Colonoscopy has been considered to be a relatively safe procedure with a reported incidence of colonic perforation ranging from 0.03 to 0.65 percent in diagnostic colonoscopies and from 0.073 to 0.15 percent in therapeutic colonoscopies.

Case Analysis

10 Year Experience of Iatrogenic Colon Perforation: Clinical Presentation and Management

Yan-Jiun Huang1
John Huang2
Jin-Tung Liang2
1Department of Surgery, Taipei Medical University Hospital
2Department of Surgery, National Taiwan University Hospital, Taipei, Taiwan

Key Words
Colon;
Perforation;
Colonoscopy

Purpose. Colonic perforation caused by colonoscopy is a potentially lethal and feared complication. Its increasing use is making iatrogenic perforations more common. This study aimed to determine the incidence, clinical presentation, and management of colonic perforations resulting from colonoscopy.

Methods. A retrospective study of 35 consecutive patients (23 males, 12 females) with colorectal perforations due to colonoscopy was analyzed over a 10-year period (from 1997 to 2008). Pre- and post-operative data on these 35 patients with colonic perforations were collected. The medical records of the patients with procedure related colonic perforation were reviewed.

Results. A total of 12,582 colonoscopies were performed by colorectal surgeons during the 10 years of the study. 35 colonic perforations (23 males, 12 females) were diagnosed (0.27%). 32 occurred during diagnostic and 3 during therapeutic colonoscopy. 22 patients were diagnosed with a hollow organ perforation within 6 hours after colonoscopic study, while 4 cases of colonic perforation were found more than 24 hours after the study. Abdominal pain and distention were the most common complaints. Rectosigmoid junction was the most common site of perforation followed by the descending colon or sigmoid/descending junction (87% and 6%, respectively). All except three patients had emergency operation including primary repair of the perforated colon without a diverting colostomy in 27 patients, primary repair of the perforated site with a diverting colostomy in 3 patients, right hemicolectomy in 1 patient, low anterior resection in 1 patient, and conservative treatment in 1 patient. The average hospital stay was 15.6 days.

Conclusion. Colonic perforation is a serious complication following colonoscopy. Prompt diagnosis and management are essential to ensure outcome optimization. The incidence of colonic perforation was 0.27%. Surgical treatment with primary repair remains the mainstay management of colonic perforation.

[J Soc Colon Rectal Surgeon (Taiwan) 2010;21:149-154]
2.14 percent in therapeutic colonoscopies. Colono-
scopy remains the gold standard for colorectal cancer
screening and adjunct in the workup of gastrointestinal
disease, despite improvements in the imaging tools
such as computed tomography colonography. An in-
creasing number of colonoscopies performed for
screening purposes, as in our center, increased the fre-
quency with which surgeons encounter colonoscopic
colon perforation. The optimal treatment for colonic
perforations, whether conservative or operative, is
still unknown because no large randomized clinical
trial has ever been performed. The aim of this study
was to review the experience of a major university af-
iliated medical center with colonoscopy and to ana-
lyze the incidence of perforations and management.

Materials and Methods

From January 1997 to December 2008, 35 pa-
tients of our hospital were diagnosed with colonic per-
forations. Exclusions have been made for cases that
were referred from other institutions. Patient demo-
graphics, indications for colonoscopy, time to operate,
size of perforation hole, length of hospitalization and
management were collected via medical chart review.
The operative and pathological reports were reviewed
for gathering information on the extent of peritoneal
contamination and operative method, and the site and
size of perforation. The continuous data were pre-
sented as mean ± standard deviation (S.D.).

