Natural history of uncomplicated sigmoid diverticulitis

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Abstract

While diverticular disease is extremely common, the natural history (NH) of its most frequent presentation (i.e., sigmoid diverticulitis) is poorly investigated. Relevant information is mostly restricted to population-based or retrospective studies. This comprehensive review aimed to evaluate the NH of simple sigmoid diverticulitis. While there is a clear lack of uniformity in terminology, which results in difficulties interpreting and comparing findings between studies, this review demonstrates the benign nature of simple sigmoid diverticulitis. The overall recurrence rate is relatively low, ranging from 13% to 47%, depending on the definition used by the authors. Among different risk factors for recurrence, patients with C-reactive protein > 240 mg/L are three times more likely to recur. Other risk factors include: Young age, a history of several episodes of acute diverticulitis, medical vs surgical management, male patients, radiological signs of complicated first episode, higher comorbidity index, family history of diverticulitis, and length of involved colon > 5 cm. The risk of developing a complicated second episode (and its corollary to require an emergency operation) is less than 2%-5%. In fact, the old rationale for elective surgery as a preventive treatment, based mainly on concerns that recurrence would result in a progressively increased risk of sepsis or the need for a colostomy, is not upheld by the current evidence.

Key words: Diverticulitis; Colon; Cohort; Recurrence; Natural history

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Core tip: The natural history of sigmoid diverticulitis is poorly understood. While there is a clear lack of uniformity in terminology, which results in difficulties interpreting and comparing findings between studies,
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The results of our study confirm that a non-surgical strategy for the treatment of uncomplicated diverticulitis is safe in the long term. They also contradict the once popular view that diverticulitis is a progressive disease. Out of the 6 patients (2.1%) who developed complicated diverticulitis during follow-up, four (1.4%) patients developed peritonitis (Hinchey III/IV) and underwent emergency Hartmann operation. A conservative policy after a first episode of simple diverticulitis is thus associated with a colostomy rate, which is similar to the risk of anastomotic dehiscence after an elective sigmoid colectomy. Eglinton et al. found a risk of 5% for developing complicated disease after a first episode of uncomplicated diverticulitis. The risk of stoma formation was only 0.9%, all of which were temporary and subsequently reversed. Most perforations do not occur after recurrences, but after the first attack of acute diverticulitis. Buchs et al. do not agree with the general thought that younger patients has more aggressive diverticulitis, as suggested by others. We agree the recent shift towards a more conservative management of diverticulitis is effective for all the different age groups. There is no evidence that younger patients should be treated differently from older patients.

The gravity of inflammation (measured by the CRP level) is associated with a higher probability of recurrence, as shown in our series. The risk of recurrence at 6 mo was 22% for patients with CRP > 240 mg/L during their initial episode. Recently, CRP was seen as an interesting marker in simple cases of sigmoid diverticulitis. A level higher than 200 mg/L can be associated with local complication. Buchs et al. proposed that the diagnostic criteria for diverticulitis should include CRP. In our series, free pelvic fluid seen on CT was not associated with further recurrence. However, the discovery of a pneumoperitoneum was of borderline significance. Others groups have reported risk factors for recurrence, including: Age younger than 40 (or 50), a history of at least 3 episodes of acute diverticulitis, medical vs surgical management, male patients, radiological signs of complicated first episode.

**Figure 1** Flow chart of patients’ outcome. Simple: Uncomplicated acute attack (Hinchey Ia) (no abscess, no perforation); Complicated: Presence of abscess (Hinchey Ib and II) or peritonitis (Hinchey III and IV).

No recurrence = 84%
Simple = 14%
Complicated = 2%

Recurrent diverticulitis

n = 285

n = 40

n = 6

n = 239

| No recurrence | Simple | Complicated |
|---------------|--------|-------------|
| 239           | 40     | 6           |

50 years at the first episode. But, younger patients have a similar absolute risk of recurrence, and a higher lifetime risk. Buchs et al. do not agree with the general thought that younger patients has more aggressive diverticulitis, as suggested by others.

