Review

Diverticular disease – A pictorial review

A.N. Chalazonitis[1], N. Ptohis[2], J. Tzovara[3], P. Porfyridis[3], V. Nikolaou[4], A. Ghiatas[3]

SUMMARY

Diverticular disease is a very common situation, especially among elderly people. Usually patients are asymptomatic but sometimes they present with symptoms ranging from minor complaints to life-threatening peritonitis. The clinical picture may resemble other pathology and further imaging and laboratory investigation is usually requested. In this review, we describe the imaging findings of diverticular disease.

Key words: diverticular disease, imaging findings.

INTRODUCTION

By the term divericular disease three different manifestations of the same disease process are included which form a continuum: prediverticular phase, diverticulosis and diverticulitis.

During the prediverticular phase of the disease there is a marked thickening of the colon wall due to the thickening of the taenia and the circular muscular layer.[1, 2]

Diverticulosis describes the presence of mucosal herniations, usually multiple, through vascular entry into the pericolic fat.[3,4] In most cases the wall of the diverticula consists only of mucosal and submucosal layers and because of this, they are referred to as pseudodiverticula. Diverticula may appear at any site of the colon, in 90%-95% of the cases though they are located in the descending colon and the sigmoid.[5,6] Usually patients are over 60 years old and it is reported that 66% of the population will suffer from diverticulosis by the age of 85 years old.[7]

Most patients are asymptomatic, but many may complain of left-sided abdominal pain and bowel habit alterations. 15% of the cases will present with lower gastrointestinal hemorrhage.[8,9] Diverticulosis is the leading cause of major rectal bleeding and is due to injury and rupture of an adjacent vessel. Up to 10%-25% of the patients with diverticulosis will ultimately progress to diverticulitis.[10,11] Diverticulitis was previously believed to be caused by entrapment of fecal material within a diverticulum resulting in erosion of the mucosa and inflammatory reaction. The increase of the intradiverticular pressure was thought to lead to perforation of the diverticulum. This hypothesis is now thought to be rare.[12] It is considered more possible that increased intraluminal pressure and/or local trauma of inspissated food particles may erode the wall of the diverticulum. The patient presents with left iliac fossa pain, constipation and/or diarrhea, fever, leucocytosis and physical examination may reveal palpable mass, either if an intramural abscess is formed confined by the colon wall, or if the inflammation spreads beyond the bowel wall resulting in the formation of an extramural abscess.[13] Extension of the inflammation to a neighboring viscus or the abdominopelvic wall may lead to fistulation. The commonest communication formed is between the colon and the bladder resulting in pneumaturia and recurrent urinary infection. Colovaginal fistula may also be formed.[14-16]

DISCUSSION

It is considered that if the clinical picture is clear, then further tests are not necessary.[17] However, a clinical diagnosis may be false in up to one third of the patients[18]. Diverticular disease can easily be demonstrated by means

[1]Department of Radiology, "Hippocration" General Hospital, Athens, Greece, [2]Department of Radiology, "Alexandra" General Hospital, Athens, Greece, [3]Department of Radiology, "IASO" General Hospital, Athens, Greece, [4]Department of Radiology, "Laiko" General Hospital, Athens, Greece

Author for correspondence:

P.Porfyridis, 31 Vosporou Str, 14234 Nea Ionia, Athens,
Tel: +0030 6973205973,
e-mail: pitgastone@yahoo.com

of today's available imaging modalities.

Abdominal and chest radiographs do not make the diagnosis of diverticulitis, but they can exclude free air, bowel obstruction or an inflammatory mass.

Ultrasound is often the first imaging modality used, and may show a thickened bowel-wall or an abdominal abscess appearing as a cystic mass with echogenic densities.[19] However, it might be non-diagnostic if there is free peritoneal air or ileus. Ultrasound can prove very useful in excluding other pelvic or gynecological pathology. Its sensitivity and specificity rates are found to be 84%-98% and 80%-97% respectively.[20]

Barium enema has long been the gold standard in demonstrating the extent of the diverticular disease, narrowing of the lumen due to muscular thickening and fistulae. Diverticulae appear as flask-like or rounded outpouchings. When seen en face they produce ring shadows. Muscular thickening results in a concertina-like or serrated appearance, there are usually spasms, reflecting abnormal.[21] This method though, has poor results in demonstrating the complications of the disease. In the acute setting, if there is peritoneal air, barium enema is absolutely contraindicated[22].

