relatively rare, comprising only 18% of all small bowel diverticula, which is likely an underestimate given they are often incidentally found on imaging [3–5]. Their etiology is unclear; however, some studies have postulated that abnormal neuromotor innervation causing intestinal dyskinesia may be a factor [6]. This causes abnormally elevated intraluminal pressure resulting in the formation of false (pulsion) diverticula at points of weakness along the intestine where blood vessels penetrate the wall, similar to colonic diverticulosis. Unlike their true counterparts (to include Meckel’s diverticula), they involve only the mucosal and submucosal layers of
the bowel wall and are typically located on the mesenteric border [5, 7]. There appears to be an association with age older than 60 years, male gender, colonic diverticulosis, and systemic connective tissue diseases [2, 6]. Familial tendencies have also been noted.

Table 1 demonstrates cases of jejunal diverticulosis with diagnosis and management reported in the literature over the last 10 years. Comparing this case to others reported in literature, our patient was younger in age (mean age = 74). She presented with an acute abdomen, whereas most small bowel diverticula are asymptomatic. The diverticula were found on the mesenteric side of the bowel, the most common location for jejunal diverticulosis. In cases published in the last decade, only one report stated finding anti-mesenteric small bowel diverticula [40]. Our patient was treated with an open surgical resection, as reported in the majority of the cases. Of note, there were reports of conservative treatment and laparoscopic resection [5, 7, 9, 12, 14, 17, 19, 25, 28, 31], but not in patients with perforated diverticulitis presenting with an acute abdomen.

In the majority of cases, jejunal diverticulosis is diagnosed incidentally either on imaging or intraoperatively. However, around 10–30% of patients present with disease complications including diverticulitis, perforation, bleeding, or small bowel obstruction [46]. Isolated perforation is extremely rare, and to date, only a few cases have been reported in the English literature. Consequently, most centers have little experience with managing these cases. It is believed that in the same manner that asymptomatic colonic diverticulosis is managed without intervention, incidental jejunal diverticulosis is not of clinical significance. However, the diagnosis and management of its complications remains a challenge.

Patients typically present with non-specific symptomatology including acute abdominal pain in varied locations, fever, intestinal bleeding, and obstructive symptoms meaning that there is reliance on adjunctive tools such as CT scans or balloon enteroscopy and often a delay in making the correct diagnosis [47]. Many have adopted management strategies with a similar approach to colonic disease. Non-operative treatment with bowel rest and antibiotics has been successful for cases of uncomplicated diverticulitis [5]. However, in patients who present with acute peritonitis, hemodynamic instability, or evidence of free perforation, an aggressive operative approach is most appropriate. On review of complicated diverticulitis cases to date, most authors have had successful outcomes with resection of the involved small bowel segment and primary anastomosis [4, 46, 48]. This is especially important when considering the high mortality (around 20–30%) associated with this disease process, mostly attributable to a delay in diagnosis. Our patient was managed in this manner and successfully discharged without the development of complications.