Among the different risk factors for recurrence, age has often been mentioned (Table 1). In the past, sigmoidectomy was advocated in young patients (< 50 years at the first episode). But, younger patients have a similar absolute risk of recurrence, and a higher lifetime risk. Buchs et al. do not agree with the general thought that younger patients has more aggressive diverticulitis, as suggested by others. We agree the recent shift towards a more conservative management of diverticulitis is effective for all the different age groups. There is no evidence that younger patients should be treated differently from older patients.

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(abscess formation and extra-colonic contrast or gas), higher comorbidity index, family history of diverticulitis, and length of involved colon > 5 cm\(^a\),\(^b\),\(^c\),\(^d\),\(^e\),\(^f\).

In addition, risk factors for the development of complicated diverticulitis include smoking, non-steroidal anti-inflammatory drugs use, renal failure, organ transplants and steroid use\(^g\).

After the resolution of an episode of diverticulitis, a variety of medical therapies have been used to prevent future attacks. Supplemental fiber, antispasmodics, rifaximin, Mesalamine 5-aminosalicyclic acid (5-ASA), and probiotics have all been studied. These studies included heterogeneous patients however the history of diverticulitis was poorly characterized\(^5\), 5-ASA has been reported to reduce the risk of recurrent symptomatic diverticular disease\(^10\), but there is no evidence that it may prevent recurrent diverticulitis. A recent randomized controlled trial showed that 5-ASA did not reduce the risk of recurrence or time to recurrence. The proportion of patients requiring surgery was comparable among 5-ASA and placebo groups\(^45\). Whilst a protective benefit for these agents has been suggested, their role in prevention of diverticulitis remains to be properly defined\(^46\).

This review has some limitations. First, most of the studies consider only individuals who received in-hospital treatment, and it is known that 50% of diverticulitis patients are safely managed in an outpatient setting\(^18\),\(^47\). There is a risk of bias in considering for inclusion the most severe cases of diverticulitis. Second, longer follow-up is needed to draw definitive conclusions. Finally, the clear lack of uniformity in terminology results in difficulties interpreting and comparing findings between studies.

In conclusion, we have demonstrated the benign nature of simple sigmoid diverticulitis in the vast majority of cases, with a low rate of recurrence, and most importantly a very low rate of subsequent peritonitis requiring emergency surgery. The risk of complication after sigmoidectomy for simple diverticulitis is probably superior than the risk to develop a complication related to the disease itself. And surgery does not completely protect against recurrence\(^36\). The old rationale for elective surgery as a preventive treatment, based mainly on concerns that recurrence would result in progressively increased risk of sepsis or the need of colostomy\(^21\), is thus not supported by current series.

REFERENCES

1. **Lidor AO**, Segul JB, Wu AW, Yu Q, Feinberg R, Schneider EB. Older patients with diverticulitis have low recurrence rates and rarely need surgery. Surgery 2011; 150: 146-153 [PMID: 21801956 DOI: 10.1016/j.surg.2011.05.006]

2. **Stollman NH**, Raskin JB. Diagnosis and management of diverticular disease of the colon in adults. Ad Hoc Practice Parameters Committee of the American College of Gastroenterology. *Am J Gastroenterol* 1999; 94: 3110-3121 [PMID: 10566700 DOI: 10.1111/j.1572-0241.1999.01501.x]

3. **Floch MH**, Bina I. The natural history of diverticulitis: fact and theory. *J Clin Gastroenterol* 2004; 38: S2-S7 [PMID: 15115921]
4 Rafferty J, Shellohi P, Hyman NH, Buie WD. Practice parameters for sigmoid diverticulitis. Dis Colon Rectum 2006; 49: 939-944 [PMID: 16741596 DOI: 10.1016/j.dsr.2005-06-0782].

5 Feingold D, Steele SR, Lee S, Kaiser A, Boushey R, Buie WD, Rafferty JF. Practice parameters for the treatment of sigmoid diverticulitis. Dis Colon Rectum 2014; 57: 284-294 [DOI: 10.1097/DCR.0b013e3182800075].

6 Ambrosetti P. Acute diverticulitis of the left colon: value of the initial CT and timing of elective colectomy. J Gastrointest Surg 2008; 12: 1318-1320 [PMID: 18443885 DOI: 10.1007/s11605-008-0489-8]

7 Wong WD, Weexner SD, Lowry A, Vernava A, Buie WD. Randomized clinical trial of antibiotics in acute uncomplicated diverticulitis. Br J Surg 2010; 97: 952-957 [PMID: 20474406 DOI: 10.1002/bjs.7035].

