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Pulsion diverticula of the rectum: Radiological diagnosis and clinical implications

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Abstract

Introduction: The aim of this study was to investigate the appearance of acquired rectal diverticula on barium enema and computed tomography (CT) and to review the pertinent clinical data about this entity.

Methods: This series included 3 men and 6 women, who ranged in age from 47 to 82 years (average: 64 years). Air-contrast barium enema in 6 patients with history of anorectal disease or obstructed defecation demonstrated rectal diverticula. In these cases, multiple radiographs of the rectosigmoid region were obtained in upright position while the patient was relaxing or straining without any attempt to evacuate the barium. In 3 cases, the lateral rectal diverticula were incidental finding on CT studies that were performed for various unrelated abdominal complaints.

Results: Pulsion type of diverticulum presenting as a wide-neck outpouching was detected on the lateral rectal wall in 5 and on the posterior wall in 4 patients. They measured 2–3 cm in diameter when filled with contrast material or gas, and became even larger when the intraluminal pressure was increased by straining.

Conclusion: Pulsion diverticula of the rectum present as a wide-neck outpouching of the lateral or posterior rectal wall in adult patients. This acquired abnormality is usually associated with coexisting anorectal lesions or defecation disorders. The practising radiologists and colorectal surgeons should be aware of this uncommon condition, its appearance on barium enema and other imaging studies, and its clinical implications.

Key words: anorectal disorders; barium enema; computed tomography; rectal diverticulum.

Introduction

The rectum is a highly unusual site for the development of diverticula. This is in contrast to the colon itself, where diverticulosis is a prevalent intestinal disease among the populations of North America, Europe and Australia.^{1,2} About 50–60% of the individuals over the age of 60 years show evidence for colonic diverticulosis on barium enema examination or colonoscopy. These diverticula are caused by protrusion of the colonic mucosa through the weak points of muscular wall at the entry sites of vasa recta. They are located along the three distinct bands of longitudinal muscles known as tenia libera, mesocolica and omentalis.^{1–3}

The teniae coli merge with each other at the rectosigmoid junction to form an outer muscular layer of

the rectum. Therefore, the usual colonic diverticulosis does not involve the rectum. Instead, the rectal wall may occasionally protrude as a wide-neck outpouching that represents a true pulsion type of diverticulum.^{4–6} The latter occurs predominantly when the anterior rectal wall bulges towards the vagina as a diverticular-shaped rectocele in elderly women with relaxed rectovaginal septum.^{7,8} Rectocele is well-described in publications dealing with pelvic floor disorders and defecography; hence, it will not be re-addressed herein.^{7–9}

This article describes our experience with nine patients who had lateral or posterior rectal diverticula demonstrated by barium enema or computed tomography (CT) of the pelvis. The relevant clinical data and published literature about this entity are briefly reviewed.

Methods

Patients demographic data and symptoms

This series consisted of 3 men and 6 women, who ranged in age from 47 to 82 years (average : 64 years). They were examined by air-contrast barium enema in 6 patients and CT of the abdomen in three patients for various clinical symptoms such as rectal pain and bleeding, constipation and history of diverticular disease or defecation disorders. In one patient, a posterior rectal diverticulum seen on air-contrast colon examination was later confirmed on 2 subsequent CT studies that were done for the evaluation of an abdominal aortic aneurysm.

Imaging methods

Air-contrast barium enema examinations were performed according to the standard technique, and routine images of the colon were obtained. The patient was then brought to an upright standing position, and multiple spot films of the rectosigmoid region were exposed while the patient was instructed to relax or strain. This technique of dynamic proctography permitted assessment of the rectum during elevated intraluminal pressure when the patient attempts to evacuate the rectum through a narrowed anal canal caused by an existing lesion or spastic anal sphincter.

