Surgical challenges in diverticular disease
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Introduction and outline of the thesis
Diverticular disease is one of the most prevalent gastrointestinal disorders in Western society, associated with incidences of 33% in the population over 45 years of age and increasing to 66% in the population older than 85 years of age. Although diverticular disease is more common among elderly patients, an important rise in incidence is noted in the younger age groups. Approximately 10-25% of patients with asymptomatic diverticulosis will develop acute diverticulitis; its presentation may vary from mild complaints to a generalized peritonitis.

The pathogenesis of diverticula is related to two processes, weakening of the colonic wall and increased intraluminal pressure. The weakening of the colonic wall is thought to be due to the aging process and connective tissue disorders. Fibre deficiency and abnormal colonic motility may be responsible for the increased intraluminal pressure. Typically for left-sided diverticulosis are false diverticula, which are small, mucosal herniations that develop at the natural weak spots of the colon, where the vasa recta reach the bowel wall. Other anatomic characteristics in diverticulosis are circular muscle thickening, narrowing of the colonic lumen and shortening of the taeniae, known as myochisis. Obstruction of diverticula by fecal matter might induce a cascade of events including distention of the sac, bacterial overgrowth, vascular compromise, and micro or macro perforations. Clinical manifestations of diverticulitis are phlegmon, abscess, peritonitis or fistula (see Figure 1). Late sequelae of diverticulitis are often the result of post inflammatory alterations, like adhesions or stenosis.

The term ‘diverticular disease’ comprises a spectrum of conditions. Diverticulosis refers to the presence of diverticula in the colon, mostly asymptomatic and localized in the sigmoid colon. Diverticulitis refers to infection or inflammation of diverticula and can be classified as: 1) complicated diverticulitis, associated with abscesses, perforation, fistula or stenosis; 2) uncomplicated diverticulitis, associated with clinical episodes of fever, pain, bloating and/or change in bowel habits, whereby imaging may show phlegmon or small abscess, or no abnormalities at all; 3) acute diverticulitis, associated with the requirement of an immediate admission or intervention, and that may be complicated or uncomplicated. Nowadays, the diagnosis of acute diverticulitis and the extent of the disease is confirmed by Computed Tomography, enhanced by intravenous and rectal contrast. Colonoscopy is helpful in the elective setting when a stenosis is suspected or for ruling out cancer. Traditionally, complicated diverticulitis is classified according to Hinchey’s classification (see Figure 2), but other grading systems have been proposed.
The treatment of diverticular disease depends on the severity of the disease. Mild cases of diverticulitis such as phlegmon or small abscesses (Hinchey I) can be treated conservatively, with or without antibiotics and fluid diet. Larger abscesses (Hinchey II) can be relieved by CT-guided percutaneous drainage. After a successful conservatively treated episode, there is a risk of recurrence of disease and complications, such as stenosis or fistulas to hollow organs (bladder or vagina). Purulent (Hinchey III) or fecal (Hinchey IV) peritonitis results from a perforation and is associated with high morbidity and mortality (10-35%). Under these severe circumstances, acute surgical intervention is warranted. Hartmann’s procedure used to be the treatment of choice, but recently primary anastomosis or laparoscopic lavage are used increasingly.

In 2000 the American Society of Colon and Rectal Surgeons (ASCRS) presented practice guidelines for preventing recurrence of diverticulitis with subsequent perforation. It was advised to perform an elective sigmoid resection after two episodes of acute diverticulitis.
recurrences, but at the first attack of acute diverticulitis. Furthermore, conservative management of recurrent non-perforated diverticulitis is associated with low morbidity and mortality rates. These new insights resulted in a revision of the ASCRS guidelines in 2006, advocating a more individual and conservative approach.

In an elective setting, conventional open sigmoid resections for diverticular disease have been associated with high postoperative complication rates and a mortality rate of two to five percent. In the early nineties, laparoscopic approaches for colorectal surgery were already introduced to minimize surgical trauma and subsequently reduce morbidity and shorten hospitalization. Several authors have published non-randomized comparative studies, reporting beneficial outcomes following laparoscopic sigmoid resections for treating diverticular disease. Confirmation of these advantages of the laparoscopic approach in a randomized control trial is called for, especially when the more stringent indications for elective surgery are considered.

