Surgical challenges in diverticular disease

Klarenbeek, B.R.

2010

document version
Publisher's PDF, also known as Version of record

Summary and general discussion

PART I – Current management of diverticular disease

Perforated diverticulitis is the most common benign cause of mortality in surgery after ruptured abdominal aortic aneurysm. Each year diverticular disease accounts for 14,000 hospital admissions in the Netherlands and 312,000 in the United States of America.[1] Rising incidences of diverticular disease contribute to the significance of this condition in modern health care. Whereas this demographic increase might partially be due to the aging of the populace of Western society, the incidence among young patients is rising more rapidly than in older individuals.

At the same time, new insights in the natural history of diverticular disease bring about a more conservative approach to mild cases. The old adage that recurrent episodes increase the risk of complications is revised.[2] Currently it is thought that most complications (i.e. perforations) occur at the first presentation of the disease, and that prophylactic sigmoid resections are no longer warranted.[3,4] The American Society of Colorectal Surgeons (ASCRS) is nowadays advocating an individual approach.[5]

In the first part of this thesis several aspects of these recent developments are addressed.

In **Chapter 1** reviews all current classifications for diverticular disease. This leads to a new and useful classification for creating a comprehensive practice parameter, thereby putting the 'new rules' (i.e. indications for elective surgery) and therapeutic options into clinical perspective (see Table 1).

Chapter 2 evaluates the 'new concept' on the course of diverticular disease and subsequent change in the indication for elective sigmoid resections. A cohort of 291 patients was analyzed retrospectively for identifying potential risk factors that may be associated with a more hazardous course of diverticular disease. It is concluded that indications for an elective sigmoid resection should not be based on the number of recurrent episodes only. Clear indications for elective surgery are held to be complaints of stenosis, fistulas or recurrent diverticular bleeding. Furthermore, an elective sigmoid resection might be justified in high-risk patients after a conservatively treated episode of diverticulitis, those using immune suppression therapy, and those having chronic renal failure or collagen-vascular diseases.

The goal of **Chapter 3** is to analyze the prognostic value of age in the course of diverticular disease. For different reasons, young and elderly patients that suffer diverticular disease are regarded as distinct entities.[6] It is thought that diverticular

Table 1 Proposed classification

Classification		Presentation	Imaging	Treatment
A		**Uncomplicated disease**		**Conservative treatment**
		• Pain in left lower quadrant • Fever • Changes in bowel habits	**CT-scan** • Phlegmon • Small abscess in bowel wall **Colonoscopy** • Diverticulosis • Inflammation	**Treatment acute episode** • Antibiotics • Low residue diet **Prevention** • Fibers • Prevention of obesity • Treatment of comorbidity • Mesalazine
B		**Moderately complicated disease**		**Elective intervention**
		• Impaired passage of stool • Presence of fistula • Recurrent rectal blood loss • Incapacitating symptoms • High-risk patients	**CT-scan** • Stenosis • Fistula **Colonoscopy** • Stenosis • Fistula • Blood in diverticula	**Sigmoid resection with primary anastomosis** • Open • Laparoscopically
C		**Severely complicated disease**		**Acute intervention**
	1	• Fever • Painful mass	**CT-scan** • Large abscesses (> 5 cm)	**Percutaneous drainage**
	2	• Ileus	**CT-scan** • Intestinal obstruction	**Sigmoid resection with primary anastomosis** **Hartmann's procedure**
	3	• Massive rectal blood loss	**CT-angio** • Contrast blush **Colonoscopy** • Active diverticular bleeding	**Sigmoid resection with primary anastomosis** • Open • Laparoscopically **Endoscopic intervention** **Endovascular coiling**
	4	• Generalized peritonitis	**CT-scan** • Pneumoperitoneum • Extraluminal contrast • Free fluid	**Diagnostic laparotomy / laparoscopy** • Resection with primary anastomosis • Lavage and drainage • Hartmann's procedure

disease in young patients follows a virulent course and therefore a more aggressive approach might be warranted.[7] Yet, also high age has been associated with less favourable outcomes in acute diverticulitis, although this seems not to be an independent factor. [8,9] The course of diverticular disease as well as its treatment have been greatly determined by the age factor. In elderly patients a more conservative approach might be justified, because of a higher postoperative mortality. In contrast, the course of the disease in younger patients was characterized by more recurrent episodes and a higher risk for having emergency surgery at one of these recurrences. When considering 73% of patients under 40 years of age eventually require an operation, early elective sigmoid resection after a single episode of acute diverticulitis might well be considered in this age group.

