

Diverticulitis of the appendix: is it clinically significant?

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We represent here, a case of male patient aged 32 years coming complaining of diffuse periumbilical pain since 2 days that shifted to the right iliac fossa and suprapubic areas within 6 h from onset. The condition was accompanied by vomiting (once), constipation, and fever. Abdominal examination revealed tender Mc-Burney point with rebound tenderness in the right iliac fossa; he had a pulse of 97 beats/min, temperature of 38.1°C, and total leukocytic count of 9000 c/m. Ultrasonography revealed minimal free fluid with noncompressible tubular blind structures, indicating acute appendicitis (Fig. 1). The patient was prepared for appendectomy in the usual manner through Lan's incision. On operation, two bulges were found arising from the antimesenteric border of the distal half of the appendix (Fig. 2) as diverticulae with impending rupture of one of them (Fig. 3). Both the appendix and diverticulae are seats of inflammation (Fig. 4). Appendectomy was performed and the specimen was sent for histopathologic examination, revealing diverticulitis of an inflamed appendix (type 2 diverticulosis of the appendix). We reviewed the literature to study cases on such a clinical entity and determine whether appendectomy was sufficient in all cases and whether there was actual increased risk for another diverticulae elsewhere.

Keywords:

appendiceal diverticulitis, colonic diverticulae, rare diverticular disease

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Discussion

Although acute appendicitis is one of the most common acute abdominal conditions [1], diverticulosis of the appendix is an uncommon entity [2] (Figs. 1–4). It was first described by Kelynack [3] in 1893 as a greatly distended appendix, totally shut off from the cecum, having two distinct diverticular processes directed between the folds of the mesentery [4]. Over the years several cases have been reported [5]. The incidence of diverticulae found in appendectomy specimens ranges from 0.004 to 2.1% and that from routine autopsies from 0.20 to 0.6% [6]. Some believe that the incidence may be greater than that generally appreciated and may be dismissed by surgeons and pathologists as a variant of true appendicitis [7]. However, appendiceal diverticulitis is a discrete clinical process that must be considered in the appropriate setting [6].

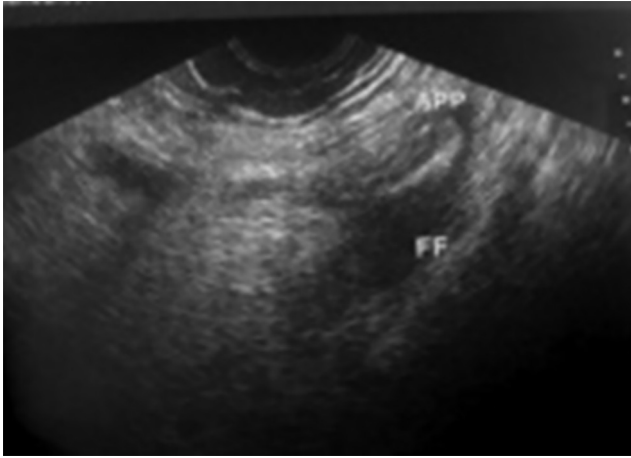
Two types of appendiceal diverticulae have been identified: congenital and acquired [8]. The acquired type, which is the most prevalent, is a false diverticulum. It represents a herniation of the mucosa through a muscular defect of the appendix (mainly on the mesenteric border) [2]. Some believe that nearly all appendiceal diverticulae are acquired [8]. The exact pathogenesis is still unknown, but several explanations have been postulated [4]. The inflammatory theory is one of these explanations: it postulates that an attack of appendicitis occurs with a postappendicitis weakness of the wall, followed by ulceration and regenerated epithelium over the injured area [9]. Alternatively, Stout [10] suggested

a combination of luminal obstruction (coupled with the 1–2 ml of appendiceal secretions that are produced daily) in the presence of active muscular contraction, which leads to development of high intraluminal pressure with subsequent formation of a diverticulum on the mesenteric border of the appendix, often at the site of entry of the artery. Others suggested a multifactorial origin [9].

