Perforation after colonoscopy: Our 16-year experience

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RESUMEN

Objetivo: el propósito de este estudio retrospectivo fue conocer la incidencia de perforaciones de colon por colonoscopia diagnóstica y terapéutica y valorar el manejo de las mismas en nuestro medio.

Pacientes y método: se revisaron las perforaciones por colonoscopias realizadas en nuestro hospital entre enero de 1991 y diciembre de 2006. Se analizaron la finalidad del procedimiento, el mecanismo de la lesión, su presentación clínica y radiológica, el retraso diagnóstico, el estado general de los pacientes, el manejo terapéutico y sus resultados.

Resultados: en el periodo de estudio hubo 15 perforaciones (0.09%) de un total de 16.285 colonoscopias realizadas (9 varones, 6 mujeres). Nueve ocurrieron tras colonoscopias diagnósticas y 6 terapéuticas. El 60% de las perforaciones fueron advertidas por el endoscopista durante el procedimiento (en el 88.6% de las diagnósticas y en el 16.6% de las terapéuticas). En el 73.7% de los casos el dolor con distensión abdominal fue el síntoma más frecuente y en 11 pacientes con pruebas de imagen se apreció gas extraluminal en el 100% de los casos. El retraso diagnóstico (> 24 horas) ocurrió en el 40% de los pacientes (rango: 1-6 días). Fueron intervenidos 12 pacientes (80%) de los que 4 eran ASA II y 8 ASA III/IV. La morbilidad postoperatoria fue del 44.44% y la mortalidad del 25%. La evolución de los pacientes tratados conservadoramente fue satisfactoria.

Conclusión: la perforación de colon por colonoscopia es una complicación rara de consecuencias graves e incluso letales. El tratamiento conservador puede realizarse en casos seleccionados y bajo un control clínico estricto. El tipo de cirugía va a depender de la localización, tamaño de la lesión, patología colónica concomitante y grado de contaminación fecal. La mortalidad parece estar más relacionada con el estado general del paciente que con la propia técnica quirúrgica realizada.


ABSTRACT

Objective: the aim of this retrospective study was to evaluate the incidence of colon perforations from diagnostic and therapeutic colonoscopies, and to assess their management in our hospital.

Patients and method: perforations resulting from colonoscopy in our hospital were reviewed for the period January, 1991 to December, 2006. The study analyzed: purpose of procedure, lesion mechanisms, clinical and radiological presentations, delays in diagnosis, patient status, therapeutic handling, and outcome.

Result: fifteen perforations (0.09%) (9 males and 6 females) out of a total of 16,285 colonoscopies carried out were seen to have taken place during the study period. Nine of these occurred after diagnostic colonoscopies, and 6 occurred after therapeutic endoscopies. Around 60% of perforations were detected by the endoscopist while carrying out the procedure (88.6% during diagnostic endoscopy, and 16.6% during therapeutic endoscopy). In 73.7% of cases abdominal pain and distension were the most frequent symptoms; extraluminal gas was seen in 100% of cases with imaging techniques. Delayed diagnosis (> 24 hours) occurred in 40% of patients (range: 1-6 days). Twelve patients were operated upon (80%), of whom 4 were ASA II and 8 were ASA III/IV. Postoperative morbidity was 44.44%, and mortality was 25%. The outcome of patients receiving conservative treatment was found to be satisfactory.

Conclusion: perforation of the colon during colonoscopy is a rare complication with serious—even lethal—consequences. Conservative treatment can be provided for selected cases under strict clinical control. Type of surgery will depend on the lesion location and size, concomitant colon pathology, and degree of fecal contamination. Mortality seems to be related to general status rather than the surgical technique used.

Key words: Colonic perforation. Colonoscopy. Colonoscopy complications.

INTRODUCTION

Colonoscopy is a normal procedure in the diagnosis, treatment, and follow-up of colon diseases. Post-colonoscopic perforation is an infrequent complication that has
important and even lethal consequences. Its recent incidence in many series with large numbers (> 15,000 colonoscopies) oscillates between 0.016 and 0.19% (1-3). Although percentages in some series were found to be similar when used for diagnostic or therapeutic purposes (4), other series have shown that such incidence is greater during the therapeutic use (5), and significantly greater during the diagnostic use of colonoscopy (6).