Results

Demographics

From January 1997 to December 2008, 12,582
colonoscopies were performed at the division of
colorectal surgery at National Taiwan University Hos-
pital, resulting in 35 (0.27%) colonic perforations.
The study group consisted of 23 males and 12 females
ranging in age from 18 to 81 years (mean 64.5, me-
dian 67.5 years). All 35 patients (100%) underwent
colonoscopy as outpatients. 3 patients (8.5%) had
prior abdominal, groin or pelvic operation. Signifi-
cant comorbid conditions included steroid use in 3 pa-
tients (8.5%), current malignancy in 5 patients (14%),
corticosteroid use in 3 patients (8.5%), and organ
transplantation in 1 patient (0.28%).

Indications of endoscopy

Colonoscopy was performed or supervised by
colorectal surgeons. Neither analgesics nor sedatives
were used. The indications for colonoscopy are shown in
Table 1. Of the 35 colonoscopies resulting in per-
forations done at our hospital, the surgical endo-
scopist noted or suspected a perforation during 9 ex-
aminations (26%), based on the finding of intra-ab-
dominal organs with colonic intraluminal bleeding on
the monitor.

Clinical manifestations

Thirty-one (89%) patients developed abdominal
pain and distention. One asymptomatic patient with
micro-perforation free intra-abdominal sub-diaphrag-
matic air on both chest and abdominal radiography
was treated conservatively without sequelae. Two pa-
tients were in the state of septic shock: one had an un-
derlying disease of ulcerative colitis under strong
inotropic agent support, and the family refused to un-
dergo aggressive treatment and left the hospital ag-
ainst medical advice. The other one was on the wait-
ing list for liver transplantation, but with rapid down-
hill of the clinical condition, even with the surgical
treatment, the family refused to proceed with aggres-
sive treatment. Thirty-three patients (94%) underwent
operative treatment. Thirty (86%) of these thirty-five
patients had peritoneal sign on physical examination.
Nine patients were operated within 3 hours after diag-

Table 1. Indications for colonoscopy

<table>
<thead>
<tr>
<th>Indication</th>
<th>No. of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health examination</td>
<td>16 (45)</td>
</tr>
<tr>
<td>Known or history of polyp</td>
<td>3 (8.5)</td>
</tr>
<tr>
<td>Gastrointestinal bleeding</td>
<td>4 (11)</td>
</tr>
<tr>
<td>Post – op follow up</td>
<td>5 (14)</td>
</tr>
<tr>
<td>Liver transplantation evaluation</td>
<td>1 (2.8)</td>
</tr>
<tr>
<td>Change in bowel habits</td>
<td>5 (14)</td>
</tr>
<tr>
<td>Iron-deficiency anemia</td>
<td>1 (2.8)</td>
</tr>
<tr>
<td>Total</td>
<td>35 (100)</td>
</tr>
</tbody>
</table>
nosis of hollow organ perforation because the colonic perforation was noted by the endoscopist. All thirty-three patients managed operatively underwent chest roentgenograms (CXR): 22 (66%) had free air noted, and 11 (34%) did not. Computed tomography was used in conjunction with peritoneal sign in the diagnosis of these 11 patients with no free air shown on chest roentgenograms.

2 cases of colonic perforation were found 24 hours and another 2 cases were found 48 hours after the examination.

**Operative and non-operative management**

One patient was managed nonoperatively. Length of hospitalization was 9 days. The patient was diagnosed within 6 hours of colonoscopic perforation with initial presentation of abdominal pain but without peritoneal signs. The chest X-ray showed free air. Thus she was admitted to the hospital for intravenous antibiotics, hydration, and withholding oral intake. The patient then recovered completely with resolution of abdominal pain, normal temperature, and normal leukocyte count.

A mortality occurred in a 44-year-old female with an underlying disease of ulcerative colitis that had been under strong steroid treatment. She received a scheduled follow-up for her current status but colonoscopy-related colon injury causing a tension pneumoperitoneum and shock happened. The patient’s family declined any further surgical intervention, and the patient was taken home against medical advice a few hours after the procedure. The patient died within 24 hours after she was taken home. Another cirrhotic patient undergoing liver transplant evaluation suffered from colonic perforation and died 5 days after intervening surgical management involving purely simple closure of the tiny perforated hole.