**Aim of the thesis**

- To review current classifications of diverticular disease, in perspective of new insights in its natural history, novel imaging modalities and therapeutic options
- To evaluate the indications for elective surgery in diverticular disease
- To identify risk factors that may be associated with a more complicated course of diverticular disease
- To compare the impact of laparoscopic versus open elective sigmoid resections on postoperative complication rates in patients with symptomatic diverticular disease

**Outline of the thesis**

**Part I** of this thesis addresses the current management of diverticular disease in relation to classifications, indications for elective surgery, risk-factors for complications and clinical practice. **Part II** describes the Sigma-trial, a randomized control trial comparing laparoscopic versus open elective sigmoid resections in patients with symptomatic diverticular disease.

**PART I – Current management of diverticular disease**

The definition and classification of such a complex condition like diverticular disease seem indispensable. In Chapter 1 all current classifications on diverticular disease will be reviewed. The result is a proposal of a comprehensive classification that provides a useful practice parameter for diagnostic tools and treatment modalities.

The indications for elective sigmoid resections for diverticular disease are evolving. Recent publications show that perforations due to diverticulitis or other acute surgical indications occur more often in patients without a history of diverticular disease. Moreover, the course of diverticular disease after conservative treatment tends to be mild with very low rates of recurrences and complications. Thereby suggesting that elective resections should be restricted to complicated cases only. In Chapter 2, a retrospective analysis is performed to clarify the natural history of diverticular disease and to identify clinical risk factors that may be associated with a more hazardous course of diverticular disease.

The rising incidence of diverticular disease among young patients is alarming, especially because several authors claim a more virulent course of the disease in this group. As a result, the management of diverticular disease in young patients remains controversial. Less favorable outcomes in elderly patients have also been published, but the increased morbidity and mortality rates in the high age groups might mainly be determined by their comorbid conditions. Chapter 3 outlines the relation of the age factor associated with the course of diverticular disease and its treatment.

Since diverticular disease accounts for 14,000 hospital admissions in the Netherlands each year, it is important to evaluate the implementation of these developments for daily practice in terms of the diagnostic tools, the indications for surgery, and the treatment modalities. Chapter 4 addresses current surgical practice of diverticular disease in The Netherlands.

**PART II – The Sigma-trial**

Over the last two decades, laparoscopic surgery has gained popularity in the treatment of diverticular disease. Particularly in an elective setting, certain beneficial effects on postoperative outcomes of laparoscopic sigmoid resections have been reported following non-randomized comparison studies. In Chapter 5, the Sigma-trial protocol is described, this is the first study designed as a randomized control trial to compare the impact of laparoscopic versus open sigmoid resections on postoperative complication rates in patients with symptomatic diverticulitis.
Chapter 6 reports the short-term results of the Sigma-trial. Primary endpoints included are postoperative mortality and postoperative complications within 30 days from surgery. Since this study is the first randomized controlled trial comparing laparoscopic and open sigmoid resections for diverticular disease, overwhelming reactions followed its publication. Valuable comments in two letters to the editor are added to this manuscript, mainly addressing the adoption of enhanced recovery programs. The letters and reactions are depicted in Chapters 6.1 and 6.2.

The results described in Chapter 6 comprise a follow-up period of six weeks. Data on late outcomes after laparoscopic surgery for diverticular disease is scarce, although a reduction in incisional hernias and recurrent disease might only be demonstrated after several months. The mid-term results of the Sigma-trial can be found in Chapter 7.

There is compelling evidence that laparoscopic sigmoid resections provide several advantages, but serious concerns regarding higher medical costs remain. It has been suggested that the longer operative procedures and the wide use of disposable products might be partially compensated by the shorter hospital stay. In Chapter 8 the direct healthcare costs of patients with symptomatic diverticular disease randomized for either laparoscopic or open elective sigmoid resection are compared. Furthermore, a cost-effectiveness analysis of the laparoscopic approach in comparison with open sigmoid resections is presented.

Finally the results from these studies will be put into perspective of a general discussion in the concluding chapter of this thesis.

References