Although the literature describes specific cases that were given conservative treatment, and some series had a 100% success rate in patients (7), recent series have shown that between 33 and 100% of patients need urgent laparotomy after diagnosis (8,9), with a morbidity rate between 27 and 39%, and a death rate between 0 and 14% (4,6,10,11).

The aim of the present study is to establish the incidence of post-colonoscopic secondary perforations in our hospital, and above all to assess therapeutic handling and outcome.

PATIENTS AND METHODS

A total of 16,285 colonoscopies were carried out in our hospital between January 1991 and December 2006. The demographic data of patients were collected from the Coding Center in our hospital, and colonoscopy reports registered there were reviewed. The following data were collected for patients with post-colonoscopic perforation: age, sex, use of sedatives and analgesia, ASA (American Society of Anesthesiology) rating, colonoscopy indication, personal history, time from procedure to perforation diagnosis, clinical presentation, radiographical findings, location, therapeutic handling, morbidity, and mortality.

RESULTS

A total of 16,285 colonoscopies were carried out over a period of 16 years, with a result of 15 perforations (0.09%), and 80% of these occurred during the latter half of the study period (3 perforations out of 5638 colonoscopies between 1991 and 1998, and 12 perforations between 1999 and 2006). Eleven were located in the sigmoid colon, 2 in the cecum, and 2 at the rectosigmoid junction. The average age of patients was 70.20 years (range 33-88 years), whereas the mean age for therapeutic colonoscopies and in 16.6% of therapeutic ones; 3 patients returned to the clinic 24 hours after endoscopy, 1 patient 48 hours later, and 2 patients arrived after 4 and 6 days, respectively. The cause of perforation was identified as mechanical in 12 patients (through direct traumatism by the colonoscope’s end), while in 7 patients it was secondary to polypectomy, and in 5 patients perforation was due to argon therapy, and to pneumatics in 3 patients.

Only 1 patient evolved without any symptoms and was diagnosed 4 days after colonoscopy because of the presence of fecal contents in the peritoneal dialysis fluid. The most frequent symptoms were abdominal pain and distension (73.73%), only abdominal distension (6.66%), and only pain (13.33%). One patient was diagnosed 24 hours after colonoscopy because of subcutaneous emphysema, but with no accompanying symptoms. All 11 patients subjected to imaging tests (plain X-rays or abdominal CT) were found to be positive to pneumoperitoneum, and one of these also had pneumoretroperitoneum and pneumomediastinum (Fig. 1).

Of the 12 patients subjected to surgery, 4 were ASA II, 6 ASA III, and 2 ASA IV cases. Surgery was immediately performed in 8 patients (less than 3 hours after colonoscopy), after a 24-hour period in 2 patients, after a 48-hour period in 1 patient, and after 4 days in 1 patient. Hartmann’s surgery was performed on 4 patients, primarily suture in 4 patients (one of them through laparoscopy), right colectomy and ileocolic anastomosis in 2 patients, sigmoidectomy and primary anastomosis in 1 patient, and subtotal colectomy with ileorectal anastomosis in 1 patient with right colon angiodysplasia, left colon diverticulosis, and a 12-cm perforation in the sigma. Three patients died after surgery (25%), 2 of them had been immediately operated upon after colonoscopy and 1 at 24 hours after colonoscopy. The cause of death was septic shock originating in the abdomen in one 86-year-old patient with ASA III, and upper digestive tract hemor-
rhage in 2 patients aged 82 and 86 who had a history of portal hypertension and were ASA III and IV, respectively (Table I).

Postoperative morbidity was 44.44%: pneumonia (n: 2), percutaneously drained subphrenic abscess (n: 1), and infection of surgical wound (n: 1). Average postoperative stay in hospital was 16 days (range: 7-43 days).

One patient presented with pain in the right lower abdominal quadrant after colonoscopy, and a perforated sigma was diagnosed using X-rays 6 days later. Medical treatment was found to be satisfactory. There were no complications in the three patients that were treated with conservative treatment.

