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Original article

Incidence of iatrogenic perforation during colonoscopy and their treatment in a university hospital

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ABSTRACT

Introduction: Colon perforation is a fairly uncommon, but serious, complication during endoscopy of the lower gastrointestinal tract. Treatment is controversial, although surgery is used in the majority of cases. The aims of this study were to determine the incidence of perforations due to colonoscopy in our hospital and to find out the results of the treatment options used.

Material and methods: Retrospective study of perforations caused by colonoscopy between January 2004 and October 2008. The variables analysed were: demographic characteristics, colonoscopy indication, clinical signs and symptoms, diagnostic tests used, time between perforation and the diagnosis, treatment type, hospital stay and complications.

Results: A total of 13,493 colonoscopies were performed during the study period. A perforation of the colon was found in 13 (0.1%) patients. Nine perforations occurred whilst performing a diagnostic colonoscopy (0.08%) and the remaining 4 after a therapeutic colonoscope (0.16%). In 10 of the cases the diagnosis was made within the first 12h, and in 5 of these the perforation was identified during the procedure itself. The most common location was the sigmoid, in 7 cases. Surgical treatment was carried out on 11 patients, and in the other two it was resolved by conservative treatment. The most used surgical technique was simple suture followed by resection with anastomosis. One patient died due to intra-abdominal sepsis.

Conclusion: Perforations caused by colonoscopy are rare, but serious, complications. The majority of these patients required surgical treatment, with conservative treatment being reserved for selected patients.

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Incidencia de la perforación iatrogénica por colonoscopia y resultados del tratamiento en un hospital universitario

Palabras clave:
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RESUMEN

Introducción: La perforación del colon es una complicación poco frecuente, aunque grave, de la endoscopia digestiva baja. El tratamiento es controvertido, aunque en la mayoría de los casos es quirúrgico. Los objetivos de este estudio fueron determinar la incidencia de las perforaciones por colonoscopia en nuestro centro y conocer los resultados de las opciones terapéuticas empleadas.

Material y métodos: Estudio retrospectivo de las perforaciones producidas por colonoscopia entre enero de 2004 y octubre de 2009. Las variables analizadas fueron las siguientes: características demográficas, indicación de la colonoscopia, manifestaciones clínicas, pruebas diagnósticas utilizadas, tiempo entre la perforación y el diagnóstico, tipo de tratamiento, estancia hospitalaria y complicaciones.

Resultados: Durante el período de estudio se realizaron 13.493 colonoscopias. En 13 pacientes (0,1%) se produjo una perforación del colon. Nueve perforaciones ocurrieron durante la realización de una colonoscopia diagnóstica (0,08%) y las restantes 4 después de una colonoscopia terapéutica (0,16%). En 10 casos, el diagnóstico se realizó durante las primeras 12 h y en 5 de ellos, la perforación se identificó durante el mismo procedimiento. La localización más frecuente fue el sigma en 7 casos. En 11 pacientes se realizó tratamiento quirúrgico y en 2 pacientes se resolvió con tratamiento conservador. La técnica quirúrgica más utilizada fue la sutura simple seguida de la resección con anastomosis. Un paciente falleció por sepsis intraabdominal.

Conclusión: Las perforaciones causadas por colonoscopia son complicaciones poco frecuentes, aunque graves. La mayoría de estos pacientes precisarán tratamiento quirúrgico, y quedará reservado el tratamiento conservador para pacientes seleccionados.

Introduction

Lower gastrointestinal endoscopy is the technique of choice for the diagnosis and treatment of various colonic diseases. A direct view of the intestinal mucosa allows for a greater diagnostic specificity and sensitivity when compared to other imaging techniques such as barium enemas.[1] Furthermore, in recent decades, colonoscopies have been used with ever-greater frequency for treatment of various types of lesions in the digestive tract, with polypectomies figuring most prominently. Recently, other therapeutic procedures have been incorporated into this technique, such as cauterisation of angiodysplastic lesions with argon and stent placement, among others.

Colon perforation is an infrequent but severe complication of lower gastrointestinal endoscopy, as it can cause peritonitis and secondary sepsis with a high morbidity and mortality.[2] The rate of perforations caused by lower gastrointestinal endoscopy has been calculated in broad-scale studies at between 0.03% and 0.9%.[2,3] This percentage can reach 3% in endoscopies performed for therapeutic purposes.[4,5]

The treatment of iatrogenic perforations of the colon is a topic of controversy and, at the present moment, there is a lack of sufficient clinical evidence and specific guides providing clear recommendations on the best therapeutic option.[6,7] A wide range of possible treatments exists, including everything from conservative treatments to emergency surgery using various techniques. The possible techniques that have been described include simple suturing, colon resection with or without a protective stoma and simple intestinal bypass.[2,8] Recently, the use of minimally invasive techniques has been suggested, such as laparoscopy[9,10] and endoscopy.[11,12] Recognition of associated risk factors, an early diagnosis of intestinal perforations and adequate treatment can all contribute to decreasing the morbidity and mortality rate in these patients.[3]

The objectives of this study were to determine the incidence of perforations due to colonoscopies at our centre in the last 5 years, understand the various therapeutic options in use and evaluate the results of each one, along with the associated complications.