However, contrast enemas are not frequently used, especially in the acute setting, since computed tomography (CT) is available. Triple contrast enhancement is used eg, oral, rectal and intravenous. CT has a sensitivity rate of 69-95% and a specificity rate of 75t%-100% and is superior to contrast enema considering that the method plays a large role in diagnosing diverticulitis[23-27]. With this method, the size and extent of the abscess is much better appreciated. Moreover, therapeutic percutaneous drainage can be performed under CT guidance, avoiding operation and allowing a single stage procedure.[28]

On CT, diverticulae appear as outpouchings of the bowel wall, filled with air, fecal material or contrast enema (Fig. 1). The wall of the large bowel is considered thickened when its width exceeds 4mm and may reach 20mm in diverticulitis. The more severe the disease, the longer the affected colon is. Intramural air may also be demonstrated. After intravenous administration of contrast media, the inflamed wall is enhanced homogenously (Fig.2). Linear or non-linear densities within the fat adjacent to the inflammation are one of the most characteristic findings (Fig.3). Inflammatory edema of the fat adjacent to the involved colon appears hyperdense (Fig 4, 5). Free fluid in the peritoneal cavity may be accumulated, usually in the root of the mesentery. Sometimes, CT may show the inflamed or perforated diverticulum as a deformed outpouching with little air at its apex (site of perforation) (Fig. 6). When perfora-

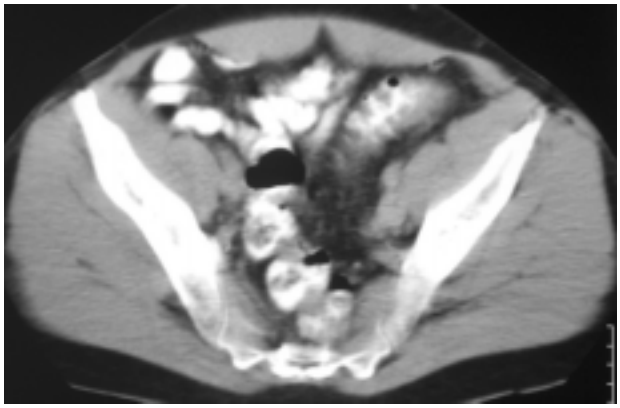

Fig. 1. CT showing divericula presenting as outpouchings of the bowel wall filled with air.

Fig. 2. Homogenous enhancement of the thickened bowel wall due to inflammation.

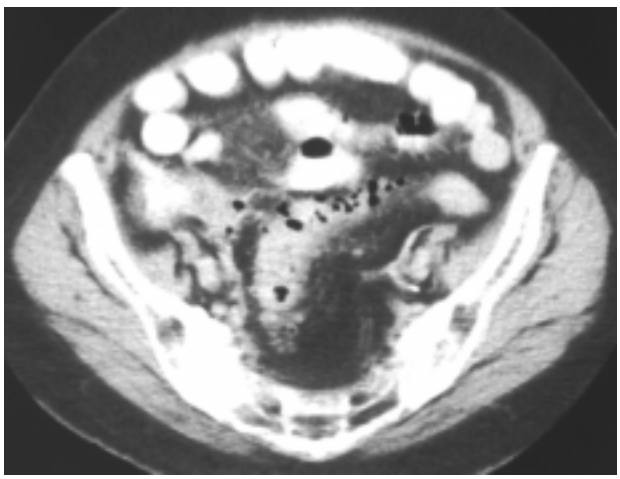

Fig. 3. Multiple divericula and linear and non-linear densities indicating inflammatory changes, involving the pericolic fat.

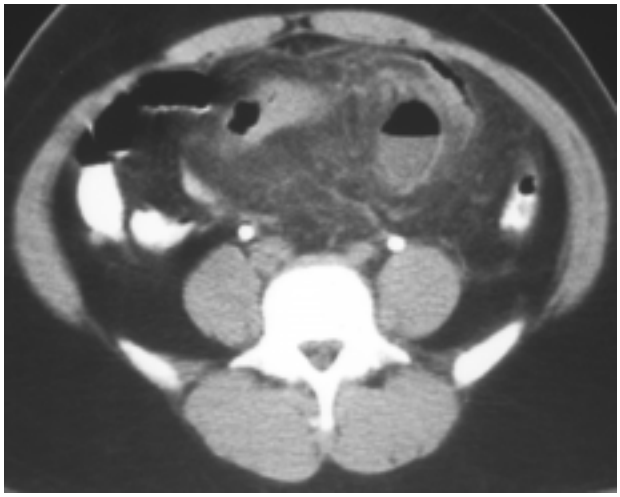

Fig. 4. There is bowel wall thickening, increased attenuation of pericolic fat adjacent to the sigmoid mesocolon and the presence of a pericolic abscess.