Current surgical practice of diverticular disease in The Netherlands is outlined in **Chapter 4**. Using patient data from three different clinics, both university and teaching, the employment of new operative techniques and evolving indications is described. A total of 300 patients were analyzed after acute and elective surgery for diverticular disease. Morbidity and mortality rates in this cohort are comparable to other series, although biased by regional differences in treatment and population.

Until 2005 all seemed clear; high incidences of diverticular disease are associated with age; 10-25% of patients with diverticulosis will develop acute diverticulitis; and their presentation may vary from mild complaints to a general peritonitis.[10] It was advised to perform an elective sigmoid resection after two episodes of acute diverticulitis, after a single episode in young patients or when complications occur, such as stenosis or fistulas.[7] This practice was based on the following assumptions: 1) recurrence rate after every episode is at least 33%, 2) every recurrence means a higher risk on perforation, permanent colostomy and other acute complications, 3) complicated diverticulitis is associated with high morbidity and mortality. Therefore, it is held that high mortality and permanent colostomy could be prevented by an elective sigmoid resection.

These recommendations, apparently were supported only by a publication of Parks in 1969, and since 2005 have been challenged in several studies.[2] New data on the natural history of diverticulitis shows that most perforations do not occur at recurrences, but at the first attack of acute diverticulitis.[11,12] In addition, conservative management of recurrent non-perforated diverticulitis is shown to be associated with low morbidity and mortality rates. Substantial publications on this subject have since then followed, leading to a more conservative approach in the treatment of diverticular disease. The overall

message of all recent articles is: diverticulitis is a mild disease, which responds well to conservative therapy. The 'new rule' sounds: surgery should be reserved for 'rare' complicated cases, which usually present themselves at the first sign of diverticular disease. Thereby suggesting that there is no room for elective surgery, and that emergency interventions should only be performed on demand.

These 'new rules' are nuanced in **Part I** of this thesis. A major reason is that a considerable number of patients still suffer serious complications after a first episode and could effectively benefit from an elective sigmoid resection. Hereby not discounting that elective surgery should not be performed only on indication of the number of episodes. All in all, valid indications for elective sigmoid resection after a conservatively treated episode of acute diverticulitis remain: 1) elective complications, such as stenosis, fistulas to hollow organ or recurrent diverticular bleeding; 2) high-risk patients, using immune suppression therapy, having chronic renal failure or collagen-vascular diseases; and 3) young patients under 40 years of age. Finally, persistent pain and a high frequency of recurrent episodes may be considered as relative indications for elective sigmoid resections in individual patients.

A 'change of rules' is not the aim of this discussion, more so a renewal of attention for the natural course of diverticular disease. Fully understanding its pathways, requires knowledge of the pathogenesis of diverticular disease. For instance, in colonic manometric studies an increased motility has been demonstrated, that resembles the motility of the Irritable Bowel Syndrome (IBS).[13] Hypothetically, IBS could be a precursor for diverticular disease, progressing into a 'prediverticular state' when signs of myochosis occur.[14] Other studies report endoscopic and histologic patterns resembling Colitis Ulcerosa and Crohn's disease, called 'segmental colitis associated with diverticulitis' (SCAD).[15] Future research will have to identify these phenomena as important predictors for the course of diverticular disease.

As for now it can be said that the similarities between chronic inflammation of diverticular disease and Inflammatory Bowel Diseases (IBD) do suggest that patients with symptomatic diverticular disease may benefit from treatment with anti-inflammatory medication such as 5-aminosalicylic acid (5-ASA).[16] Several study-groups have already published results of randomized control trials that assess the therapeutic efficacy of 5-ASA in patients with colonic diverticular disease.[17,18] Another relevant development, is the use of Fecal Calprotectin as an inflammatory marker of the activity and relapse of IBD.[19] Fecal Calprotectin is released from cells during cell activation or death, and it is stable in feces for several days after excretion. Tursi et al. recently published data on the relation between Fecal Calprotectin and diverticular disease, making it a potential tool to distinguish between symptoms from diverticular inflammation and from IBS [20]. Moreover Fecal Calprotectin values seem to be related to the degree of the diverticular disease and may decrease after treatment.

