Diverticulitis, pelvic and other intra-abdominal abscesses

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Abstract

Diverticular disease is a common condition in the Western world and it carries significant morbidity and healthcare cost. Patients with diverticular disease may present acutely or to out-patients, and the management should be stratified using clinical judgement and appropriate investigation including radiology. Intra-abdominal abscess is a common complication of diverticular disease, but it can also be due to any intra-abdominal organ disease. Conservative management is safe but in the "unwell" patient, other options such as: radiological drainage, laparoscopic washout and drainage, and surgical resection can be life-saving. Careful selection of patients using current stratification tools will help with management. All patients with intra-abdominal abscesses require follow-up and possibly further investigations. This article discusses current evidence and controversies underlying today's management of diverticulitis, diverticular abscess and other intra-abdominal abscesses.

Keywords CT imaging; diverticular disease; diverticulitis; Hartmann's procedure; Hinchey; intra-abdominal abscess; laparoscopic surgery; lavage; pelvic abscess; radiological drainage

Introduction

Diverticular disease is common in the Western world and the population prevalence of diverticulosis is up to 25% by 60 years of age. In most people, the condition remains asymptomatic but up to quarter of patients develop diverticulitis of which 5% develop complications such as perforation, obstruction, haemorrhage, fistulae or abscesses. In the West, left-side diverticulosis is more common than right-side cases. In contrast, diverticulosis rates are lower in Asia, though there is a higher incidence of right-side diverticulosis, albeit, left-sided cases are still the more common of the two.[1]

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The cost of the management of diverticulosis remains high. In the United States, acute diverticulitis is ranked as the third most common in-patient gastrointestinal diagnosis and management of the condition cost $2 billion annually. In Europe, for non-complicated cases, the cost of treatment varies between €547.05 and €1671.75 and this is dependent on whether patients are managed in out-patients (OPD) or in hospital, respectively. Additionally, in the more cost effectively managed patients in OPD, they show better physical and mental health as measured by the 12-item Short Form Questionnaire.[2]

Pathophysiology

Diverticulosis is thought to occur as a result of weak colonic wall, high intraluminal pressure or slow colonic transit time caused by colonic structural abnormality, dysmotility and/or fibre deficiency.[1] Diverticulitis is inflammation of colon affected by diverticulosis and may be the result of luminal obstruction of a diverticulum by a faecolith. The obstruction causes stagnation which results in bacterial overgrowth. The overgrowth of bacteria stimulates an inflammatory response. The consequential oedema may restrict venous flow and then arterial flow, causing ischaemia and finally perforation. Localized abscess formation or free peritoneal pus are possible outcomes and their management is dependent on its presentation and classification.

Presentation, investigation and complications of diverticulitis

Patients with diverticulitis often present acutely with left iliac fossa pain and, not unusually, a change in bowel habit to either constipation or diarrhoea. Rectal bleeding is not uncommon and constitutional symptoms such as pyrexia, nausea, vomiting and anorexia may be present. Outpatient presentations follow a similar clinical picture but with milder symptoms. Usual initial investigations include a full history and examination, followed by blood tests to prove the presence of inflammation – leucocytosis, elevated C-reactive protein (CRP). In cases of suspected sepsis, additional measure of serum lactate, renal function, and liver function are useful tests. There was suggestion that first value of CRP could predict the further disease progression, but two recent studies from the same centre have shown that the initial CRP trend and a low CRP in the first 48 hours are not reliable in predicting the outcome.[3] The results should be taken in context of the patients' clinical picture, longer term CRP trend and radiological imaging. Radiological modalities that may be useful include ultrasonography (USS) and water-soluble contrast studies, but the gold standard investigation is computed tomography (CT).

Recurrence rate of diverticulitis varies between 13% and 47%, with less than 4% of patients having more than one recurrence.[4] The definition of recurrence is based on complete resolution of the initial episode with the patient remaining asymptomatic for 12 weeks.[4] The review conducted by Buchs et al. also noted that acute perforation is more common in first presentations, whilst fistula formation is more common in patients' with recurrent presentations.[4]

Classification of acute diverticulitis

The Hinchey classification of diverticulitis is the most common classification to standardize the definition of acute diverticulitis and to stratify treatment strategies.[5] Since then, numerous revision and modifications of the classification system has occurred throughout the years. With the advent of CT guided drainage along with laparoscopy, the modified Hinchey classification was then redefined radiologically and operatively.[6,7] These two classifications are currently the widely accepted system (Table 1). More recently, a drive to further classify CT findings to different stages in order to simplify previous CT classification system and to aid decision making was proposed by Sartelli et al.[8] (Table 2). The aim of the new proposed system was streamline the treatment and management of acute diverticulitis.