The CT examinations were performed with intravenous contrast enhancement, and 5-mm sections of the abdomen and pelvis were recorded. These images were

obtained during the usual breath-holding phase, which usually results in an increased intra-abdominal pressure affecting the rectum as well.

Results

The detection of rectal diverticula was an unexpected finding in our patients. However, most of them had colonic diverticulosis and associated anorectal abnormalities that included haemorrhoids (Fig. 1), rectal prolapse (Fig. 2) and obstructed defecation due to spastic anal sphincter (Fig. 3). These patients demonstrated a progressive enlargement of their rectal outpouchings during continued straining. This finding supports the concept about their development as a pulsion diverticulum when the intraluminal rectal pressure is elevated. The localized outpouching of the entire wall also indicated the true nature of such pulsion rectal diverticula. In contrast, the common colonic diverticula are caused by herniation of the mucosa through the muscular wall itself, thus, correctly classified as pseudodiverticula by pathologic definition.¹⁻³

The observed diverticula were located on the lateral rectal walls of 5 patients and occurred bilaterally in two of them (Figs 1 and 2). The posterior rectal wall was the location of 4 such lesions (Figs 3, 4 and 6). On CT images of the pelvis, the rectal diverticula were filled with gas in 2 and opacified with ingested contrast material in another patient (Fig. 5A–C). The diverticular wall was thin, measuring only 1–2 mm on CT images, and did not show any visible inflammatory changes. It had the same features as the rest of distended rectal wall. In one

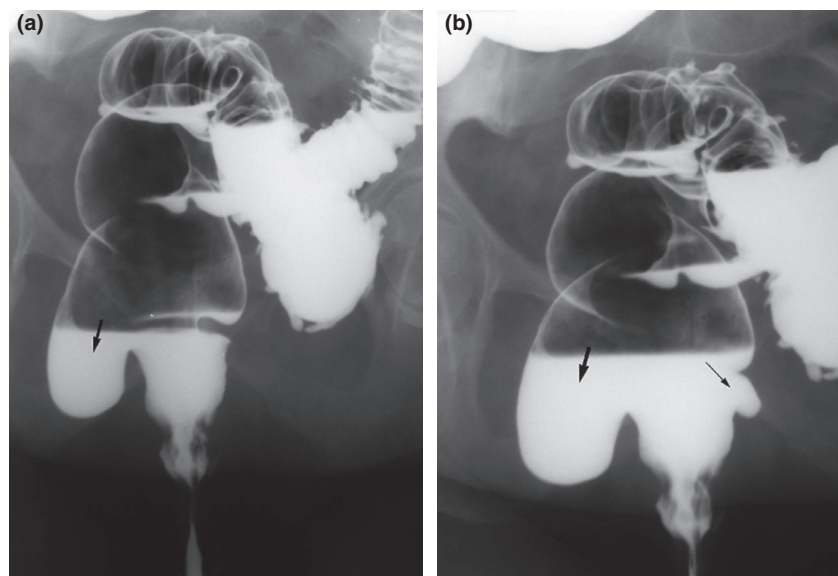


Fig. 1. Double-contrast Barium enema examination of a 65-year-old woman with rectal prolapse and sigmoid diverticulosis. (a) Radiograph obtained in upright frontal projection shows a 3-cm diverticulum of the right rectal wall (arrow). (b) Another smaller diverticulum protruding from the left rectal wall is revealed when the patient is straining (small arrow).