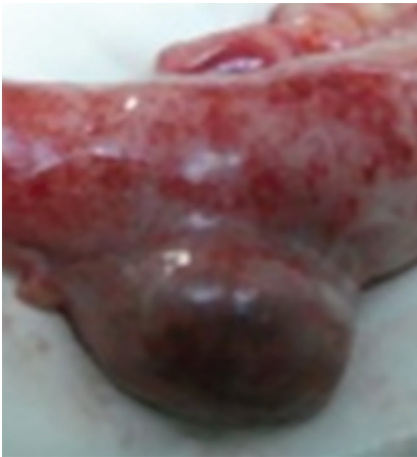
Incidental reports of congenital diverticulae have been reported [5]. The congenital type is a true diverticulum characterized by the presence of all layers of the bowel wall. This type is extremely rare, with ~50 cases reported in the literature [7]. There may be a chromosomal basis for this lesion with possible linkage to a group D chromosomal trisomy 13–15 (trisomy D13–D15 syndrome) [7]. Some have suggested embryonic deformities such as appendiceal duplication with local sacculations formed during appendiceal recanalization, or epithelial inclusion in the appendiceal wall or traction [10].

Progression from diverticulosis to diverticulitis follows a partial or complete obstruction of the lumen [11]. This may be due to swelling of the mucosa, inflammation, fecaliths, fibrous strictures, or torsion [5].

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Figure 1

Ultrasound demonstrated a noncompressible blind tube with minimal free fluid. There is difference in the usual presentation of appendicular diverticulitis and appendicitis.

Figure 3

Impending rupture of the diverticulum.

Classically, there is a diverticulum with a cylindrical appearance in the distal third of the appendix in nearly 60% of cases [12]. The acquired lesions occur on the mesenteric border of the appendix, often in association with an arteriolar blood vessel and thinning of the muscularis propria, and macroscopically it may be associated with periappendicitis [12]. Microscopic examination of the appendiceal specimen often reveals a small lumen with increased thickness of the submucosa and muscular wall, as well as atrophy of the mucosal lymphoid tissue [12] (Fig. 5).

These findings are likely physiological responses to a chronically elevated luminal pressure [9]. Appendiceal diverticula occurs in the absence of colonic diverticulosis [7].

Four subtypes of appendiceal diverticulitis have been reported. Type 1 is defined as a normal-appearing

Figure 2

Two bulges on the antimesenteric border of the appendix.

Figure 4

Type 2 diverticulosis of the appendix — that is, diverticulitis with appendicitis.

appendix with an acutely inflamed diverticulum. Type 2 involves an acutely inflamed diverticulum with surrounding appendicitis, as seen in this case. Type 3 is conventional appendicitis with an incidental uninvolved diverticulum. Type 4 is an incidental appendiceal diverticulum with no evidence of appendicitis or diverticulitis [6].

The clinical presentation varies greatly from the asymptomatic group to the seriously complicated group with 30-fold increased mortality compared with simple appendicitis [4].

Patients with diverticulosis may be asymptomatic or may just complain of persistent lower abdominal pain [13]. When acute diverticulitis develops, the patient presents with acute appendicitis. Some cases of acute appendicitis may present difficulties in diagnosis [14]. The confusion is greater in cases of

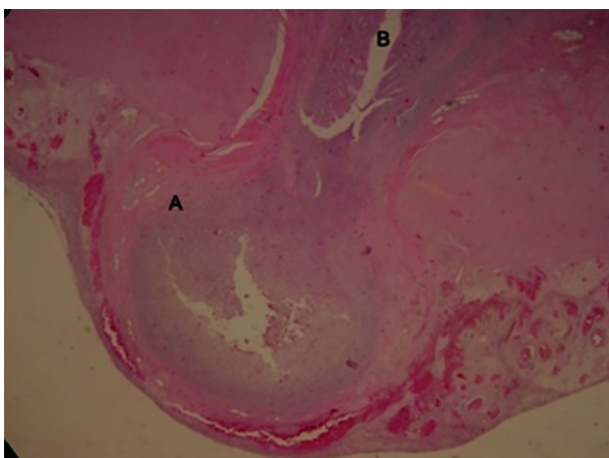
diverticulitis of the appendix [13]. On comparison with appendicitis, pain is often described as insidious in nature, intermittent, and extended over a long period. Anorexia, nausea, and vomiting, which are cardinal features in classic appendicitis [15], are usually absent [13]. Signs may be few [16]. Most of the patients would have had one or more admissions before the operative admission [16]. Appendiceal diverticulitis occurs more often in the male population [11] and in patients with cystic fibrosis [7]. Appendicitis classically manifests in patients before the third decade of life, whereas appendiceal diverticulitis usually appears after the third decade of life [17] (Table 1). Occasionally, these two conditions can be distinguished with a thorough history and physical examination. With detailed questioning, some patients will report prior episodes of right lower-quadrant pain (i.e. chronic appendicitis). Patients seek medical treatment much later than those with classic appendicitis, and if there is a delay in establishing the correct diagnosis perforation within the mesentery is found at the time of operation [17].