The median duration of hospital stay of these 33 patients was 10 days (mean 15.6, range 7–84 days). The operative procedure was simple closure in 27 (82%) patients, right hemicolectomy in 1 (3%) patient, low anterior resection (LAR) in 1 (3%) patient, segmental/wedge resection in 1 (3%) patient, and simple repair with a diverting ileostomy or colostomy in 3 (9%) patients (Table 2).

The amount of intraperitoneal contamination ranged from no visible ascites to minimal ascites in 16 (48%) patients, to local soiling in 10 (30%) patients, and generalized fecal peritonitis in 7 (21%) patients. Most patients with no visible or minimal ascites (N = 15, 45%) required no stoma. Aggressive intraperitoneal irrigation (6L or more of normal saline) was used in all operative cases. Four out of seven patients with generalized intra-peritoneal contamination had post-operative morbidity (Anastomotic leakage: 1, Aspiration pneumonia: 1, Surgical wound infection: 2) (Table 3). Medical treatment involving antibiotics was given to the above 4 cases, and in combination with pigtail drainage, chest care and wound wet dressing change, separately to each mentioned morbidity case. These morbidity cases eventually recovered and discharged in average 2 month after hospitalization.

Perforations occurred at the rectosigmoid junction or sigmoid colon in 29 (87%) patients. The perforation size ranged from 0.2 to 6 cm (mean, 3.5 cm). The largest perforations were from mechanical injury and the small perforations were the result of electrocautery injury.

<table>
<thead>
<tr>
<th>Table 2. Techniques of operative repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operative procedure</td>
</tr>
<tr>
<td>Right hemicolecotomy</td>
</tr>
<tr>
<td>Low anterior resection</td>
</tr>
<tr>
<td>Simple repair</td>
</tr>
<tr>
<td>Simple repair with diverting ileostomy or colostomy</td>
</tr>
<tr>
<td>Segmental/wedge resection</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3. Post-operative morbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
</tr>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
</tr>
</tbody>
</table>
Discussion

From January 1997 to December 2008, 12,582 colonoscopies were performed at our institution, resulting in 35 colonic perforations. The incidence of colonoscopic perforation in our study was 0.27%, which is quite similar to that in other larger series.\(^4\)\(^-\)\(^7\) The growing number of colonoscopies performed as a diagnostic and therapeutic tool nationwide has made this complication more evident and common. In addition, colonoscopies are nowadays more performed in older and less healthy people who are more susceptible to iatrogenic colonoscopic perforation. The management of iatrogenic colonoscopic perforations may be conservative or surgical, and should be selective. The choice of treatment depends on the patient’s clinical condition, the primary colonic pathology, size of perforation, adequacy of bowel preparation, and the timing of diagnosis.\(^8\)\(^,\)\(^9\)

Abdominal pain (89%) remains the main clinical presentation of colonic perforation in our study. Abdominal roentgenogram is an easy-accessible, cost-effective, and useful means for providing information on the presence of pneumoperitoneum. However, a negative finding does not rule out the possibility of colonic perforation. In this case, computed tomography can be used to detect free air or microperforations.

In our study, perforation at the rectosigmoid/sigmoid colon accounted for 87% of all perforated sites. This data is consistent with that of other studies.\(^10\)\(^-\)\(^12\) This may be explained partly by its anatomy of redundancy, narrowing of the lumen caused by diverticular disease, or adhesion from previous operation.\(^13\) Three possible main mechanisms are responsible for iatrogenic colonoscopic perforations: first, direct perforation by the endoscope’s tip, second, barotrauma from overinsufflation of air, and finally, perforations that happen during therapeutic procedures.

