

Non-operative treatment of right-sided colonic diverticulitis has good long-term outcome: a review of 226 patients

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Abstract

Introduction Data highlighting the long-term outcome following an initial episode of right-sided colonic diverticulitis is lacking. This study aims to evaluate and follow up on all patients with right-sided colonic diverticulitis.

Methods A retrospective review of all patients who were discharged with a diagnosis of right-sided colonic diverticulitis from January 2003 to April 2008 was performed.

Results A total of 226 patients, with a median age of 49 (range, 16–93) years, were admitted for acute right-sided colonic diverticulitis. The majority of the patients ($n=198$, 87.6 %) had mild diverticulitis (Hinchey Ia and Ib). Seventy-three (32.3 %) patients underwent emergency surgery. The indications of surgery were predominantly suspected appendicitis ($n=50$, 22.1 %) and perforated diverticulitis ($n=16$, 7.1 %). Right hemicolectomy was performed in 32 (43.8 %) patients, while appendectomy, with or without diverticulectomy, was performed in the rest ($n=41$, 56.2 %). There were seven patients who underwent elective right hemicolectomy after their acute admissions. Over a median duration of 64 (12–95) months, there were only nine patients who were readmitted 12 times for recurrent diverticulitis at a median

duration of 17 (1–48) months from the index admission. The freedom from failure (recurrent attacks or definitive surgery (right hemicolectomy)) at 60 months was 92.0 % (95 % Confidence interval 86.1 %–97.9 %).

Conclusion Right-sided diverticulitis is commonly encountered in the Asian population and often gets misdiagnosed as acute appendicitis. If successfully managed conservatively, the long-term outcome is excellent.

Keywords Conservative · Diverticulitis · Right sided · Asians · Management

Introduction

The natural history and the role of elective surgery following an initial attack of sigmoid diverticulitis are well described in the literature [1–4]. However, data and recommendations regarding the management of right-sided diverticulitis are uncommon because of the rarity of this pathology in the Western population [5–7].

The significantly higher incidence of right-sided diverticular disease seen in the Asian population has been attributed to genetic and ethnic differences [8–10]. The pathogenesis of right-sided diverticuli remains controversial. While some have suggested that solitary diverticulum is likely congenital in origin and is a “true” diverticulum, others have commented that, in cases of multiple diverticuli, these are likely acquired and hence related to the commonly seen “false” diverticuli of the left colon [9]. The preponderance of this pathology in the younger age group mimics acute appendicitis in its presentations [11, 12], which then resulted in a higher incidence of non-therapeutic appendectomies being performed [13].

Moreover, the natural history of right-sided diverticulitis is not clear. While the severity of right-sided diverticulitis is usually less severe on admission and therefore amendable to

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conservative treatment [13–15], its predisposition in younger patients then poses the dilemma of whether elective surgery is then warranted to address the risk and implications of repeated attacks [16, 17].

In view of the above considerations, we undertook this study to describe our experience in the management of right-sided colonic diverticulitis and also to document the long-term outcome in these patients with specific consideration on the incidence of recurrences and the role of elective surgery.

Materials and methods

A retrospective review of all patients who were discharged with a diagnosis of colonic diverticulitis from 2003 to 2008 was performed. The diagnosis of colonic diverticulitis was made based on radiological and/or operative findings. In this study, right-sided diverticulitis was determined if the pathology arose anyway from the cecum till the transverse colon [10, 13]. Patients would be excluded if the attack is a recurrence instead of an index episode. The severity of diverticulitis was assessed using the modified Hinchey's classification [18, 19].

During the study period, there was no fixed clinical protocol, and the decision to perform a computed tomographic (CT) scan or an emergency surgery was made by the consultant after review within 24 h of admission. All CT scans were obtained on four-slice or 64-slice multidetector CT scanners. Apart from intravenous antibiotics which were administered in all patients upon admission, another possible option for non-operative intervention included a radiologically guided drainage of the abscess in suitable cases. The decision to abandon conservative management in favor of surgery was made by individual consultants. If an emergency surgery was performed, the decision to perform a right hemicolectomy or an appendectomy (with or without diverticulectomy) was dependent on the severity of the pathology as determined by the surgeon intraoperatively.