**Conclusion**

Complicated jejunal diverticulitis can be both a diagnostic and therapeutic challenge with a high mortality rate. We recommend that jejunal diverticulitis be considered a differential diagnosis in the acute abdomen and a CT scan will allow for the timeliest diagnosis. In cases of free perforation, operative resection of the affected segment with primary anastomosis appears to be a successful management strategy.
| Paper          | Year | Age | Gender | Preoperative diagnosis       | Distance from Trietz's lig. (cm) | Location | No. of diverticula | No. of perforations | Type | Diverticulitis | Treatment                                           |
|---------------|------|-----|--------|-------------------------------|----------------------------------|----------|-------------------|-------------------|------|--------------|----------------------------------------------------|
| Prough H [8]  | 2019 | 65  | M      | Diverticulitis                | NA                               | Mesentery| 1                 | 0                 | NA   | Yes          | Open surgery with resection                        |
| Gurala D [9]  | 2019 | 70  | F      | Small intestine diverticulitis | NA                               | NA       | 2                 | 1                 | NA   | Yes          | Failed conservative, laparoscopic surgery with resection |
| Mazahreh TS [10] | 2019 | 68  | M      | Gastrointestinal bleed        | 10                               | NA       | Multiple           | 0                 | True and false | No                                                  | Open surgery with resection                         |
| Fleres F [11] | 2018 | 88  | F      | Unknown                       | NA                               | NA       | 3                 | 1                 | NA   | Yes          | Open surgery with resection                        |
| Fleres F [11] | 2018 | 86  | F      | Volvulus                      | 150                              | Mesentery| Multiple           | 0                 | NA   | Yes          | Open surgery with resection                        |
| Abdelbaki A [12] | 2018 | 65  | F      | Small intestine diverticulitis | 45                               | NA       | Multiple           | 1                 | NA   | Yes          | Open surgery with resection                        |
| Abdelbaki A [12] | 2018 | 74  | F      | Small intestine diverticulitis | NA                               | NA       | NA                | 0                 | NA   | Yes          | Conservative                                        |
| Abdelbaki A [12] | 2018 | 87  | M      | Small intestine diverticulitis | NA                               | NA       | NA                | 0                 | NA   | Yes          | Conservative                                        |
| Syllaos A [13] | 2018 | 75  | M      | Small intestine diverticulitis | NA                               | NA       | 6                 | 0                 | False | Yes          | Open surgery with resection                        |
| Kagolanu DC [5] | 2018 | 91  | M      | Small intestine diverticulitis | NA                               | NA       | Multiple           | 0                 | NA   | Yes          | Conservative                                        |
| Ejaz S [14]  | 2017 | 76  | M      | Small intestine diverticulitis | NA                               | NA       | Multiple           | NA                | NA   | Yes          | Conservative                                        |
| Ejaz S [14]  | 2017 | 78  | F      | Small intestine diverticulitis | NA                               | NA       | Multiple           | 0                 | NA   | Yes          | Conservative                                        |
| Ejaz S [14]  | 2017 | 87  | M      | Small intestine diverticulitis | NA                               | Mesentery| Multiple           | NA                | NA   | Yes          | Conservative                                        |
| Grubbs J [15] | 2017 | 90  | M      | Sigmoid diverticulitis        | NA                               | NA       | Multiple           | 1                 | NA   | Yes          | Open surgery with resection                        |
| Kumar D [16]  | 2017 | 60  | F      | Small intestine diverticulitis | NA                               | Mesentery| Multiple           | 0                 | NA   | Yes          | Open surgery with resection                        |
| Kumar D [16]  | 2017 | 68  | M      | Small intestine diverticulitis | NA                               | Mesentery| Multiple           | 1                 | NA   | Yes          | Open surgery with resection                        |
| Cui J [17]   | 2017 | 65  | F      | Small intestine diverticulitis | NA                               | Mesentery| Multiple           | 0                 | NA   | Yes          | Failed conservative, laparoscopic surgery with resection |
| Malghan L [18]| 2017 | 91  | F      | Small intestine diverticulitis | NA                               | NA       | Multiple           | 0                 | NA   | Yes          | Open surgery with resection                        |
| Karas L [19] | 2017 | 82  | F      | Intestinal mass               | NA                               | NA       | Multiple           | 0                 | NA   | Yes          | Open surgery with resection                        |
| Karas L [19] | 2017 | 80  | F      | Small intestine diverticulosis | NA                               | NA       | Multiple           | 0                 | NA   | Yes          | Laparoscopic surgery with resection                |
| Mohi RS [20] | 2016 | 62  | M      | Volvulus                      | NA                               | Mesentery| Multiple           | 0                 | NA   | Yes          | Open surgery with resection                        |
| Aydin E [21] | 2016 | 69  | M      | Small intestine diverticulitis | 20                               | Mesentery| Multiple           | 0                 | NA   | Yes          | Open surgery with resection                        |
| Tenreiro N [22] | 2016 | 81  | M      | Diverticulitis                | NA                               | NA       | Multiple           | 1                 | NA   | Yes          | Failed conservative, open surgery with resection |
| Ghressi R [23] | 2016 | 72  | M      | Small bowel obstruction       | NA                               | NA       | Multiple           | 0                 | NA   | No           | Open surgery with resection                        |
| Harbi H [24] | 2016 | 31  | M      | Unknown                       | NA                               | NA       | Multiple           | 1                 | False | Yes          | Open surgery with resection                        |
| De Minicis S [25] | 2015 | 60  | M      | Jejunal diverticula           | NA                               | NA       | Multiple           | 0                 | NA   | Yes          | Conservative                                        |
| Natarajan K [26] | 2015 | 56  | M      | Small intestine diverticulitis | 8                                | Mesentery| Multiple           | 3                 | False | Yes          | Open surgery with resection                        |
| Kassir R [27] | 2015 | 79  | M      | Small intestine diverticulitis | NA                               | Mesentery| Multiple           | 1                 | NA   | Yes          | Open surgery with resection                        |
Table 1 Characteristics and treatment of jejunal diverticulosis in cases published between 2010 and 2020 (Continued)