Causes of abscesses and clinical presentation

Intra-abdominal abscesses can be a consequence of perforated diverticulitis. Other causes include traumatic or infective perforation of any other intra-abdominal hollow viscus (including gall bladder, and appendix), infected necrotic pancreatitis, post-operative anastomotic leak, after any other intra-abdominal operations, neoplasia and gynaecological infections.

Patients usually present with a 'swinging' pyrexia, diarrhoea, abdominal pain along with constitutional symptoms. Leucocytosis, elevated CRP, thrombocytosis and raised levels of acute phase proteins are common. All intra-abdominal abscesses can initially be treated similarly regardless the primary cause but further investigation is required to identify the source.

Management after initial assessments

The natural history of diverticulitis is now well described[4,8] and CT is a frequently used tool to guide diagnosis, and stratify treatment as described earlier. Hence, after initial clinical assessment, resuscitation and investigations, conducting a double contrast CT of the abdomen and pelvis will help with decision making according to the modified Hinchey classification and Sartelli CT classification. Broadly, management can be divided into two separate categories: the 'well' and the 'unwell' patient based on whether they have uncomplicated or complicated diverticulitis (Figure 1). The management of other intra-abdominal abscesses can also follow the same algorithm of the two separate categories.

Modified Hinchey Classification for diverticulitis (adapted from Wasvary et al. and Kaiser et al.)

Score	Modified Hinchey classification[9]	Corresponding CT findings[10]
0	Mild clinical diverticulitis	Diverticuli ± thickened colonic wall
Ia	Localized pericolic inflammation or plegmon	Thickened colonic wall with pericolic soft tissue changes
Ib	Pericolic or colonic mesentery abscess	Ia with localized abscess around colon or within colonic mesentery
II	Pelvic, distant intra-abdominal or retroperitoneal abscess	Ia changes and distant abscess
III	Generalized purulent peritonitis	Free intraperitoneal gas with localized or free fluid ± peritoneal wall thickening
IV	Generalized faecal peritonitis	III findings but with suggestion of free intraperitoneal faecal matter

Table 1

Four stages of complicated diverticulitis (adapted from Sartelli et al.)

Stage	Corresponding CT findings[8]
1A	Pericolic air bubbles or little pericolic fluid without abscess
1B	Abscess ≤4 cm
2A	Abscess >4 cm
2B	Distant air (>5 cm from inflamed bowel segment)
3	Diffuse fluid without distant free air (no hole in colon)
4	Diffuse fluid with distant free air (persistent hole in colon)

Table 2

Management and treatment in emergency presentation

The 'well' patient

These patients usually present with localized peritonism and are systemically well. In diverticulitis, the CT findings usually show a Hinchey 0 or Ia diverticulitis, and is coined with the term simple diverticulitis. As the recurrence rate and risk of developing complicated diverticulitis is low, there is an argument to treat simple diverticulitis conservatively. Patients with a CRP >240 mg/L, smokers, renal failure, organ transplant, on non-steroidal anti-inflammatory drugs, and steroids should be managed with caution as they are at higher risk of developing complications.[4]

The classical approach to managing acute diverticulitis has always been the prescriptive use of antibiotics and analgesia. However, a recent meta-analysis showed that withholding antibiotics does not increase the risk of requiring emergency surgery, developing early complications (abscesses and perforation), late complications (strictures), or recurrences.[9] However, the meta-analysis is limited as it is performed on only three RCTs and, therefore, caution is required in interpreting the results. Recent studies showed that the 'well' patient can be managed cost effectively and successfully as an OPD patient with only 2.6% requiring readmission but their management requires the provision of clear instructions on fluid and food intake along with follow-up on discharge.[2]

The 'unwell' patient

Any patient with symptoms, signs and investigative findings consistent with sepsis will require antibiotics as the primary line