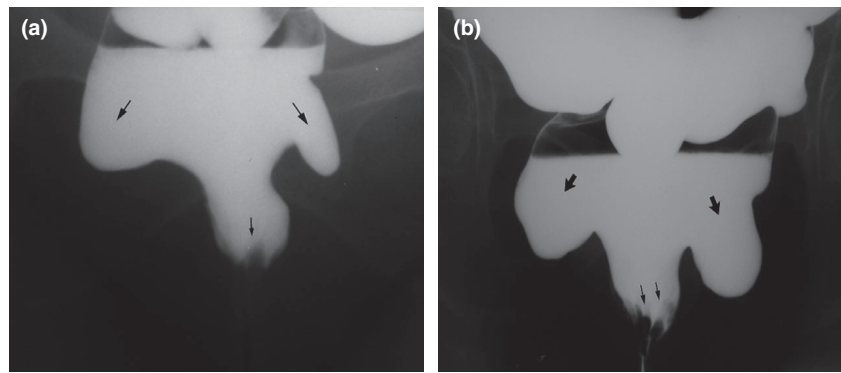


Fig. 2. Bilateral rectal diverticula in a 71-year-old woman with history of rectal pain, hematochezia and obstructed defecation. (a) Upright radiograph of the rectum during double-contrast colon examination shows the large bilateral rectal diverticula and associated internal haemorrhoids (arrows). (b) Further enlargement of both diverticula and engorged haemorrhoids are demonstrated when the patient is straining (arrows).

patient, a posterior rectal diverticulum that was initially detected on air-contrast colon examination was also demonstrated on two subsequent CT studies performed 8 months apart following repair of an abdominal aortic aneurysm (Fig. 6A–C).

The posterior rectal diverticula of 4 patients were about 2 cm in size, but those located on the lateral walls were larger and measured up to 4 cm in diameter when filled with barium or gas. They protruded into the supralelevator pelvic fat; whereas, the anterior rectocele in women is caused by focal protrusion of rectal wall into the vagina due to weakened rectovaginal septum.

Although 5 patients had subsequent colonoscopy, the existence of already known rectal diverticula was not recognized during the procedure. Upon further inquiry, however, one gastroenterologist commented that a shelf-like deformity of the rectal wall had been palpable on digital examination of the patient with large bilateral diverticula (Fig. 1).

Discussion

Diverticular disease of the colon is encountered with an increasing frequency among middle aged and elderly

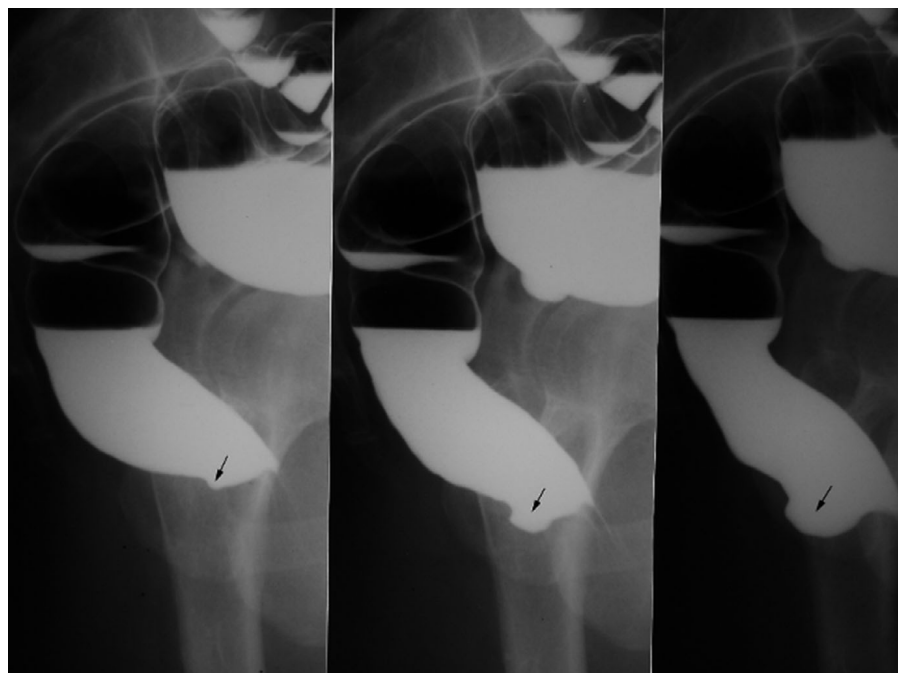


Fig. 3. Three consecutive images of the rectosigmoid region in this 47-year-old man reveal the increasing size of a posterior rectal diverticulum during continued straining (arrow).