Upon resolution of the symptoms, patients were discharged and followed up in the outpatient specialist clinic. An elective colonoscopy or barium enema was advised to confirm the presence of diverticular disease if no surgery was performed at the index admission. Elective surgery was reserved for patients with persistent symptoms.

The failure of conservative management in patients who did not undergo right colectomy at the index admission was determined by the need for elective surgery for persistent symptoms and/or if patients were readmitted for recurrent episodes of diverticulitis, which were confirmed by CT scans. Fisher's exact test was used for categorical variables, while Mann–Whitney *U* test was used for continuous variables. For the multivariate analysis, the logistic regression

model was applied. The probability of developing failure was estimated according to the Kaplan–Meier method. All statistical analyses were performed using the SPSS 17.0 statistical package (Chicago, IL, USA).

Results

Of the 346 patients who were admitted for acute colonic diverticulitis from January 2003 to April 2008, 226 (65.3 %) of them had right-sided involvement and formed the study group. The median age of this group was 49 (range, 16–93) years with a slight male majority of 54.4 % ($n=123$). CT scans were performed in 168 (74.3 %) patients. The remaining 58 patients underwent immediate surgery based on clinical suspicion without any prior CT scans and had their diagnoses achieved intraoperatively. Most of the patients ($n=198$, 87.6 %) had mild diverticulitis (Hinchey Ia and Ib) while Hinchey II, III, and IV grade diverticulitis were seen in 17 (7.5 %), nine (4.0 %), and two (0.9 %) patients, respectively. Table 1 illustrates the characteristics of the study group.

Seventy-three (32.3 %) patients underwent emergency surgery. The indications for surgery were suspected appendicitis ($n=50$, 68.5 %) and perforated diverticulitis ($n=16$, 21.9 %). Four patients (5.5 %) had clinical deterioration in spite of conservative treatment and underwent surgery in the same admission. Thirty-two (43.8 %) patients underwent a right colectomy. The remaining 41 patients underwent appendectomy, without ($n=38$) or with ($n=3$) diverticulectomy, which is the excision of the inflamed diverticulum till healthy edges and then followed by primary closure of the colotomy using interrupted absorbable sutures [20].

There were three patients who underwent successful radiological guided drainage of their diverticular abscesses. Emergency surgery was not performed in any of them. One underwent an elective surgery, while another was readmitted 2 months later and required a repeat drainage procedure. He declined surgical intervention and has been well and symptom-free since. The last person did not experience any recurrent attacks since discharge.

From our study, it was obvious that all patients that were conservatively managed underwent a CT scan and had milder grades of diverticulitis than the group of patients who underwent emergency surgery. These also then corresponded to a shorter length of stay. These differences were statistically significant as seen in Table 2.

When we selectively compared the patients who underwent emergency surgery on the index admission (Table 3), it was apparent that the group of patients who underwent appendectomy was younger, did not undergo pre-operative CT scans, and had milder grades of diverticulitis. The length of stay in the right colectomy group was expectedly much