Patients and methods

We performed a retrospective study of the iatrogenic perforations caused by colonoscopies at our centre between January 2004 and October 2009. We obtained information from the Medical Records Centre at the Hospital del Mar and from the databases at the General Surgery and Gastroenterology Departments. The variables we compiled and analyzed were the following: demographic characteristics of the patients; type and indication of the lower gastrointestinal endoscopy; clinical manifestations at the moment of perforation, along

with diagnosis; type of treatment applied; intraoperative findings; duration of hospital stay and complications during hospital stay.

Results

Demographics and colonoscopies

Between January 2004 and October 2009, 13,493 colonoscopies were performed in the Gastroenterology Department at our hospital. All procedures were performed under sedation. The patients had been previously informed as to the possible complications associated with the procedure and had signed the appropriate informed consent form. During the study period 13 patients (0.1%) had perforated colons as a consequence of the endoscopic procedure, all of which were performed by doctors specialized in endoscopies. The study group consisted of 6 men and 7 women, with a mean age of 64 years (range: 50-85).

Of the 13,493 colonoscopies performed, 10,929 (81%) were diagnostic and 2,564 (19%) were therapeutic. Nine of the 13 perforations occurred during diagnostic lower gastrointestinal endoscopies, representing 0.08% of all such procedures performed. Examination of a lower gastrointestinal haemorrhage in 4 cases, follow-up on colorectal cancer in 3 cases, changes in bowel habits in one case and examination of an iron deficiency anaemia in one case indicated the need for a diagnostic colonoscopy. The other 4 perforations occurred after therapeutic lower gastrointestinal endoscopies, constituting 0.16%. These consisted of 2 polypectomies and 2 argon plasma treatments of bleeding vascular lesions.

Symptomology and diagnostics

The most frequent symptom of perforations was abdominal pain, which occurred in 8 cases. In 10 patients, the diagnosis was performed within 12 hours and in 5 of these, the perforation was identified by the same endoscopist during the procedure. In 5 cases, the difficulty of the exam was noted on the record sheet, and in 4 of these, it was specified that the causal mechanism of the perforation was that the passage of the endoscope was very difficult. One patient was diagnosed within 12-24 hrs after the procedure, and in 2 cases the diagnosis was made after the first 24 hrs after the endoscopy. In 8 patients, an abdominal CT scan was used to confirm the diagnosis, while the rest of the diagnoses were made with simple abdominal x-rays, and one pneumoperitoneum was observed. The lesion was punctiform in five cases and of a larger size in the other 8.

Surgical technique and complications

Table shows the location of the perforation and corrective techniques used in this study. In 11 patients a surgical treatment was used and in only 2 patients was a conservative treatment prescribed. A simple suture was the most frequently used technique. A stoma was performed in 3 patients, although in 2 cases this was to protect the anastomosis. In the 2 cases in which a conservative treatment was chosen, the patients were haemodynamically stable, without fever, with abdominal pain but no peritoneal irritation, and the CT scan showed some air bubbles around the sigmoid colon but without other findings. An NPO diet was started along with empirical antibiotics and monitoring, with positive evolution of the condition.

Table 1 – Location of the perforation and techniques for treating colon perforations caused by colonoscopies in our study

Location, n	13
Sigmoid	7
Cecum	4
Ascending colon	1
Intraperitoneal rectum	1
Surgical technique, n	11
Simple suture	5
Resection with anastomosis	3
Simple suture with protective ileostomy	2
Hartmann operation	1

Three of the 13 patients had some type of complication: superficial infection of the wound in 2 cases and persistent sepsis in a patient who had received a Hartmann operation for faecal peritonitis. Due to a stenosing neoplasm of the sigmoid colon, the mechanical preparation of the colon had been incomplete and the patient died 12 days later from septic shock. One patient, who had been treated using a simple suture in the cecum, was operated on a second time due to a clinical suspicion of dehiscence that was not confirmed. The mean hospital stay was 12 days (range: 6-23).