Fig. 4. Radiograph obtained during double-contrast barium enema examination of this 55-year-old woman shows a posterior rectal diverticulum (arrow) and a few sigmoid diverticula.

patients. The predominant site of involvement is the sigmoid colon in up to 95% of the cases.^{1,2} However, the rectum itself is spared by this process due to its unique anatomy and blood supply.¹⁰ The main reason for such discrepancy is that the three separate bands of longitudinal muscles known as teniae coli are fused together at the rectosigmoid junction and form a solid external layer around the rectum. This would eliminate its involvement by colonic diverticulosis, which develops due to mucosal protrusion at the entry sites of vasa recta along the margins of each teniae coli.¹⁻³

Acquired rectal diverticula are rare, and less than one hundred cases have been reported in the medical literature.^{4-6,11} They were found with an incidence of 0.07–0.08% on barium enema studies which included 2 large series of patients.^{6,10} The exact pathogenesis for the development of these diverticula is not well-documented, since there are no distinct areas of anatomical weakness in the rectal walls.¹⁰ Nevertheless, high intraluminal pressure can lead to focal outpouching of the rectal wall as a

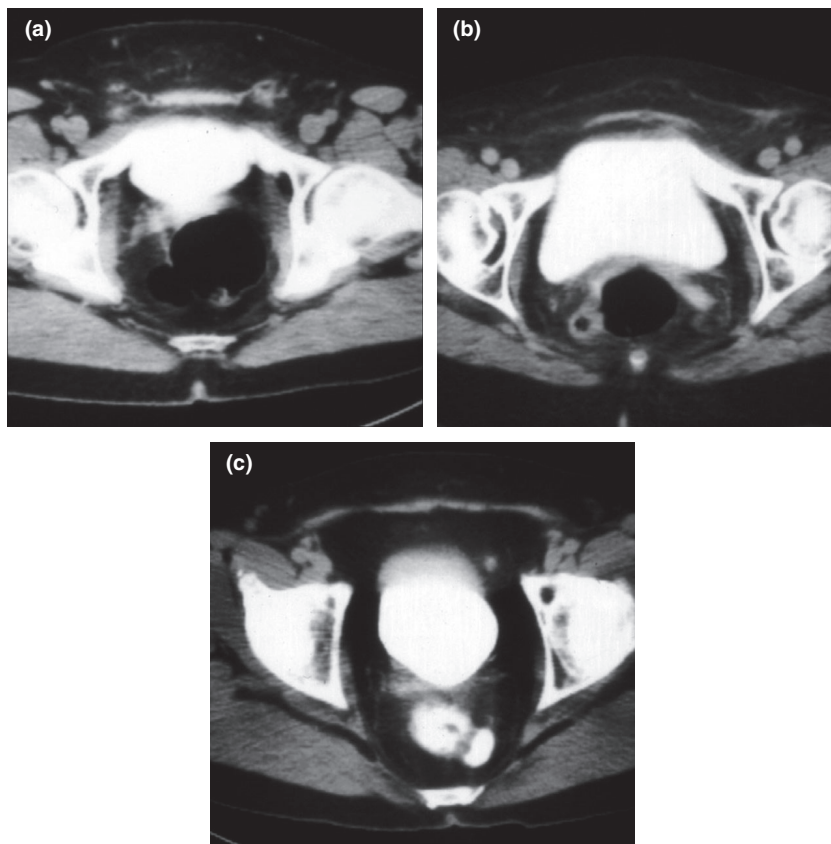


Fig. 5. (a–c) Pelvic CT images of 3 different patients demonstrate the lateral rectal diverticula that are filled with gas or contrast material. These were unexpected finding of examinations performed for the evaluation of unrelated abdominal or pelvic pain, but the diverticulum in (b) was also confirmed by subsequent barium enema examination.