8 Anaya DA, Flum DR. Risk of emergency colectomy and colostomy in patients with diverticulitis disease. Arch Surg 2005; 10: 681-685 [PMID: 16027534 DOI: 10.1001/archsurg.140.7.681].

9 Broderick-Villa G, Burchette RJ, Collins JC, Abbas MA, Haigh PI. Hospitalization for acute diverticulitis does not mandate routine elective colectomy. Arch Surg 2005; 140: 576-581; discussion 581-583 [PMID: 15967905 DOI: 10.1007/s00268-005-1165-5].

10 Shalik S, Krukowski ZH. Outcome of a conservative policy for managing acute sigmoid diverticulitis. Br J Surg 2007; 94: 876-879 [PMID: 17380481 DOI: 10.1002/bjs.5703].

11 Chapman JR, Dozois EJ, Wolf BG, Gullerud RE, Larson DR. Diverticulitis: a progressive disease? Do multiple recurrences predict less favorable outcomes? Ann Surg 2006; 243: 876-830; discussion 880-883 [PMID: 16772791 DOI: 10.1097/01.sla.000019682.9185.11].

12 Gervaz P, Inan I, Perneger T, Schiffer E, Morel P. A prospective, randomized, single-blind comparison of laparoscopic versus open sigmoid colectomy for diverticulitis. J Am Coll Surg 2010; 252: 3-8 [PMID: 20505508 DOI: 10.1016/j.jamcs.2010.02.026].

13 Andeweg C, Peters J, Bleichrodt R, van Goor H. Incidence and risk factors of recurrence after surgery for pathology-proven diverticulitis disease. World J Surg 2008; 32: 1501-1506 [PMID: 18330623 DOI: 10.1007/s00268-008-9530-z].

14 Klarenbeek BR, Samuels M, van der Wal MA, van der Peet DL, Meijerink WJ, Cuesta MA. Indications for elective sigmoid resection in diverticulitis disease. Ann Surg 2010; 251: 670-674 [PMID: 20224374 DOI: 10.1097/SLA.0b013e3181d34474].

15 Somasekar K, Foster ME, Haray PN. The natural history diverticular disease: is there a role for elective colectomy? J R Coll Surg Edinb 2007; 42: 481-482, 484 [PMID: 12018691].

16 Humes DJ, West J. Role of acute diverticulitis in the development of complicated colonic diverticulitis disease and 1-year mortality after diagnosis in the UK: population-based cohort study. Gut 2012; 61: 95-100 [PMID: 2151188 DOI: 10.1136/gut.2011.238808].

17 Binda GA, Arezzo A, Serventi A, Bonelli L, Facchini M, Prandi M, Carraro PS, Reitano MC, Clerici G, Garibotto L, Alosio R, Sgarzaroni A, Zanoni M, Zanandrea G, Pellegrini F, Mancini S, Amato A, Barisone P, Bottini C, Altomare D, Milito G. Multicentre observational study of the natural history of left-sided acute diverticulitis. Br J Surg 2012; 99: 276-285 [PMID: 22105809 DOI: 10.1002/bjs.7723].

18 Konvolinka CW. Acute diverticulitis under age forty. Am J Surg 1994; 167: 562-565 [PMID: 8290928].

19 Lahat A, Avidan R, Sahatoo E, Katz L, Fiddher HH, Meir SB. Acute diverticulitis: a decade of prospective follow-up. J Clin Gastroenterol 2013; 47: 415-419 [PMID: 23238302 DOI: 10.1097/MCG.0b013e318267044b].

20 Nelson RS, Ewing BM, Wengert TJ, Thorson AG. Clinical outcomes of complicated diverticulitis managed nonoperatively. Am J Surg 2008; 196: 969-972; discussion 973-974 [PMID: 19095117 DOI: 10.1016/j.amjsurg.2008.07.035].

21 Biondo S, Parés D, Martí Ragué J, Kreizler E, Fracalvieri D, et al. Follow-up of complicated sigmoid diverticulitis. [PMID: 24430321 DOI: 10.1001/jama.2013.282025].