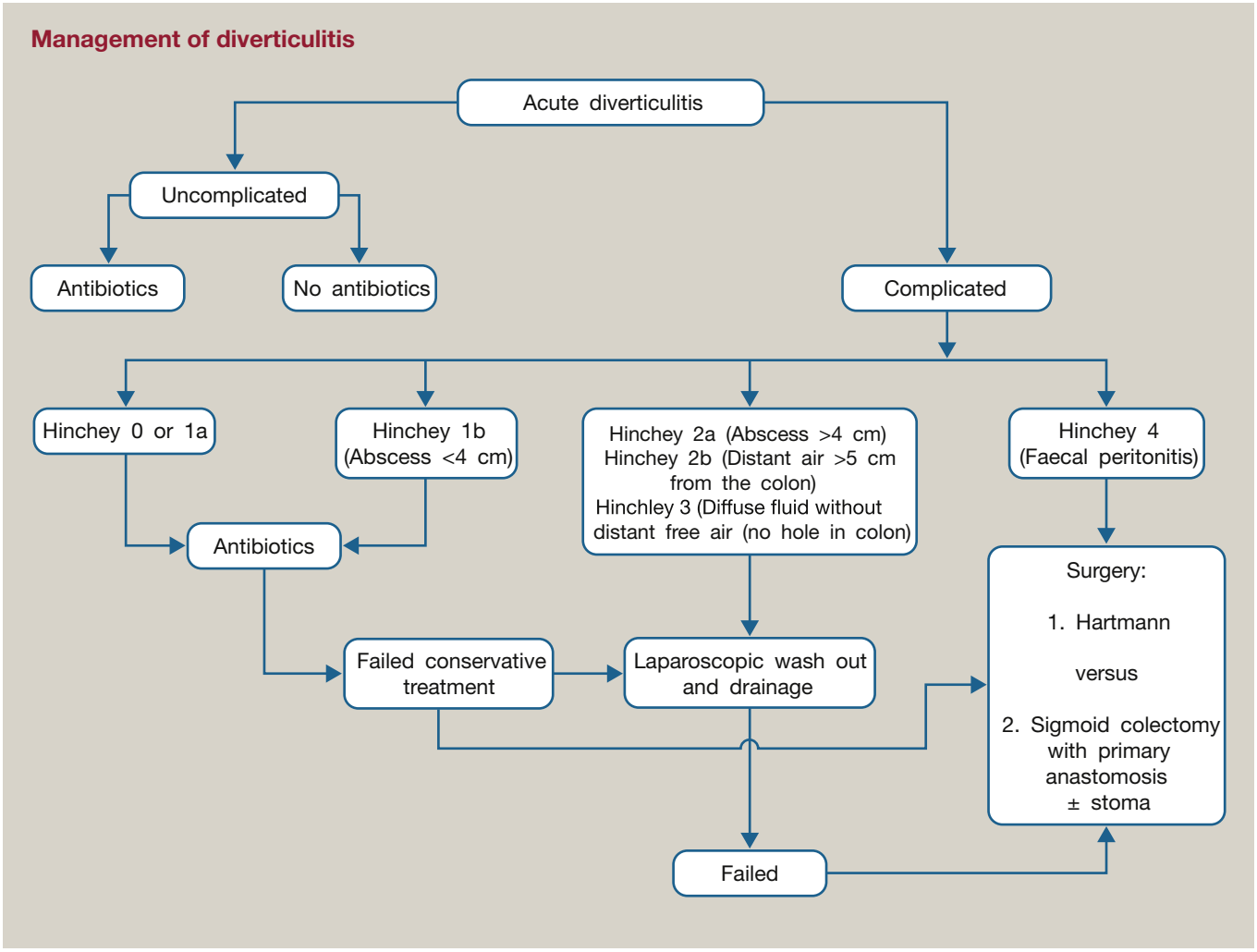

Figure 1

of treatment along with analgesia, intravenous fluid resuscitation and other definitive treatment such as percutaneous radiological drainage, surgical drainage or surgical resection. Current evidence suggest that any antibiotic regimen that is advised by local guidelines is satisfactory as first line treatment for any patient with secondary peritonitis. The 'unwell' patients usually have complicated diverticulitis (Hinchey ≥Ib). Complicated diverticulitis can be further classified based on their CT findings (Table 2) to help stratify management.

Radiological drainage: percutaneous radiological drainage has the benefit of avoiding surgery, especially in patients too ill or unsuitable for surgery. Patients with abscesses ≤4 cm (stage 1B) usually only require conservative management without drainage unless not resolving clinically. In stage 2A and 2B, percutaneous drainage along with antibiotics is often required but comes with a failure rate of between 15% and 30% and a recurrence of the abscess between 40% and 50%. Failure is usually a result of multiloculated abscesses, and location. If the abscess fails to resolve with drainage or if it is not amenable to percutaneous drainage, then surgery should be pursued. The same principles can be applied to other intra-abdominal abscesses.

