

RAPID COMMUNICATION

Colonoscopic perforation: A report from World Gastroenterology Organization endoscopy training center in Thailand

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Abstract

AIM: To determine the incidence of colonoscopic perforation (CP), and evaluate clinical findings, management and outcomes of patients with CP from the World Gastroenterology Organization (WGO) Endoscopy Training Center in Thailand.

METHODS: All colonoscopies and sigmoidoscopies performed between 1999 and 2007 in the Endoscopic unit, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok were reviewed. Incidence of CP, patients' characteristics, endoscopic information, intra-operative findings, management and outcomes were analyzed.

RESULTS: A total of 17357 endoscopic procedures of the colon (13 699 colonoscopies and 3658 flexible sigmoidoscopies) were performed in Siriraj hospital over a 9-year period. Fifteen patients (0.09%) had CP: 14 from colonoscopy and 1 from sigmoidoscopy. The most common site of perforation was in the sigmoid colon (80%), followed by the transverse colon (13%). Perforations were caused by direct trauma from either the shaft or the tip of the endoscope ($n = 12$,

80%) and endoscopic polypectomy ($n = 3$, 20%). All patients with CP underwent surgical management: primary repair (27%) and bowel resection (73%). The mortality rate was 13% and postoperative complication rate was 53%.

CONCLUSION: CP is a rare but serious complication following colonoscopy and sigmoidoscopy, with high rates of morbidity and mortality. Incidence of CP was 0.09%. Surgery is still the mainstay of CP management.

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Key words: Colonoscopic perforation; Colonoscopy; Complication; Incidence; Endoscopy training center

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INTRODUCTION

There are an increasing number of patients undergoing endoscopic examination of the colon and rectum for various purposes such as screening and surveillance of colorectal cancer. Endoscopy-related complications could result from preparation for the procedure (such as hypotension and electrolyte imbalance following mechanical bowel preparation), or they could be directly related to the endoscopic procedures (such as post-polypectomy hemorrhage and colonic perforation). Although colonoscopic perforation (CP) is a rare complication, it is associated with a high rate of morbidity and mortality^[1-4]. The incidence of CP could be as low as 0.02% in diagnostic colonoscopy and could be as high as 0.6% in therapeutic colonoscopy^[5,6]. The

reported morbidity following CP is about 40% and mortality might be up to 14% depending on patients' characteristics and co-morbidities^[7]. Most patients with CP require open surgery; however, there is recent evidence that CP can be successfully managed by endoluminal repair^[6] and laparoscopic surgery^[8-11].

To the best of our knowledge, there is no published literature about CP from any World Gastroenterology Organization (WGO) Endoscopy Training Center. The aims of this study were to determine the incidence of CP following colonoscopy and flexible sigmoidoscopy, and to evaluate clinical findings, management and outcomes of patients with CP from the WGO Endoscopy Training Center in Thailand.

MATERIALS AND METHODS

All colonoscopies and sigmoidoscopies performed between 1999 and 2007 at the Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand, were reviewed. Patients with CP were identified from the prospectively collected database of the Siriraj GI Endoscopy Center or from the hospital information system. Medical records of all CP patients were reviewed. The incidence of CP, patients' characteristics, endoscopic information, intra-operative findings, management and outcomes in CP patients were analyzed. The study was approved by the Institutional Ethics Committee and informed written consent was obtained from each patient.

All data were prepared and compiled using SPSS software (version 10.0 for Windows). Pearson chi-square test or Fisher's exact test was used for comparing categorical data, whereas the Mann-Whitney *U* test was used for comparing non-categorical data. $P < 0.05$ was considered statistically significant. Values were presented as a number (percentage), or mean (range).

RESULTS

Demographic data

A total of 17 357 endoscopic procedures of the colon (13 699 colonoscopies and 3658 flexible sigmoidoscopies) were performed in Siriraj hospital over a 9 year period. Fifteen patients (0.09%) had CP: 14 from colonoscopy and 1 from sigmoidoscopy. The incidence of CP following colonoscopy was slightly higher than that following sigmoidoscopy (0.1% *vs* 0.03%; $P = 0.22$), with a relative risk ratio of 3.7 (95% confidence intervals = 0.5-28.4).