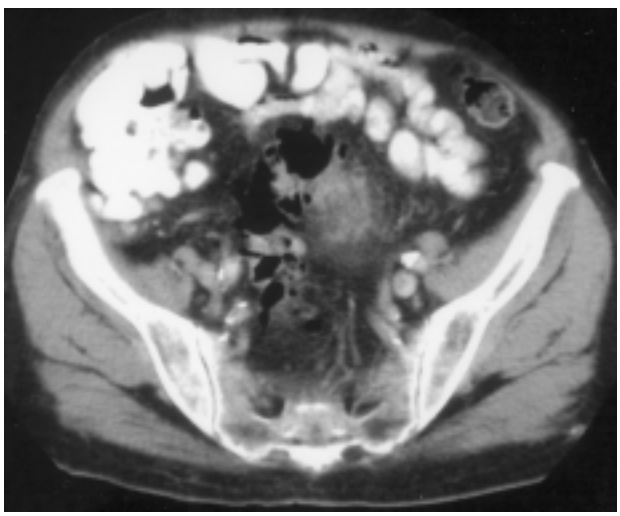

Fig. 5. Pericolonic inflammatory changes, forming a mass filled with fluid and producing adjacent fat changes.

tion of an inflamed diverticulum takes place, air is confined in the adjacent pericolic fat, however sometimes free air can be seen in the retroperitoneum. If an abscess is formed, it appears as a mass with fluid and air within it (Fig.7). Communication between colon and adjacent organs is hard to demonstrat, unless the fistula concerns the skin or if contrast media fills the viscus into which the fistula opens (Fig 8). Rarely, thrombosis of the portal or /and mesenteric vein resulting from pyelophlebitis can be shown in CT images.

CT is very useful in staging diverticular disease, assessing the severity and indicating the prognosis of the disease.

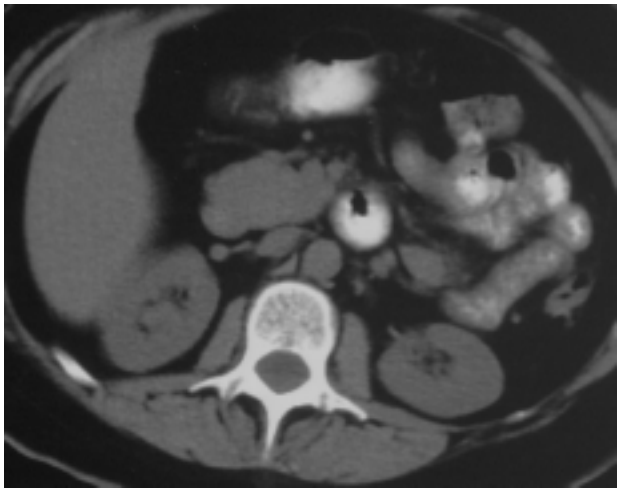

Fig. 6. Deformed diverticulum due to inflammation and past small rupture.

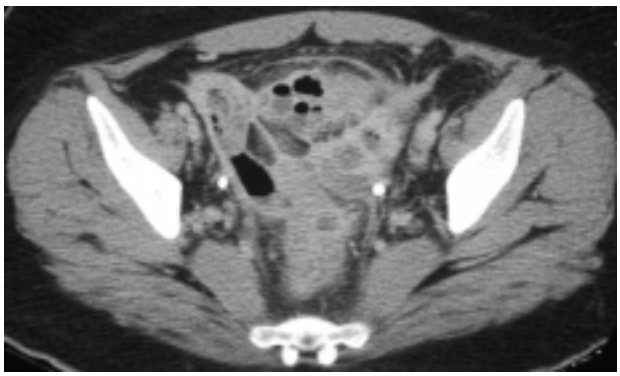

Fig. 7. Pelvic abscess in a patient with divertculitis. Note the presence of a mass filled with air and fluid.