Table 1 Characteristics of the 226 patients who had right-sided diverticulitis

	<i>n</i> (%)
Median age, range (years)	49 (16–93)
≤50	127 (56.2)
>50	99 (43.8)
Gender	
Male	123 (54.4)
Female	103 (45.6)
CT scan	
Yes	168 (74.3)
No	58 (25.7)
Premorbid condition	
Hypertension	70 (31.0)
Diabetes mellitus	26 (11.5)
Hyperlipidemia	38 (16.8)
Ischemic heart disease	10 (4.4)
History of cerebrovascular accident	7 (3.1)
Site of disease	
Cecum	152 (67.3)
Ascending colon	118 (52.2)
Hepatic flexure	9 (4.0)
Transverse colon	11 (4.9)
Diverticulitis	
Hinchey Ia	164 (72.6)
Hinchey Ib	34 (15.0)
Hinchey II	17 (7.5)
Hinchey III	9 (4.0)
Hinchey IV	2 (0.9)
Procedure performed (<i>n</i> =73)	
Appendectomy alone	38 (52.1)
Appendectomy with diverticulectomy	3 (4.1)
Right hemicolectomy	32 (43.8)
Indication for surgery	
Suspected appendicitis	50 (68.5)
Perforated diverticulitis	16 (21.9)
Acute abdomen	3 (4.1)
Failure of conservative treatment	4 (5.5)

longer than the other two groups. The severity of diverticulitis and the indication of surgery were the only variables that remained significant after multivariate analysis.

Although there was no mortality in our study, several complications were noted. In the appendectomy group, four (9.8 %) patients developed mild complications. Two had wound infection while another two had prolonged ileus. Not surprisingly, the right colectomy group had a much higher complication rate of 34.4 % (*n*=11). Four patients had wound infections with another five developing prolonged ileus. One patient required a relook laparotomy for delayed hemorrhage

Table 2 Comparison between the conservatively managed and emergency surgery groups

	Conservative management (<i>n</i> =153) (%)	Emergency surgery (<i>n</i> =73) (%)	<i>p</i> value
Age group			0.002
≤50	77 (50.3)	50 (68.5)	
>50	76 (49.7)	23 (31.5)	
CT scan			<0.001 ^a
Yes	153 (100)	15 (20.5)	
No	0	58 (79.5)	
Diverticulitis			<0.001 ^a
Hinchey Ia	132 (86.3)	32 (43.8)	
Hinchey Ib	18 (11.8)	16 (21.9)	
Hinchey II	3 (2.0)	14 (19.2)	
Hinchey III	0	9 (12.3)	
Hinchey IV	0	2 (2.7)	
Median length of stay, days (range)	3 (1–8)	5 (2–95)	<0.001 ^a

^a Statistically significant on multivariate analysis

secondary to a torn mesenteric vessel, while another had an anastomotic dehiscence that was conservatively managed with percutaneous drainage.

Table 3 Comparison between the two groups of patients who underwent emergency surgery

	Appendectomy (<i>n</i> =41) (%)	Right colectomy (<i>n</i> =32) (%)	<i>p</i> value
Age group			
≤50	33 (80.5)	17 (53.1)	0.021
>50	8 (19.5)	15 (46.9)	
CT scan			
Yes	3 (7.3)	12 (37.5)	0.001
No	38 (92.7)	20 (62.5)	
Severity of diverticulitis			
Hinchey Ia	28 (68.3)	4 (12.5)	<0.001 ^a
Hinchey Ib	9 (22.0)	7 (21.9)	
Hinchey II	4 (9.8)	10 (31.3)	
Hinchey III	0	9 (28.1)	
Hinchey IV	0	2 (6.3)	
Indication for surgery			
Suspected appendicitis	41 (100)	9 (28.1)	<0.001 ^a
Perforated diverticulitis	0	16 (50.0)	
Acute abdomen	0	3 (9.4)	
Failure of conservative treatment	0	4 (12.5)	
Median length of stay, days (range)	2 (2–7)	7 (4–95)	<0.001

^a Statistically significant on multivariate analysis

Of the 194 patients who did not undergo a right colectomy, nine patients were readmitted a total 12 times for recurrent attacks of right-sided diverticulitis. These readmissions occurred at a median duration of 17 (1–48) months from the index admission (Table 4). Three of them underwent a right colectomy during the readmissions. Of all the patients who only underwent appendectomy at the index admission, only one had a recurrent attack 17 months later that was successfully treated conservatively. Another four patients that had recurrent attacks were successfully managed conservatively with intravenous antibiotics, while the last required a repeat radiologically guided drainage of the abscess as described prior. A total of four patients who did not suffer from any recurrent attacks underwent an elective right colectomy for persistent symptoms. The remaining 181 patients remained symptom-free over a median duration of 64 (12–95) months. The freedom from failure [recurrent attack or definitive surgery (right colectomy)] at 60 months was 92.0 % (95 % Confidence interval 86.1 %–97.9 %) (Fig. 1).