Most of our patients (94%) with colonoscopic perforations underwent surgical intervention and only one patient was treated non-operatively. This clearly demonstrates that the choice between conservative treatment and surgical intervention largely depends upon the clinical factors, like the patient’s condition. Conservative treatment is usually reserved for patients in stable clinical condition and without signs of peritonitis. On the other hand, surgical intervention is undertaken in patients with unstable vital signs, with diffuse peritonitis, or with accompanying primary colonic pathology such as colorectal cancer. Operative treatment was mainly determined by intra-operative findings. Due to the small sample size, the results were underpowered but nevertheless we can see that patients that are diagnosed with colonoscopic perforation more than 24 hours following colonoscopy seem to have a higher chance of having extensive intra-abdominal fecal contamination. This group of patients is more likely to require resection/repair with fecal diversion than those being diagnosed within 24 hours. In our study, 76% of the patients diagnosed with colonic perforation were operated within 6 hours and this was positively correlated with the duration of hospital stay \((p < 0.001)\). One cirrhotic patient undergoing liver transplantation evaluation diagnosed with colonic perforation died despite surgical intervention. Primary repair was done in this patient but without a diversion stoma. This makes us to reconsider in the future whether a prophylactic diversion stoma is indicated in patients with major comorbidity.

Conclusion

In this study, we found that the incidence of colonoscopic perforation was 0.27% and abdominal pain was the most common initial presenting symptom. The rectosigmoid junction was the most common site of perforation. Prompt surgical intervention is still the mainstay of treatment and is indicated in the presence of a large perforation noted clinically or radiographically and in the setting of generalized peritonitis or ongoing sepsis. Protective ileostomy might be indicated in patients with significant comorbidity. Conservative treatment is best reserved for carefully selected patients.

References


病例分析

大腸鏡造成醫源性大腸穿孔之十年經驗：
臨床表現與處理方式

黃彥均 1  黃約翰 2  梁金銅 2

1 台北醫學大學附設醫院  外科部
2 國立台灣大學附設醫院  外科部

目的 大腸鏡造成醫源性大腸穿孔是令人害怕且有潛在致命性的病發症。大腸鏡在臨床使用率的增加使得醫源性大腸穿孔更容易被觀察到。這個研究的目的主要是探討其發生率、臨床表現與臨床處理的方式。

方法 針對 1997 年至 2004 年間，因進行大腸鏡檢查而引發醫源性結腸穿孔的 35 位病人，進行病歷紀錄的回溯性研究，以紀錄病人術前及術後的基本資料、接受大腸鏡檢查的原因、病人的潛在疾病、大腸鏡檢查資料、重大腹部手術病史、結腸穿孔診斷時間、手術後之發現、治療方法。併發症與結果。

結果 在此 10 年期間，台大醫院外科總共進行過 12582 次大腸鏡檢查，因為此項檢查而引發醫源性大腸穿孔的病人共有 35 位 (0.27%)。其中 32 位醫源性大腸穿孔都是發生在施行診斷性大腸鏡的過程中。有 22 位病人在大腸鏡檢查後 6 小時內即被診斷出而另有兩位病人則是在鏡検完後 24 小時被診斷出。腹痛和腹脹是兩個主要的臨床表現。直腸乙狀結腸交界處是穿孔最常見之處，其次是乙狀結腸降結腸交界處 (分別是 87% and 6%)。有 27 位病人接受大腸穿孔的直接修補、3 位病人接受大腸穿孔的直接修補合併分流性大腸造口、1 位病人接受右升結腸切除術、1 位病人接受低位直腸切除術、1 位病人接受保守治療。平均住院天數是 15.6 天。有一位病人住院超長其主要原因為吻合處滲漏。

結論 大腸鏡造成的醫源性大腸穿孔是一項很嚴重的病發症。快速正確的診斷及處理是確保病人有較好預後的一種有效的方式。醫源性大腸穿孔的發生率是 0.27%。手術直接修補處理大腸鏡造成的大腸穿孔仍是目前處理的主要方式。

關鍵詞 大腸、穿孔、大腸鏡。