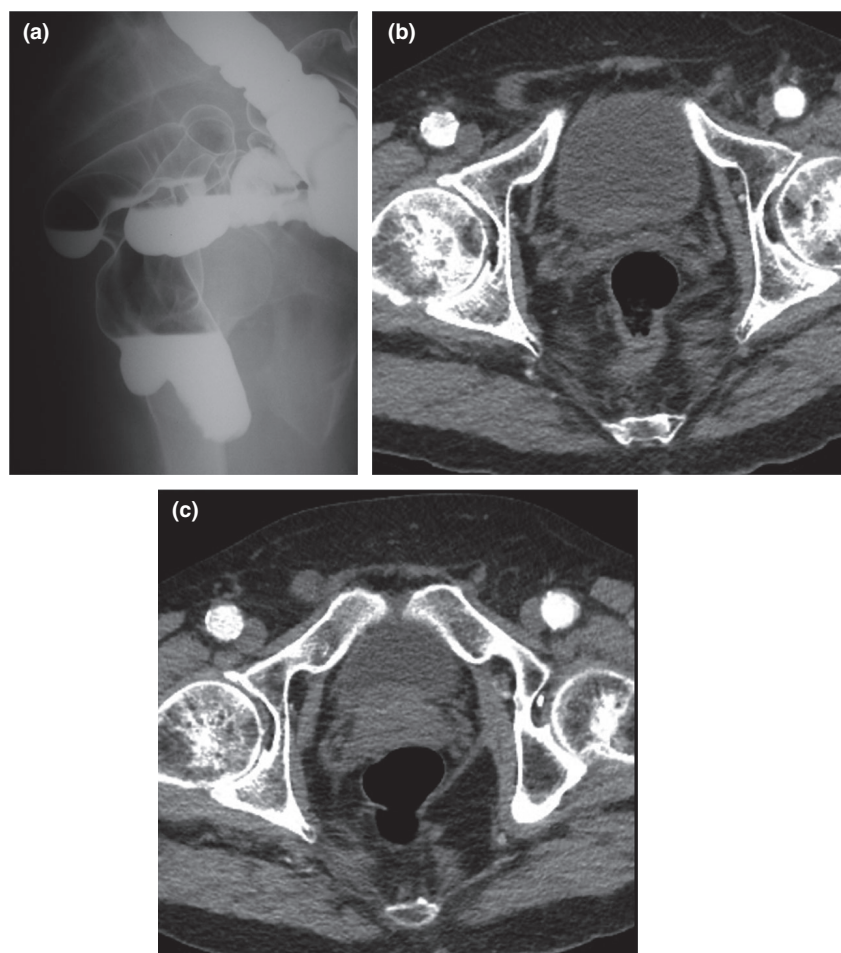


Fig. 6. (a) Radiograph from air-contrast colon examination of this 78-year-old man shows a posterior rectal diverticulum. (b, c) Images from 2 subsequent CT studies performed 8 months apart demonstrate the same lesion. Note the thin walls of the gas-distended rectum and its diverticulum.

pulsion diverticulum. This occurs most commonly when the anterior rectal wall protrudes towards the vagina as a rectocele in women with relaxed rectovaginal septum.⁷⁻⁹

The lateral and posterior diverticula presented herein were just above the location of puborectalis muscle and protruded into the supralelevator pelvic fat. It has been postulated that the muscular wall of the rectum may be thinner on its lateral aspects, thus, accounting for preferential location of such diverticula.^{1,5} However, this concept has not been verified by endorectal ultrasound or other sectional imaging modalities.