| Paper            | Year | Age | Gender | Preoperative diagnosis                          | Distance from Trietz’s lig. (cm) | Location      | No. of diverticula | No. of perforations | Type   | Diverticulitis | Treatment                        |
|------------------|------|-----|--------|-----------------------------------------------|----------------------------------|---------------|-------------------|-------------------|--------|---------------|----------------------------------|
| Fidan N [7]      | 2015 | 67  | M      | Small intestine diverticulitis                | NA                               | NA            | Multiple          | 0                 | NA     | Yes           | Conservative                     |
| Levack MM [28]   | 2014 | 77  | M      | Small intestine diverticulitis                | NA                               | NA            | 1                 | 1                 | NA     | No            | Conservative                     |
| Xu XQ [29]       | 2014 | 86  | M      | Small intestine diverticulitis                | 50                               | NA            | Multiple          | NA                | NA     | Yes           | Open surgery with resection       |
| Fresow R [30]    | 2014 | 73  | M      | Small intestine diverticulitis                | 0                                | NA            | 3                 | 0                 | NA     | Yes           | Open surgery, no resection         |
| Corcelles R [31] | 2014 | 63  | F      | Intestinal perforation                        | NA                               | NA            | Multiple          | NA                | NA     | Yes           | Laparoscopic resection            |
| Ojili V [32]     | 2014 | 75  | M      | Small intestine diverticulitis                | NA                               | NA            | NA               | NA                | NA     | Yes           | Open surgery with resection       |
| Zamani A [33]    | 2013 | 63  | F      | Small intestine diverticulitis                | 12                               | NA            | Multiple          | 1                 | NA     | Yes           | Open surgery with resection       |
| Aydin I [34]     | 2013 | 74  | F      | Small intestine diverticulitis                | 40–100                           | Mesentery     | Multiple          | 1                 | False  | Yes           | Open surgery with resection       |
| Singal R [35]    | 2012 | 63  | M      | Unknown                                        | NA                               | NA            | Multiple          | 0                 | NA     | No            | Open surgery, no resection         |
| Ferreira-Aparicio FE [36] | 2012 | 65  | F      | Appendicitis                                  | 0                               | NA            | Multiple          | NA                | NA     | Yes           | Open surgery with resection and ileostomy |
| Ferrarese A [37] | 2012 | 92  | F      | Intestinal perforation                        | NA                               | NA            | NA               | NA                | 1      | Yes           | Open surgery with resection       |
| Garnet DJ [38]   | 2011 | 80  | M      | Small intestine diverticulitis                | NA                               | NA            | Multiple          | 1                 | NA     | Yes           | Laparoscopic converted open surgery, with resection |
| Tan KK [39]      | 2011 | 88  | M      | Gastrointestinal hemorrhage                   | NA                               | NA            | NA               | 0                 | NA     | No            | Open surgery with resection       |
| Tan KK [39]      | 2011 | 72  | M      | Gastrointestinal hemorrhage                   | NA                               | NA            | NA               | 0                 | NA     | No            | Open surgery with resection       |
| Tan KK [39]      | 2011 | 84  | M      | Gastrointestinal hemorrhage                   | NA                               | NA            | Multiple          | 0                 | NA     | No            | Open surgery with resection       |
| Tan KK [39]      | 2011 | 70  | M      | Intestinal inflammation                       | NA                               | NA            | Multiple          | 1                 | NA     | Yes           | Open surgery with resection       |
| Tan KK [39]      | 2011 | 84  | M      | Intestinal inflammation                       | NA                               | NA            | 1                 | 1                 | NA     | Yes           | Open surgery with resection       |
| Tan KK [39]      | 2011 | 75  | M      | Intestinal inflammation                       | NA                               | NA            | Multiple          | 1                 | NA     | Yes           | Open surgery with resection       |
| Nonose R [40]    | 2011 | 86  | F      | Intestinal perforation                        | 15–50                            | Anti-mesenteric | Multiple          | 1                 | NA     | Yes           | Open surgery with resection       |
| Falidas E [41]   | 2011 | 55  | M      | Small intestine diverticulum and bowel obstruction | NA                           | NA            | Multiple          | 0                 | NA     | Yes           | Failed conservative, open surgery with resection |
| Sakpal SV [42]   | 2010 | 25  | F      | Enteritis                                     | NA                               | Mesentery     | 1                 | 1                 | NA     | Yes           | Open surgery with resection       |
| França M [43]    | 2010 | 75  | M      | Small intestine diverticulitis                | NA                               | Mesentery     | 3                 | 1                 | NA     | Yes           | Open surgery with resection       |
| Varnykel F [44]  | 2010 | 79  | F      | Small intestine diverticulitis                | NA                               | NA            | Multiple          | 1                 | NA     | Yes           | Laparoscopic converted open surgery, with resection |
| Chugay P [45]    | 2010 | 89  | F      | Small intestine diverticulum                  | NA                               | NA            | Multiple          | NA                | NA     | Yes           | Failed conservative, open surgery with resection |
| Chugay P [45]    | 2010 | 79  | M      | Small intestine diverticulum                  | NA                               | NA            | Multiple          | 1                 | NA     | Yes           | Open surgery with resection       |

PubMed database was queried for studies published from January 1, 2010 to April 31, 2020, with English language restriction. Search strategy included the term “jejunal diverticulitis.” Case series lacking patient-specific data were excluded. Lig ligament, No. number, NA not available, F female, M male
Abbreviations
CT: Computed tomography; BUN: Blood urea nitrogen; IV: Intravenous

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This is a case report, so there is no dataset. The data for the patient, however, is available upon request.

Ethics approval and consent to participate
An ethics approval committee was not required as this is a case report.

Consent for publication
Informed consent for publication of their clinical details and/or clinical images was obtained from the patient. A copy of the consent form is available for review by the Editor of this journal.

Competing interests
The authors declare that there are no competing interests in preparing this article.

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