Discussion

Colonoscopy is a commonly used technique both for the diagnosis and treatment of lesions of the colon and has been since its introduction at the Beth Israel Medical Centre by Wolff in June 1969.[13] Intestinal perforations caused by this procedure are very severe complications, which in most cases require surgical treatment, and are associated with a considerable morbidity and mortality rate. The rate of perforations varies according to the published study. This rate varies between 0.03% and 0.9% in diagnostic colonoscopies, and is slightly higher in therapeutic colonoscopies, at 0.15%-3%.[2,3,8,14]

The results of this study show that the incidence of perforations caused by colonoscopies at our centre are within the range published to date in more extensive studies. Perforation rates under 0.2% are necessary, especially when participating in colorectal cancer screening programs, as in the case at our hospital. Moreover, we believe that it is important that each hospital registers the secondary complications caused by lower gastrointestinal endoscopy and other endoscopic procedures performed, and analyses the results of the treatment given in the same way that the morbidity and mortality caused by colorectal surgery is

evaluated. This process is not free of morbidity, and patients must be informed as to the risks of the procedures, with consent given for all necessary techniques.

The basic causative mechanisms described for perforations are the following: mechanical cause, whether due to the endoscope becoming embedded in the colon wall or from a kink in the endoscope; barotrauma from excessive insufflation and therapeutic procedures such as polypectomies or argon plasma coagulation. Perforations due to the endoscope becoming embedded and therapeutic procedures were the causative mechanisms in our study. According to other studies, these are the mechanisms that are most often involved in this type of perforation.[8,14]

The majority of perforations caused by diagnostic endoscopies are produced in the sigmoid or rectosigmoid junction, as observed in our study, this being an area of the intestine that is often more winding and difficult to pass through. In contrast, perforations caused by therapeutic endoscopies are more often produced in the cecum, this having a thinner intestinal wall.[3,8,14] In our review, 3 of the 4 perforations that occurred during therapeutic colonoscopies were produced in the cecum.

Another observation shared by several published studies is that perforations caused by diagnostic colonoscopies tend to be diagnosed earlier than those from therapeutic procedures. In the case of diagnostic colonoscopies, the diagnosis tends to be made during the course of the same procedure and consequently, the time between diagnosis and surgical treatment is also lower.[2,6,8,14,15] However, the lesion caused by diagnostic colonoscopies tends to be more severe, causing greater contamination of the abdominal cavity, which requires a greater number of resections with or without intestinal bypass. In perforations caused by therapeutic colonoscopies, the diagnosis is made later, due in part to the causal mechanism, which is different from those produced during diagnostic procedures. These perforations tend to be small and easily go unnoticed. At the moment in which the perforation is produced, whether for poplypectomy or lesion coagulation, a significant amount of air passes into the abdominal cavity but contamination is minimal since these are small lesions that collapse easily. As a result, in spite of the greater delay in diagnosis, conservative treatment is possible in selected cases.[3,7,8,14,15] In our study, only 2 patients were diagnosed after the first 24 hrs, one after a diagnostic procedure and the other following a polypectomy, and so we cannot make any conclusions based on our results in this sense.

The surgical procedures performed in our study also coincide with those previously published. Simple suturing and resection with anastomosis was possible in the majority of patients. Conservative treatment was only possible in 2 cases. Most authors agree that non-surgical treatment is suitable only in stable patients in which a late diagnosis was made with no signs of peritoneal irritation. Moreover, mortality rates in different studies are quite variable, oscillating between 0% and 50%.[3,7,8,14] In this study, mortality was 8%: only one patient who had significant associated comorbidities.

Diagnostic laparoscopy is an intermediate technique between conservative treatment and emergency surgery which, when performed by experienced surgeons, could also allow for surgical treatment in those patients that require it. Experience in this field is still limited, as demonstrated by a recent publication of one of the largest studies on the subject, which only included 11 patients, in which 5 required conversion while the other 6 were able to complete the treatment (simple suture by laparoscopy)[9,10] The authors concluded that abdominal cavity exploration by a minimally invasive approach is suitable in all patients in which a perforation is suspected from colonoscopies. However, the difficulty in locating the perforation and any doubt on the safety of the repair indicates the need for conversion to open surgery. Meanwhile, we believe that its use also depends on the emergency surgeons' training in advanced laparoscopic surgery. Therefore, its use is currently not possible in most cases, as reflected in our study.[9,10]

Lastly, the possibility of repairing the perforation by endoscopy using endoclips has also been described.[11,12] This option could be suitable in small perforations in order to prevent contamination of the peritoneal cavity and as a complement to conservative treatment, although experience in this field is still very limited.[11,12]

To conclude, perforations caused by colonoscopies are severe complications, with a very high associated morbidity. As such, early diagnosis and treatment are necessary and are to be established on a case-by-case basis. The majority of these patients will require surgical treatment, whether by simple suturing or resection with anastomosis, with conservative treatment being reserved for selected patients.

Conflict of interest

The authors affirm that they have no conflicts of interest.

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