Perforation of the appendiceal diverticulitis is four-fold that of simple appendicitis, and there is a 30-fold increase in mortality rate. However, generalized peritonitis is unusual as the inflammatory process is contained within the mesoappendix by surrounding adhesions [18]. This ‘mass-like’ effect

Table 1 Comparison of usual presentation of appendiceal diverticulitis[4]

Symptom	Onset	Characteristic
Right lower-quadrant abdominal pain	2–13 days	Insidious, intermittent, originates in the right lower quadrant
Nausea, anorexia, emesis	Variable	Often absent
Fever	Variable	Temperature 38.4°C or more

Figure 5



Microscopic picture of a false diverticulum.

is often mistakenly identified as carcinoma [18]. Hemorrhage from the appendiceal diverticulae may also occur that sometimes requires several units of blood transfusion [12]. In addition, several cases of pseudomyxoma peritonei have been reported from appendiceal diverticuli [19]. Pseudomyxoma peritonei is a potential risk [15]. This may make removal of an appendix with diverticuli appropriate when found incidentally during surgery or upon barium enema [6]. Some suggested possible associations with locoregional neoplasms. However, most of the studies in the literature have not shown any association of it with appendiceal neoplasm or locoregional neoplasm and advised the pathologists to ensure they do not overdiagnose any reactive atypia or ruptured diverticulum as low-grade mucinous neoplasm [2]. Chronic diverticulitis sometimes presents with chronic intermittent lower abdominal pain and a mass-like effect on imaging study [18].

No current diagnostic radiographic evaluations are available for appendiceal diverticulosis [6]. Because of the likelihood of complications, diverticulosis of the appendix is a finding that radiologists stress upon. Ultrasonography has been used to identify peridiverticulitis, but its role in detecting appendiceal diverticulitis remains to be established [20].

Computed tomography is a very useful diagnostic tool (Fig. 6) especially in cases of persistent nonspecific right lower-quadrant abdominal pain. CT can identify the appendiceal diverticulum with the pericecal fat usually shows increased density. Also, a large pericecal phlegmon with or without evidence of abscess formation may be present [11]. The literature shows that computed tomography is the best imaging modality for diagnosis of appendiceal diverticular diseases [11].

Figure 6



Computed tomography (CT) of diverticulitis of the appendix.

Treatment options vary from appendectomy, cecectomy, to right hemicolectomy, depending on the extent of indurations and intraoperative findings [21].

Once the diagnosis of appendiceal diverticular disease has been established, resection is recommended. Laparoscopic or conventional resection of the incidentally discovered appendix with diverticulosis is indicated because two-third of patients will experience an episode of acute inflammation [21]. However, some investigators doubt the potential benefit of a prophylactic appendectomy [7].

Conclusion

Although diverticulitis of the appendix is an uncommon clinical entity, it should be considered because of its possible clinical significances. Its insidious onset and initial minimal signs make late presentation common. Risk for perforation is four times more than that in simple appendicitis with 30-fold increase in mortality rate. Pseudomyxoma peritonei and significant hemorrhage may also occur. Sometimes the presentation of a mass-like effect is often mistakenly identified as carcinoma. It may also be the cause of chronic lower abdominal pain. No current diagnostic radiographic evaluations are available for appendiceal diverticulosis. However, computed tomography is very useful in patients with complications. [22] Appendectomy is usually sufficient, but sometimes extended resection until right hemicolectomy may be needed. Prophylactic appendectomy is recommended because of the serious sequelae that may occur.

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Conflicts of interest

There are no conflicts of interest.

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