It should be noted that the herein illustrated rectal diverticula are often unrecognized during colonoscopy, but an isolated observation of this abnormality has been reported.¹¹ Digital rectal examination of another patient with large lateral diverticulum revealed a shelf-like deformity of the wall.¹² This finding was also noticed by the examining gastroenterologist in one of the cases (Fig. 1), although it was not visible at colonoscopy.

Rectal diverticula are usually an incidental finding in patients who have concurrent anorectal lesions, such as

rectal prolapse, haemorrhoids, anal fissure or stenosis. They may also occur due to functional narrowing of the anal canal caused by the spastic anal sphincter. Almost all of them have coexisting colonic diverticulosis and history of chronic constipation or obstructed defecation.⁴⁻⁶

It should be emphasized that lateral rectal diverticula are obscured and invisible on conventional defecography because the pelvic organs are viewed when the patient is sitting in lateral position. Therefore, only the anterior or posterior rectoceles will be detected by defecography procedure.⁷⁻⁹ As illustrated here, the upright frontal images obtained during barium enema examination are crucial for the recognition of lateral rectal diverticula (Figs 1 and 2). In contrast, the posterior diverticula are visualized only when the rectum is viewed in lateral projection (Figs 3, 4 and 6).

Only scant information is available regarding the diagnosis of rectal diverticula by transrectal ultrasonography (TRUS), computed tomography (CT) or magnetic resonance imaging (MRI). In a case reported by Jung and Kim, a fluid-filled rectal diverticulum was diagnosed as a

cystic lesion by MRI and TRUS, but it was not seen during colonoscopy. The patient was subsequently operated and a diverticulectomy was performed.¹⁴ In a recently published case report, an iatrogenic diverticulum originating at the location of colorectal anastomosis had appeared as a retrorectal abscess on CT and MRI.¹⁵

There have been several reports of iatrogenic rectal diverticulum following surgical treatment of haemorrhoids or rectal prolapse. These had developed at the sites of applied sutures, staples and colorectal anastomosis.¹³⁻¹⁵ It is likely that such lesions will occur with an increasing frequency in patients undergoing rectal surgery for various indications.

Complications directly related to the rectal diverticula are seldom encountered. There are a few case reports of rectal diverticulitis, perforation due to faecal impaction and inverted diverticulum causing rectal prolapse.^{12,16-18}

Two rare instances of a mucinous adenocarcinoma arising from rectal diverticulum are described in the literature.¹⁹ Accidental perforation of rectal diverticula during colonoscopy or ultrasound guided prostate biopsy has been reported.^{20,21}

Some patients with symptomatic rectal diverticulum had required resection of the lesion through endorectal diverticulectomy.^{14,22} In the majority of reported cases, however, the treatment had been directed towards the coexisting anorectal lesions or defecation disorders.

It may be of interest to note that a few cases of congenital rectal diverticulum in new-born infants have been recorded.^{23,24} There are also several publications about development of rectal diverticulum in dogs, some occurring in conjunction with perineal hernia.^{25,26}

Limitations of the study

This series of 9 cases had been collected over a period of 3 decades and reviewed retrospectively as an observational study. The 6 symptomatic patients with rectal diverticula demonstrated on air-contrast barium enema had undergone further evaluation by colonoscopy and rectal manometry prior to potential colorectal surgery for their coexisting anorectal disease. Since they did not have follow up radiological examinations, however, we could not determine the outcome of any subsequent therapeutic interventions with regard to the persistence or resolution of such diverticular outpouchings. Therefore, the small number of patients and lack of their long-term follow-up are considered as limiting factors.

In Conclusion, Rectal diverticula are very rare and may be detected incidentally on imaging studies. They are pulsion diverticula occurring on the lateral and posterior walls of the rectum, usually in patients with obstructed defecation or anorectal diseases that may cause an elevated intraluminal pressure. The practising radiologists, colorectal surgeons and gastroenterologists should be aware about the nature and clinical implications of such acquired rectal diverticula, as well as

their appearance on barium enema, CT and other sectional imaging techniques.

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