PART II – The Sigma-trial

The second part of this thesis focuses on the advances of laparoscopic surgery for diverticular disease. Since the first experimental 'celioscopy' in 1901 (see Figure 1), laparoscopic surgery evolved into an important instrument for today's gastrointestinal surgeon. Based on non-randomized comparison studies, several authors have published certain beneficial outcomes resulting from laparoscopic sigmoid resections.[21-23] Otherwise, several potential technical difficulties of the laparoscopic approach have been stressed. For instance, factors such as acute or chronic inflammation caused by diverticulitis, presence of abscesses, adhesions to other organs or the presence of fistulas

Figure 1 Dr. Kelling performing the first 'celioscopy' in 1901

may distort the normal anatomy, all making laparoscopic dissection technically quite challenging.[24] Therefore, the Sigma-trial was designed as the first randomized control trial to compare the impact of laparoscopic versus open elective sigmoid resections on postoperative complication rates in patients with symptomatic diverticulitis (see **Chapter 5**). The primary endpoints used were morbidity and mortality on short-term and after six months follow-up, furthermore an extensive cost-effectiveness analysis was performed.

Details of the short-term results of the Sigma-trial can be found in **Chapter 6**. Laparoscopic sigmoid resections were associated with a 15.4% reduction in major complication rates, less pain, shorter hospitalisation, and improved quality of life at the cost of a longer operating time. The laparoscopic approach may well be the procedure of choice for patients presenting with symptomatic diverticulitis of the sigmoid colon. In **Chapters 6.1 and 6.2** letters to the editor regarding the short-term results of the Sigma-trial are reported. Both authors comment on the lack of an enhanced recovery program in the Sigma-trial protocol, including overall pain management. The primary aim of the study was not to demonstrate the advantages of the perioperative care, but the differences in morbidity and mortality after laparoscopic or open surgery. Probably the combination of different factors of enhanced recovery programs and the laparoscopic approach will provide the best outcome for our patients.[25]

Six months follow-up is reported in **Chapter 7**. Despite the short-term benefits of the laparoscopic approach, comparable outcomes were found in the six weeks to six month follow-up period in terms of late complications, mortality, and quality of life. When total postoperative morbidity (0-6 months) is considered, the laparoscopic approach results in a significant 27% reduction in major complications in comparison with open sigmoid resections.

A description of the cost structure of laparoscopic and open sigmoid resection is given in **Chapter 8**. All direct hospital costs at the VU University Medical Center made during admission and follow-up were registered prospectively. Total healthcare costs of elective laparoscopic and open sigmoid resections for symptomatic diverticular disease are similar. The significantly higher operative costs in the laparoscopic group is partially compensated by reduced costs for hospitalization.

The Sigma-trial is the first randomized control trial comparing laparoscopic versus open sigmoid resection in patients with diverticular disease. The immediate advantages of the laparoscopic approach entail a 15.4% reduction in major complication rates, less pain, shorter hospitalisation, and improved quality of life at the cost of a longer operating time. Some of these beneficial outcomes have already been published in non-randomized studies, but bias always has to be regarded. Comparable outcomes were found in the six weeks to six month follow-up period in terms of late complications, mortality, and quality of life. When considering a 27% reduction in total postoperative morbidity (0-6 months), without increasing healthcare costs, the laparoscopic approach should be preferred over open sigmoid resections for patients presenting with symptomatic diverticular disease of the sigmoid colon. Since publications on long-term follow-up effects of laparoscopic or open surgery on patients with diverticular disease are rare, it would be very interesting to follow the patients included in the Sigma-trial for a longer period of time. Data of five and ten years follow-up may provide knowledge of the long-term advantages of the laparoscopic approach, with respect to incisional hernias, adhesions leading to intestinal obstruction or recurrence of the disease.