Patients with CP had an average age of 67 years (range 36-88) and nine patients (60%) were female. Indications for endoscopic examination in these patients were anemia or lower gastrointestinal bleeding ($n = 6$), bowel habit change ($n = 4$), large bowel mass ($n = 2$), non-specific abdominal pain ($n = 1$), refractory inflammatory bowel disease ($n = 1$), and suspected pseudomembranous colitis ($n = 1$).

Table 1 Incidence, findings and management of CP *n* (%)

Characteristics	Data
CP	15 cases
Incidence of CP	
Overall endoscopy ($n = 17357$)	0.09
Colonoscopy ($n = 13699$)	0.10
Flexible sigmoidoscopy ($n = 3658$)	0.03
Site of perforation	
Sigmoid colon	12 (80)
Transverse colon	2 (13)
Ascending colon	1 (7)
Mechanism of perforation	
Direct injury from shaft of scope	7 (47)
Direct injury from tip of scope	5 (33)
Polypectomy	3 (20)
Surgical management [†]	
Primary suture of the perforation	4 (27)
Resection with primary anastomosis	4 (27)
Resection without anastomosis	7 (47)

[†]Four patients (27%) had concomitant colorectal cancer.

Perforations

The most common site of perforation was the sigmoid colon ($n = 12$, 80%), followed by the transverse colon ($n = 2$, 13%) and the ascending colon ($n = 1$, 7%). Based on the endoscopic reports and intra-operative findings, mechanisms of perforation were determined to be direct trauma from the shaft of the endoscope in 7 patients (47%) and from the tip of the endoscope in 5 patients (33%). The others ($n = 3$, 20%) were caused by endoscopic polypectomy. All perforations were immediately recognized during endoscopy except for one electrical injury after polypectomy which caused peritonitis 24 h after the procedure. Details of the characteristics of CP are summarized in Table 1.

Management and outcomes

Non-operative management consisting of bowel rest and intravenous antibiotics was attempted in 2 patients with localized peritonitis; however, their symptoms deteriorated and an operation was eventually required. Therefore, all the patients with CP in this series underwent surgical management. Of these patients, twelve (80%) had medical co-morbidities and four (27%) had concomitant colorectal cancer. Types of operation included primary suture of the perforation in 4 patients (27%), resection and primary anastomosis in 4 patients (27%), and resection without anastomosis in 7 patients (47%).

Postoperative complications were identified in 8 patients (53%): 5 wound infections, 3 pneumonias and 1 antibiotics-associated colitis. There was no difference in age, gender, ASA status, and size of the perforation between the groups who did and did not develop postoperative complications (Table 2). There were 2 deaths (both females aged 76 and 83 years, respectively), accounting for 13% of CP patients and 0.01% of total colonic endoscopy patients. Pneumonia was the primary cause of death in both patients. The average hospital stay of CP patients was 23 d (range 3-92).

Table 2 Comparison of patients' characteristics between the groups who did and did not develop postoperative complications

	Patients with complication (n = 8)	Patients without complication (n = 7)	P
Age over 60	5 (63)	5 (71)	0.71
Female	6 (75)	3 (43)	0.32
ASA ≥ 3	5 (63)	4 (57)	0.83
Perforation size ≥ 5 cm	2 (25)	3 (43)	0.61

Values were given as a number (percentage).

DISCUSSION

The incidence of CP in our study was 0.09%, which was quite similar to that in other larger series (sample size > 30000 cases)^[12-15]. To the best of our knowledge, this is the first report of such an incidence from the WGO Endoscopy training centers. Although it remains inconclusive whether an endoscopy performed by a trainee increases risk of CP, we cannot evaluate such a potential factor because the trainee-to-endoscopist ratio for all procedures in our study was unknown. Anderson and co-workers^[16] have reported that there was no significant increased risk of CP performed by training fellows. Training bodies in America, Britain and Australia have recommended a minimum of 50-100 colonoscopies should be performed by a trainee to gain endoscopic competency^[17-20].