Laparoscopic washout and drainage: Hinchey II and III diverticulitis can be manage with laparoscopic washout and drainage with resulting low morbidity, mortality and recurrence rates.[10] Using a CT-driven approach,[8] those with stage 2B and failed radiological drainage along with stage 3 patients may be suitable for the laparoscopic procedure. Recently, three multicentre randomized controlled trials (Table 3) have been conducted to compare laparoscopic washout and drainage against primary resection as originally proposed by Myers et al. The SCANDIV trial did not find that laparoscopic lavage was advantageous. The LADIES trial on the other hand was terminated early due to an increase in adverse events in the laparoscopic lavage arm.[11] The DILALA trial differed in their conclusions from the other two trials and suggested that the procedure was feasible and safe. The differences in findings between the former two trials and the latter might be related to their method of follow-up and potential selection bias. Further details of the trials are described below and in Table 3. Current findings conclude that there is still a need for further studies with a meta-analysis to clarify the role of laparoscopic washout and drainage. In our opinion, laparoscopic wash out is safe and useful treatment modality in highly selected patients. However, caution needs to be placed on patients with

Comparison of the three randomized controlled trials in laparoscopic washout and drainage versus primary resection

Trial	n[a]	Mortality[a]	Re-operation[a]	Re-admission[a]
SCANDIV	31/25	90-day: 13.9%/11.5% $p = 0.67$	20.3%/5.7% $p = 0.01$	27%/17% $p = 0.15$
LADIES	46/42	12-month: 4%/12% $p = 0.1875$	60.9%/26.2% $p = 0.0219$	N/A
DILALA	39/36	30-day: 3%/0% $p = 0.094$ 90-day: 3%/4% $p = 0.583$	13.2%/17.1% $p = 0.634$	0%/5.7% $p = 0.134$

[a] Proportions are laparoscopic washout and drainage versus primary resection.

Table 3

intra-abdominal abscesses after appendicectomy for complicated appendicitis as a Cochrane review has shown that the placement of abdominal drains may not confer benefit but may delay patient discharge.

The SCANDIV trial: in greater detail, the SCANDIV trial was a multicentre randomized study that enrolled 199 patients with peritonitis due to perforated diverticulitis proven on CT and was fit for surgery. They compared laparoscopic peritoneal lavage against colonic resection. Colonic resection was defined as either having a Hartmann's procedure or sigmoid colectomy with or without defunctioning stoma. Patients with bowel obstruction or who were pregnant were excluded. Follow-up was at 3 months and 1 year. Their primary outcome was to assess the rate of severe complications at 90 days after surgery. Severe complications were defined as Clavien-Dindo IIIa or greater. Their secondary outcomes were length of operating time, length of postoperative stay, postoperative complications and 90-day quality of life (QOL). For their primary outcome, no statistical difference in 90-day severe complication was found. In Hinchey I to III patients, the lavage operating time was shorter with lesser blood loss and had a lower rate of stoma creation but had a higher re-operation rate. Although lavage patients had lower superficial wound infections, the rate of secondary peritonitis was greater and therefore required a re-operation. In the Hinchey IV patients, there were no differences between the two groups. The authors of the SCANDIV trial had also highlighted that their study were limited by the exclusion of higher ASA scoring patients and the risk of missed carcinomas in lavage patients.

LADIES trial:[11] the results of the LADIES trial was based on one of the arm of its study; the LOLA group. The study was also a multicentre randomized trial comparing laparoscopic lavage against sigmoidectomy with 12 months follow-up. Sigmoidectomy in this trial also refers to either Hartmann's procedure or sigmoid resection and primary anastomosis with or without defunctioning ileostomy. Eighty-eight patients with Hinchey III diverticulitis were enrolled for the study after excluding two patients for violation of their protocol. Exclusion criteria were dementia, previous sigmoidectomy, pelvic irradiation, chronic treatment with high-dose steroids, age younger than 18 or older than 85, and preoperative shock requiring inotropic support. Their primary outcome was major morbidity (defined by their protocol) and mortality within 12 months. Secondary outcomes were operative time, length of hospital stay, survival during and after hospital stay, 30-day morbidity and mortality, incisional hernia, re-interventions within 12 months, and health-related QOL. There was no difference in mortality but the lavage group had higher incidence of morbidity, specifically abscesses requiring drainage and recurrent diverticulitis. This trial was terminated early because of significantly higher 30-day morbidity and re-operation rate. For other secondary outcomes, the lavage group had shorter operative times but no difference in hospital length of stay or QOL. Additionally, the authors of the LADIES trial found that only 52% of lavage patients were treated successfully with lavage. The authors also highlighted that CT abdomen and pelvis with rectal contrast is not routinely used during initial investigations, and perhaps a change in guidelines is needed to increase diagnostic accuracy of faecal peritonitis and concurrent colonic carcinoma.