References

1. Etzioni DA, Mack TM, Beart RW, Jr. et al. Diverticulitis in the United States: 1998-2005: changing patterns of disease and treatment. Ann Surg 2009; 249:210-217.
2. Parks TG. Natural history of diverticular disease of the colon. A review of 521 cases. Br Med J 1969; 4:639-642.
3. Chapman J, Davies M, Wolff B et al. Complicated diverticulitis: is it time to rethink the rules? Ann Surg 2005; 242:576-581.
4. Salem TA, Molloy RG, O'Dwyer PJ. Prospective, five-year follow-up study of patients with symptomatic uncomplicated diverticular disease. Dis Colon Rectum 2007; 50:1460-1464.
5. Rafferty J, Shellito P, Hyman NH et al. Practice parameters for sigmoid diverticulitis. Dis Colon Rectum 2006; 49:939-944.
6. Janes S, Meagher A, Frizelle FA. Elective surgery after acute diverticulitis. Br J Surg 2005; 92:133-142.
7. Wong WD, Wexner SD, Lowry A et al. Practice parameters for the treatment of sigmoid diverticulitis-supporting documentation. The Standards Task Force. The American Society of Colon and Rectal Surgeons. Dis Colon Rectum 2000; 43:290-297.
8. Makela JT, Kiviniemi H, Laitinen S. Prognostic factors of perforated sigmoid diverticulitis in the elderly. Dig Surg 2005; 22:100-106.
9. Comparato G, Pilotto A, Franze A et al. Diverticular disease in the elderly. Dig Dis 2007; 25:151-159.
10. Jacobs DO. Clinical practice. Diverticulitis. N Engl J Med 2007; 357:2057-2066.
11. Chapman JR, Dozois EJ, Wolff BG et al. Diverticulitis: a progressive disease? Do multiple recurrences predict less favorable outcomes? Ann Surg 2006; 243:876-830.
12. Collins D, Winter DC. Elective resection for diverticular disease: an evidence-based review. World J Surg 2008; 32:2429-2433.
13. Ritsema GH, Thijn CJ, Smout AJ. [Motility of the sigmoid in irritable bowel syndrome and colonic diverticulosis]. Ned Tijdschr Geneeskd 1990; 134:1398-1401.
14. West AB, Losada M. The pathology of diverticulosis coli. J Clin Gastroenterol 2004; 38:S11-S16.
15. Tursi A, Elisei W, Brandimarte G et al. THE ENDOSCOPIC SPECTRUM OF SEGMENTAL COLITIS ASSOCIATED WITH DIVERTICULOSIS (revised manuscript CDI-00318-2008). Colorectal Dis 2009.
16. Gatta L, Vakil N, Vaira D et al. Efficacy of 5-ASA in the Treatment of Colonic Diverticular Disease. J Clin Gastroenterol 2009.
17. Comparato G, Fanigliulo L, Cavallaro LG et al. Prevention of complications and symptomatic recurrences in diverticular disease with mesalazine: a 12-month follow-up. Dig Dis Sci 2007; 52:2934-2941.
18. Tursi A, Brandimarte G, Giorgetti GM et al. Balsalazide and/or high-potency probiotic mixture (VSL#3) in maintaining remission after attack of acute, uncomplicated diverticulitis of the colon. Int J Colorectal Dis 2007; 22:1103-1108.
19. Costa F, Mumolo MG, Ceccarelli L et al. Calprotectin is a stronger predictive marker of relapse in ulcerative colitis than in Crohn's disease. Gut 2005; 54:364-368.
20. Tursi A, Brandimarte G, Elisei W et al. Faecal calprotectin in colonic diverticular disease: a case-control study. Int J Colorectal Dis 2009; 24:49-55.
21. Alves A, Panis Y, Slim K et al. French multicentre prospective observational study of laparoscopic versus open colectomy for sigmoid diverticular disease. Br J Surg 2005; 92:1520-1525.
22. Schwandner O, Farke S, Fischer F et al. Laparoscopic colectomy for recurrent and complicated diverticulitis: a prospective study of 396 patients. Langenbecks Arch Surg 2004; 389:97-103.
23. Scheidbach H, Schneider C, Rose J et al. Laparoscopic approach to treatment of sigmoid diverticulitis: changes in the spectrum of indications and results of a prospective, multicenter study on 1,545 patients. Dis Colon Rectum 2004; 47:1883-1888.
24. Eijsbouts QA, de Haan J, Berends F et al. Laparoscopic elective treatment of diverticular disease. A comparison between laparoscopic-assisted and resection-facilitated techniques. Surg Endosc 2000; 14:726-730.
25. Wind J, Hofland J, Preckel B et al. Perioperative strategy in colonic surgery; LAparoscopy and/or FAst track multimodal management versus standard care (LAFA trial). BMC Surg 2006; 6:16.