### Table I. Perforation from colonoscopy. Surgical treatment

<table>
<thead>
<tr>
<th>Case number</th>
<th>Sex</th>
<th>Age</th>
<th>ASA</th>
<th>Evolution</th>
<th>Surgery</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>50</td>
<td>IV</td>
<td>4 days</td>
<td>Hartmann</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>86</td>
<td>III</td>
<td>Immediate</td>
<td>Resection and anastomosis</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>81</td>
<td>III</td>
<td>Immediate</td>
<td>Suture</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>82</td>
<td>IV</td>
<td>Immediate</td>
<td>Suture</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>67</td>
<td>II</td>
<td>Immediate</td>
<td>Hartmann</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>86</td>
<td>III</td>
<td>24 hours</td>
<td>Right colectomy</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>33</td>
<td>II</td>
<td>48 hours</td>
<td>Hartmann</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>85</td>
<td>II</td>
<td>Immediate</td>
<td>Suture</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>45</td>
<td>III</td>
<td>Immediate</td>
<td>Colectomy and ileorectal anastomosis</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>59</td>
<td>III</td>
<td>Immediate</td>
<td>Suture</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>76</td>
<td>II</td>
<td>Immediate</td>
<td>Hartmann</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>81</td>
<td>III</td>
<td>24 hours</td>
<td>Right colectomy</td>
<td>No</td>
</tr>
</tbody>
</table>

Fig. 1. Pneumoperitoneum, retroperitoneum, and subcutaneous emphysema.

of colonoscopies carried out annually. In our series, the incidence of perforation was 0.092%. A total of 5,638 colonoscopies were performed during the first half of our study period with a result of 3 perforations (0.05%), while the result for the second half of the study period was 0.11% for 10,647 colonoscopies; therefore we did not find any differences between groups. During said second period, perforations occurred in colonoscopies that were carried out by endoscopists with more than 10 years’ experience, where each endoscopist had performed more than 400 colonoscopies. Puches et al. (13) reported that the complication frequency is proportional to the level of experience; however, this is not the case with our series, and therefore risk factors reported by several authors (2,4,10,14,15), including the presence of inflammatory activity, prior pelvic X-rays, presence of diverticula, and prior abdominal surgery, play a fundamental role in the risk of perforation. The presence of colon stenosis due to Crohn’s disease, prior abdominal surgery, and sigmoid diverticulosis with a sigma lodged in an inguinal hernial sac in 1 patient, were in our opinion the potential risk factors in 1, 3, and 5 patients, respectively.

Although perforation rates arising from diagnostic colonoscopies in some series are 42-50% (2,4,8,14,16), said rates oscillate in other series between 63 and 72% (5,6,17,18). The cause of such perforations could be mechanical in origin, or due to barotrauma. Lesions caused in the colon wall by the colonoscope’s tip due to inadequate handling, creation of an alpha loop or the penetration of the endoscope through the mucosa with progression outside the lumen are the most frequent causes of colon perforation (19-21). The error in differentiating the lumen of a diverticulum from that of the colon, the presence of adhesions due to previous surgery, the presence of a redundant sigma, and a greater incidence of diverticula in the sigmoid region make these segments more prone to lesions (4,6,17,20,21). Perforation due to barotrauma, i.e., as a result of excessive gas insufflation, provokes a greater perforation frequency at the cecum level (4,22). This could also happen in the sigmoid colon, as the bend in the colon could enable the creation of a high-pressure segment during gas insufflation (23). This could have happened in our two cases where perforation was attributed to barotrauma, where the sigma in one of the patients was elbowed and adhered to an inguinal hernial sac. Most of our cases suffering from diagnostic colonoscopic perforation were due to direct trauma of the colon wall by the colonoscope, where perforations were located at the rectosigmoidal junction level and in the sigma in 1 and 6 patients, respectively, and lesions in all cases were found to be located on the antimesenteric border, with a length oscillating between 1.5 and 12 cm.

Perforations during therapeutic colonoscopy can occur through mechanisms that are similar to those seen for diagnostic colonoscopy; however, the frequency is greater after biopsies, polypectomies, electrocautery use, or use of argon therapy for arteriovenous malformations.
(2,3,11,18,24). Our experience, and that of other authors, with these types of perforation is that they are of a considerably smaller size when compared to perforations provoked by the tip of a colonoscope, and furthermore that they are usually detected at a later stage (2,9).