Discussion

Our study supports the notion that right-sided diverticulitis is an “Asian” disease [13, 21, 22]. Two thirds of our patients with diverticulitis had their disease limited to the right colon. This is in stark contrast to its rarity in the Western population [6, 7, 23, 24]. As the majority of the diverticulitis in Asians is usually mild in severity [14–16], surgical resection (right colectomy) is often unnecessary. With a low failure rate of conservative management as seen in our series, we recommend a trial of intravenous antibiotics and bowel rest if clinically the severity of diverticulitis is mild

Table 4 Long-term outcome of the 194 patients who did not undergo right hemicolectomy at the index admission

	n (%)
Median duration of follow-up, range (months)	64 (12–95)
Outpatient investigations	
Colonoscopy	–56 (24.8)
Barium enema	–40 (17.7)
Number of patients who developed recurrent attacks	9/194 (4.6)
Total number of readmissions	12
Median duration from discharge to readmission, range (months)	17 (1–48) months
Number of patients who underwent elective surgery (right colectomy)	7/194 (3.6)
Indication for elective surgery	
Persistent symptoms	–4 (57.1)
Recurrent diverticulitis	–3 (42.9)

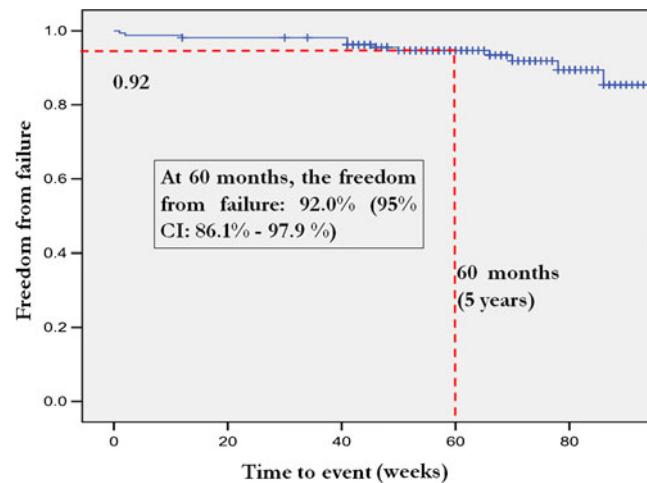


Fig. 1 Kaplan–Meier plot highlighting the failures in all patients with right colonic diverticulitis who were treated conservatively at the index admission

especially after reviewing the CT scans. If the patient deteriorates clinically, prompt radiological or surgical intervention is then warranted. Likewise, there should be no delay in operative intervention for patients with peritonitis due to Hinckley III or IV diverticulitis.

However, when faced with an inflamed right colon during surgery especially without prior imaging, the decision for a colonic resection is entirely at the discretion of the surgeon. The possibility of complications following a right colectomy must be weighed against leaving pathological colon behind. Unless obviously perforated with free peritoneal contamination, the severity of the underlying diverticulitis might only be determined after pathological examination. If the inflammation is obviously mild, there is no role for colonic resection [10, 13]. The role of appendectomy in such cases is debatable [25, 26]. While the lifetime risk of developing appendicitis has been quoted to be slightly less than 10 % [27, 28], the authors feel that the underlying etiology that triggered the right colonic diverticulitis could potentially result in appendicitis in future. Hence, it is our unit’s current practice to remove “normal-looking” appendices whenever surgery is carried out for evaluation of right iliac fossa pain.