22 Gervaz P, Ambrosetti P. Time for a (re) definition of (recurrent) sigmoid diverticulitis? Ann Surg 2011; 254: 1076-1077 [PMID: 22041512 DOI: 10.1097/SLA.0b013e31823ce6c8].

23 Hinchey EJ, Schaal PG, Richards GK. Treatment of perforated diverticular disease of the colon. Adv Surg 1978; 12: 85-109 [PMID: 735943].

24 Kaiser AM, Jiang JK, Lake JP, Ault G, Artinyan A, Gonzalez-Ruiz C, Essani R, Beart RW. The management of complicated diverticulitis and the role of computed tomography. Am J Gastroenterol 2005; 100: 910-917 [PMID: 15784040 DOI: 10.1111/j.1572-0241.2005.04.1154X].

25 Haglund U, Hellberg R, Johansen C, Halten L. Complicated diverticular disease of the sigmoid colon. An analysis of short and long term outcome in 392 patients. Ann Chir Gynaecol 1979; 68: 41-46 [PMID: 507737].

26 Egliion T, Nguyen T, Raniga S, Dixon L, Dobbs B, Frizelle FA. Patterns of recurrence in patients with acute diverticulitis. Br J Surg 2010; 97: 952-957 [PMID: 20474406 DOI: 10.1002/bjs.7035].

27 Feingold D, Steele SR, Lee S, Kaiser A, Boushey R, Buie WD, Rafferty JF. Practice parameters for the treatment of sigmoid diverticulitis. Dis Colon Rectum 2014; 57: 284-294 [DOI: 10.1097/DCR.0b013e3182800075].
Jaurrieta E. Acute colonic diverticulitis in patients under 50 years of age. *Br J Surg* 2002; 89: 1137-1141 [PMID: 12190679 DOI: 10.1046/j.1365-2168.2002.02195.x]

Käser SA, Fankhauser G, Glauser PM, Toia D, Maurer CA. Diagnostic value of inflammation markers in predicting perforation in acute sigmoid diverticulitis. *World J Surg* 2010; 34: 2717-2722 [PMID: 20645093 DOI: 10.1007/s00268-010-0726-7]

Tursi A, Elisei W, Brandimarte G, Giorgetti GM, Aiello F. Predictive value of serologic markers of degree of histologic damage in acute uncomplicated colonic diverticulitis. *J Clin Gastroenterol* 2010; 44: 702-706 [PMID: 20485187 DOI: 10.1097/MCG.0b013e3181d8979]

Mäkelä J, Vuolio S, Kiviniemi H, Laitinen S. Natural history of diverticular disease: when to operate? *Dis Colon Rectum* 1998; 41: 1523-1528 [PMID: 9860333]

Ambrosetti P, Grossholz M, Becker C, Terrier F, Morel P. Computed tomography in acute left colonic diverticulitis. *Br J Surg* 1997; 84: 532-534 [PMID: 9112910]

Raskin JB, Kamm MA, Jamal MM, Márquez J, Melzer E, Schoen RE, Szalóki T, Barrett K, Streck P. Mesalamine did not prevent recurrent diverticulitis in phase 3 controlled trials. *Gastroenterology* 2014; 147: 793-802 [PMID: 25038431 DOI: 10.1053/j.gastro.2014.07.004]

Maconi G, Barbara G, Bosetti C, Cuomo R, Annibale B. Treatment of diverticular disease of the colon and prevention of acute diverticulitis: a systematic review. *Dis Colon Rectum* 2011; 54: 1326-1338 [PMID: 21904150 DOI: 10.1097/DCR.0b013e318223c82b]

Etzioni DA, Chiu VY, Cannom RR, Burchette RJ, Haigh PI, Abbas MA. Outpatient treatment of acute diverticulitis: rates and predictors of failure. *Dis Colon Rectum* 2010; 53: 861-865 [PMID: 20484908 DOI: 10.1007/DCR.0b013e3181cecb243]

Mueller MH, Glatzle J, Kasparek MS, Becker HD, Jehle EC, Zittel TT, Kreis ME. Long-term outcome of conservative treatment in patients with diverticulitis of the sigmoid colon. *Eur J Gastroenterol Hepatol* 2005; 17: 649-654 [PMID: 15879727]