Abdominal pain and distension are the most frequent symptoms (10,18); however, symptomatology is absent in some cases or symptoms appear after a few days or even weeks later (4,7,11,17). The diagnostic delay during this study was 40%, which is similar to other series (4,7) for an average delay of 2.5 days (range: 1-6). In 83% of cases colonoscopy was undergone for therapeutic purposes, and therefore we feel that perforations occurred because of prolonged contact with the laser during an angiodyplasia treatment (24), and because of transmural thermal lesion during the application of postpolypectomy electrocoagulation (25,26).

The use of anesthetics does not increase the risk of perforation (27), and is not accompanied by severe complications (28); we did not find any diagnostic delay differences after using sedative and analgesic drugs during the procedure; however, the extent of sedation and analgesia is a controversial subject. While for some authors (29) deep sedation is an important factor in the evaluation of signs and symptoms, others use it in most of their patients without communicating adverse effects (28).

Findings in plain x-ray films can show free gas in the abdominal cavity (at the pericolic level) or an extension of the gas to the retroperitoneal space (17,18,30). In rectal perforations, or when perforations are at the rectosigmoidal level, gas can extend to the psoas muscle, the mediastinum, and subcutaneous tissues (7,30,31). If plain X-rays show no perforation, then a CAT scan may help in the diagnosis by showing the free gas, microperforations, or abscesses present (11).

The absence of gas outside the colon does not exclude a perforation diagnosis (17), and the presence of gas in itself is insufficient to justify surgery (11,16,25,31,32). The therapeutic management of these patients is controversial, and failure of conservative treatment, which requires posterior laparotomy in some series, is equal to or greater than 50% of cases (2,15). Some authors (33,34) advocate for immediate surgery based on the fact that conservative treatment failure increases contamination and inflammation, thereby increasing postoperative morbidity and mortality. Perforations from therapeutic colonoscopy are usually smaller in size, and abdominal contamination is at a minimum. Furthermore, if we prepare the colon adequately and ensure that the patient’s general condition is optimum, then such types of perforation would possibly respond satisfactorily to conservative treatment (7,8,26,29). Those of our patients who received conservative treatment had been earlier subjected to polypectomy, and had radiological signs of extraluminal gas, with a pericolic abscess in one of the patients. Therefore, we suggest that immediate surgery should be reserved only for patients whose perforations are diagnosed by the endoscopist during a general diagnostic endoscopy (2), and who could not be candidates to therapeutic management by this one (35), and whenever signs and symptoms indicate an affected peritoneum, because success of treatment would depend upon the clinical stability of patients, the evolution of their symptoms (15,25), and therefore the need for strict clinical observation (11,18).

Type of surgery would depend on lesion size, contamination extent, associated colon pathology, and patient general condition (8,10,11); thus, surgical options include perforation suture, resection, and primary anastomosis with or without a protective stoma, as well as intestinal resection and stoma in patients with extensive fecal contamination, multiple comorbidities, or hemodynamic instability (2,4,16-18,32).

Postoperative mortality in the consulted literature oscillated between 0 and 50% (4,10,11,16,17,26,34). Three patients from the present series died (25%), 1 had ASA IV and 2 ASA III, on whom a suture, resection and primary anastomosis, and right colectomy were carried out, respectively, after an immediate perforation diagnosis in two of the patients, while there was a 24-hour delay after colonoscopy in one patient. We therefore consider that mortality in these cases depends on patient status rather than type of surgery (4).

Laparoscopy is a safe and effective alternative for the treatment of this problem (36-39). One of our patients underwent a perforation suture via laparoscopy, and stayed in hospital for 9 days, a duration similar to that of 2 cases with the same technique carried out via open surgery. Further experience and documentation on the use of laparoscopy in the treatment of colonoscopic perforations would surely provide data to attempt a reduction in morbidity and hospital stay for such patients.

**CONCLUSION**

Although colonoscopic perforations are infrequent, there can be nevertheless significant postoperative morbidity and mortality. Immediate surgery is performed in most cases when the endoscopist detects the lesion while carrying out a diagnostic endoscopy. Patients can generally be treated conservatively under strict clinical surveillance whenever a perforation is due to therapeutic colonoscopy, especially after polypectomy. Type of surgery will depend on location, lesion size, and concomitant colon pathology, and can be carried out just once except in cases where extensive fecal contamination exists. Mortality seems to be related to general condition rather than surgical technique.

**REFERENCES**