Also seen in earlier reports [11, 13, 20], the tendency of these attacks occurring in younger patients mimicked an attack of appendicitis. This often resulted in numerous non-therapeutic operations [11, 13, 20]. Over 90 % of our patients who underwent appendectomy did not have a prior CT scan. A majority of these patients might have been successfully managed conservatively, obviating the need for a surgery. The balance between the cost-effectiveness of a CT scan in all patients with right iliac fossa pain versus the implications of a non-therapeutic operation merits

further work. Until we can better distinguish patients with right-sided diverticulitis from appendicitis, the incidence of non-therapeutic appendectomy will likely remain considerable in any Asian population.

Apart from CT scan, the other two alternative radiological modalities in diagnosing diverticulitis are worth mentioning [29–34]. Ultrasonography and magnetic resonance imaging have been shown to be associated with high sensitivity and specificity rates in diagnosing diverticulitis [11, 26–30]. They are perhaps more applicable in pregnant patients and when CT scan is contraindicated or not available [29–34]. However, the authors opined that CT scan remains the diagnostic modality of choice in most patients as it is investigator-independent and is readily available. Besides, it is also helpful to exclude other intra-abdominal pathology [29–34].

Drainage of diverticular abscesses under radiological guidance is a feasible option for non-operative management [35, 36]. When performed in suitable patients, it is able to relieve the sepsis and converts an emergency surgery to an elective one [35, 36]. Interestingly, two of our patients had their abscesses successfully drained and declined subsequent definitive surgery. Even though one recurred and required a repeat drainage procedure. The possibility of a radiologically guided drainage procedure being definitive in selected patients with diverticular abscesses is an exciting option to explore further. This should perhaps be limited to patients with numerous co-morbidities who might not be able to withstand a major colonic resection.

While the role of elective surgery following prior episodes of sigmoid diverticulitis in the Western population is well documented [2–4], few studies have demonstrated the natural history of right-sided diverticulitis [14, 15, 37]. From our experience, less than 10 % of patients developed recurrent attacks or require elective surgical resection over a period of 5 years. Even if patients were admitted with recurrent attacks, the success rate of conservative management remains high [14, 15, 37].

As in all retrospective studies, selection bias is a significant limitation in our study. The decision to perform a CT scan or an emergency surgery, the type of surgery to perform, and whether to offer elective surgery were all dependent on the primary surgeon. We were also unable to determine if they were any factors that could predict recurrences as the number of patients with repeated attacks was too small. Moreover, we only analyzed patients who were admitted. There could have been patients with undiagnosed mild right-sided diverticulitis who were not admitted and successfully treated conservatively.

More importantly, our study highlighted various issues surrounding an important clinical condition that is often misunderstood and mismanaged. As mentioned above, the role of CT scan in Asian patients with right iliac fossa pain should be evaluated prospectively. The side effects and cost-effectiveness of a routine CT scan must be measured against the cost

incurred from an unnecessary operation and the resultant hospitalization stay. And no matter how minor or infrequent, the complications of appendectomy cannot be overlooked. Furthermore, complications surrounding emergency right colectomy, which might not have been necessary in the first place, are considerable. Serious complications of emergency right colectomy, including mortality, of nearly 30 % have been reported [38]. Hence, it may be worth exploring the possibility of performing only appendectomy and not right hemicolectomy if Hinckley I or II diverticulitis was diagnosed only intraoperatively.

With the majority of the right-sided diverticulitis being minor in severity, it is likely that conservative management will be successful in most patients [16, 39]. Hence, the benefits and implications of solely outpatient management should also be addressed. On a similar note, if factors that could predict failure of conservative management in right-sided diverticulitis could be uncovered, morbidity could be minimized by earlier interventions.

Conclusion

Right-sided diverticulitis is frequently encountered in an Asian population. It is usually mild and misdiagnosed as acute appendicitis. If conservative management is successful, the long-term outcome is excellent.

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