DILALA trial: the DILALA trial, also a multicentre randomized-controlled trial, compared laparoscopic lavage against open Hartmann's procedure for Hinchey Iii diverticulitis. Patients were excluded if they were unfit for surgery or they were enrolled in another trial. Follow-up was up to 12 weeks for all end points apart from re-operations, their primary end point, which was collected up to 12 months. A total of 75 patients were enrolled. The trial found no difference in re-operation rate. The operative time in the lavage group was shorter along with time spent in the recovery unit. The lavage patients required more days with drains but had shorter postoperative hospital stay. The authors suggested that hospital stay was shorter because lavage patients did not require stoma training. The limitations of the trial were low recruitment rate and the short follow-up.

Definitive surgery: any patient with Hinchey III/IV or CT classification stage 3/4 or stage 2b with failed percutaneous drainage as a treatment should be considered for operative management.[8] The operative procedure can be either the sigmoid colectomy with primary anastomosis and plus/minus defunctioning loop ileostomy or the classical Hartmann's procedure; rarely, damage control surgery is employed.[8] The Hartmann's procedure was designed to be quick and less technically challenging than the sigmoid colectomy but necessitates the burden of a colostomy. Hence, in the 'unwell' patient, it had been the procedure of choice. However, sigmoid colectomy, usually performed in the elective setting, is now being performed more frequently in emergency; but there is still a lack of data to suggest which is the superior procedure.[12] Current argument for sigmoid colectomy includes lower morbidity and mortality, and higher rate of stoma reversal (if a loop ileostomy was performed). Additionally, sigmoid colectomy is also more common when operation is performed by dedicated colorectal surgeon. For either procedure, the laparoscopic approach appears to take longer to perform than the open approach but result in lower morbidity, shorter length of

stay and lower cost. Interestingly, when Vennix et al. performed a sub-group analysis on laparoscopy versus open in either Hartmann's or sigmoid colectomy, only the Hartmann's group showed a lower morbidity and mortality rate along with a shorter length of stay and lower cost.

Colonoscopy

After the patient has been successfully treated, confirmation of the cause of the acute presentation is necessary. The American Gastroenterological Association (AGA) suggests that colonoscopy should be performed in all appropriate patients to rule out concurrent neoplastic lesions or other causes. If the patient is unfit for endoscopic intraluminal visualization, other means of investigation such as CT colonogram or a repeat CT of the abdomen and pelvis should be considered. There is no consensus on the timings of performing the investigations, but normally an interval of 6–8 weeks after resolution of symptoms is required to avoid aggravating or triggering another attack of diverticulitis. However, recent meta-analyses suggest that the risk of colonic neoplasm after uncomplicated diverticulitis is equal to the population risk and in the absence of the other indication routine colonoscopy may not be necessary. Patients with complicated diverticulitis still have a significant risk of colorectal cancer and need subsequent colonic evaluation.

Elective surgery

Since the recurrence rate of diverticulitis is low,[4] elective resection should be reserved for patients with multiple attacks. However, there is still limited data to suggest the best policy. A recent retrospective cohort study showed that a conservative approach is safe and appropriate in 71% of patients.[13] Currently, the guidelines by the American Gastroenterological Association Institute, and the Association of Coloproctology of Great Britain and Ireland highlights that patient selection needs to be based of their health status, preferences and comprehends the risks of the procedure.[14] The procedure of choice would be the sigmoid colectomy, but occasionally, the Hartmann's procedure is still needed especially when the anastomosis is high risk. These risks include inadequate length, poor blood supply, and poor tissue quality.

Other intra-abdominal abscess

In general, other causes of intra-abdominal abscesses can usually be treated using the same algorithm as diverticular abscesses. The primary cause should be found so management can be tailored to the condition. For example, if appendicitis is the primary cause, percutaneous drainage should not be performed in children; whilst in adults, it is a suitable treatment and interval appendicectomy performed only in those with recurrent symptoms.[15]

Conclusion

Diverticular disease is still a common condition that can be associated with high morbidity. It is important to identify the 'unwell' patient and risk stratify them accordingly. Conservative management is safe in the carefully selected patient, otherwise, radiological drainage, laparoscopic washout and drainage, and surgical resection are potential options. Intraluminal examination of the colon should be performed to exclude colonic malignancy. Finally, current evidence highlights the need for more high quality studies. ◆

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