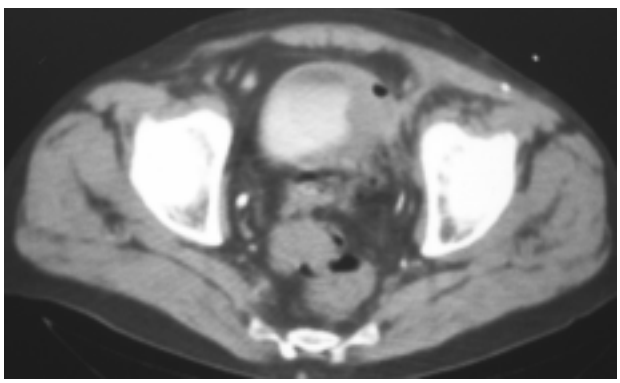

Fig. 8. Fistulation between diverticular abscess, urinary bladder and abdominal wall. The inflammatory process has thickened the bladder wall.

In stage 0 there are mural thickening and diverticula and usually patients settle with conservative management.

In stage 1 a small, up to 3cm abscess is formed and as in stage 0 it also settles with antibiotics.

In stage 2 the abscess (or abscesses) is bigger, measuring 5-10cm but is still confined in the pelvis and can be treated with percutaneous drainage under radiological guidance

In stage 3 the abscess spreads beyond the pelvis

In stage 4 CT images are similar to those of stage 3, but the patient presents clinically with symptoms of fecal peritonitis. Stages 3 and 4 will need emergency surgery.

Clinically, colon cancer may mimic diverticulitis. CT is performed often as the initial imaging investigation in patients with clinical features suggestive of diverticulitis. The aim is not only to confirm the presence of diverticulitis and detect its complications but also to rule out colon cancer. Differentiation between colon cancer and diverticulitis is fundamental to correct treatment of such patients. There have been several studies describing the CT features of diverticulitis and colon cancer.[28–36] Some of the studies have described an overlap in the CT features of these two diseases.[28-31] In nonblinded study, Balthazar et al[28] described the atypical findings that mimic cancer in cases of diverticulitis. In that study they found 16 (10%) of 150 cases of diverticulitis in which CT findings were deemed atypical and needed further evaluation. The points of overlap included wall thickening of more than 1cm, associated soft-tissue mass, wall thickening with luminal narrowing, wall thickening without pericolonic inflammation, and short segment of wall thickening. In a blinded retrospective study, Padidar et al[31] addressed the CT differentiation of diverticulitis from colon cancer by using the CT findings of the mesenteric venous engorgement and fluid at the base (root) of the mesentery. In their study, fluid at the base of the mesentery had a sensitivity and specificity of 36% and 90%, respectively, for diverticulitis. Vascular engorgement had sensitivity and specificity of 29% and 100% respectively, for diverticulitis. When fluid and/or engorgement were present, the sensitivity improved to 59%. Although these two studies[28,31] provided some useful insight, neither study addressed the complete spectrum of findings in these two diseases.

Unfortunately, CT can neither differentiate diverticulitis from colon cancer, nor safely diagnose a malignacy coexisting in the bowel, thus complementary examination with contrast enema is usually required. However, there are certain CT findings that might set the right diagnosis. Thus, pericolic and mesenteric fluid,[37, 38, 39] absence of mesenteric lymph nodes and a long segment of colonic thickening (>10cm) favour diverticulitis, whereas an abrupt intraluminar mass or the presence of mesenteric lymph nodes suggest colon cancer (Fig. 9).

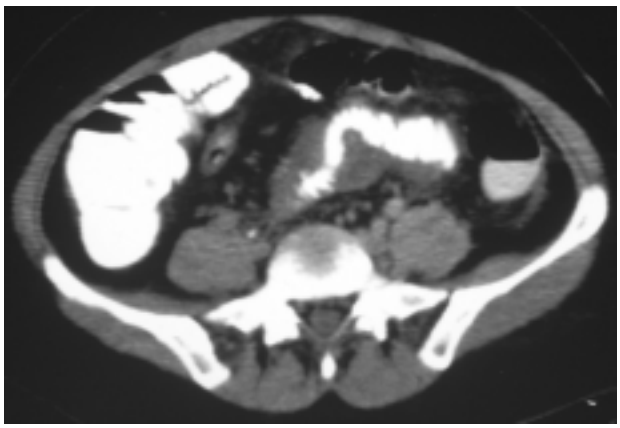

Fig. 9. Cancer of the colon. There is bowel wall thickening with small lymph nodes in the pericolic fat.

CONCLUSION

In conclusion, distribution and severity of diverticulosis remains best demonstrated by barium enema. On the other hand, CT is superior to other imaging modalities as it can be of a great value in diagnosing diverticulitis, the hallmark of which is inflammatory change within the pericolic fat. However, differentiating between diverticulitis and colon cancer is very difficult and it should always be kept in consideration that these two conditions may coexist.

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