We found that colonoscopy had an almost fourfold increased incidence of CP compared with sigmoidoscopy, although this did not reach statistical significance. Many investigators have reported that the risk of CP following colonoscopy is 2-4 times higher than that following sigmoidoscopy^[13,20]. Other risk factors for CP may include female gender^[16], advanced age^[12,21], a history of diverticular disease or previous intraabdominal surgery^[12], and endoscopic interventions such as polypectomy and endoscopic mucosal resection^[6].

In our study, perforation at the sigmoid colon accounted for 80% of all perforation sites. This finding was consistent with that of other studies^[9,10,13]. There are three possible mechanisms responsible for CP: mechanical perforation directly from the colonoscope, perforations that occur during therapeutic procedures and, finally, barotrauma from overzealous air insufflation^[22,23].

All patients with CP in the present series underwent surgical management. Clearly, the choice between conservative and surgical management depends on clinical factors^[24]. Conservative management is reserved for patients in good general condition and without any sign of peritonitis. Surgical management is recommended in patients with diffuse peritonitis, with clinical deterioration under medical treatment, or with a concomitant colonic pathology such as colorectal cancer. In the published literature, less than 20% of patients with CP can be successfully treated by non-surgical approach^[14,15,25].

With regard to the choices of operation for colonic perforation, we found that a quarter of CP patients underwent primary suture of the perforation while the others had bowel resection. The rate of primary repair in our study was less than that of other studies, in which the rate of non-resection procedures could be 30%-60%^[7,13,15,25,26]. A possible explanation for a relatively low percentage of primary repair in our series might be that half of our patients had a large perforation caused by the shaft of the scope, and many patients were suspected of having underlying colorectal cancer which required bowel resection.

The postoperative morbidity rate was 53% and wound infection was the most common complication. We cannot identify risk factors for developing postoperative complication in CP patients. This may be due to small sample size and limitation in its power. However, some investigators have suggested that such risk factors may include delayed diagnosis, extensive peritoneal contamination, patients using anticoagulants^[15], patients having severe co-morbid diseases and a large perforation^[7]. The mortality rate of patients with CP in our study was fairly comparable to other reports which ranged from 0% to 14%, depending on patients' coexisting diseases, experience of the care team and hospital setting. Pneumonia was the primary cause of death in our study. Respiratory complications often occur after major abdominal surgery^[27-30], particularly in advanced age patients like ours.

In conclusion, colonic perforation is a rare but serious complication following colonoscopy and sigmoidoscopy, with high rates of morbidity and mortality. In this first study into CP carried out in a WGO Endoscopy training center, we found that the incidence of CP was 0.09% and the sigmoid colon was the most common perforation site. Surgery is still the mainstay of CP management.

COMMENTS

Background

Colonoscopic perforation (CP) is a rare, but serious complication of colonoscopy. Rising use of colonoscopy could lead to a high number of endoscopic colonic perforations. Meanwhile, CP could be associated with a significant morbidity and mortality.

Research frontiers

Absent from the published literature is the incidence, management and outcomes of CP reported from World Gastroenterology Organization (WGO) Endoscopy Training Centers.

Innovations and breakthroughs

The Siriraj GI Endoscopy center (Bangkok, Thailand) is one of eight endoscopy training centers accredited by WGO. Incidence of CP in this center was 0.09%. The most common site of the perforation was the sigmoid colon. Direct trauma from either the shaft or tip of the endoscope was the most common cause of perforation. Surgical management remains a mainstay treatment of CP. The mortality rate was 13% and the postoperative complication rate was 53%.

Applications

Although the incidence of CP is very low, it is associated with high rates of morbidity and mortality. Further research might focus on identification of risk factors for CP and improvement of management in these patients.

Terminology

Incidence of CP in the WGO endoscopy training center in Thailand was 0.09%.

Peer review

This is a report of a large experience with endoscopic colonic perforations from a single institution. It is well organized. The complications and their management are clearly documented. It is a valuable contribution and should be accepted for publication.

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