Diseases of the Colon & Rectum

Sigmoid Colon Perforation at CT Colonography Secondary to a Possible Obstructive Mechanism: Report of a Case

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We report a case of colonic perforation in CT colonography, which was observed in a sigmoid colon segment contained within an inguinal hernia. At surgery, apart from the perforation, a normal large-bowel wall was found. Although rare, perforation may occur in patients with normal bowel wall, possibly resulting from a mechanical strain caused by gaseous overdistention. Radiologists performing the procedure must be aware of this possibility. [Key words: CT; Colonography; Perforated colon; Safety]

CT colonography (CTC), first described in 1994 by Vining and Gelfand, is gaining progressive clinical acceptance in the context of colorectal cancer detection and/or screening.[1] Current CT technology allows a full study of the colon in very short scanning times with a minimum of patient discomfort.[2] The examination requires full colonic preparation, gas insufflation (room air or CO_2), and data acquisition with the patient in the supine and prone positions.

REPORT OF A CASE

A 66-year-old male patient was referred to CTC because of a single episode of fecal blood loss. The patient was chronically anemic and experienced frequent diarrhea. Previous attempts to perform optical colonoscopy had failed for the reason of lack of patient compliance. The patient refused to perform the procedure under sedation or general anesthesia.

After insertion of a plastic balloon rectal catheter, colonic insufflation was performed by using room air by means of a hand-held bulb, delivering approximately 20 ml per puff. Air was gently insufflated by a nurse with previous experience with the procedure (more than 100 examinations) and began with the patient in the supine position. According to our local imaging protocol, air is insufflated until the patient refers significant abdominal discomfort or a total of 90 puffs (equivalent to 2 liters of room air) are achieved. Large-bowel insufflation was performed without any particular symptoms or complaints by the patient. The total sum of 90 puffs was not achieved because the patient referred some abdominal discomfort.

No intermediate imaging control was performed. A scout view in the supine position was obtained and a set of 2.5-mm contiguous axial slices from the domes to the lower pelvis was programmed using a 4-row multislice CT scanner (GE Lightspeed; GE Healthcare Technologies, Waukesha, WI). Images were reviewed on a postprocessing workstation with the colonography software package CTC-pro (Advantage Windows 4.2, GE Healthcare — GE Healthcare Technologies). When reviewing the first stack of axial images obtained in the supine position, a substantial amount of free air in the peritoneal cavity was detected and the examination was immediately

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Figure 1. CT acquisition in the supine position displaying considerable amount of free air in the peritoneal cavity.

suspended (Fig. 1). Revision of the data set revealed voluminous bilateral inguinal hernias containing large-bowel segments (Fig. 2). There were no other abnormalities especially concerning large bowel wall thickness or of the adjacent fat planes. The patient remained symptomless and was immediately informed of the arising complication. He was then taken to the operating room where, after laparotomy, a single perforation of the herniated sigmoid colon at the left inguinal canal was detected and surgically repaired. The wall of the large bowel was macroscopically normal, without any signs of inflammation, necrosis, or ulcerations. The bilateral inguinal hernias also were subject to surgical repair. There were no intervening postoperative complications, and the patient was discharged from the hospital seven days after surgery.

Figure 2. CT acquisition in the supine position displaying bilateral voluminous inguinal hernias containing two different segments of sigmoid colon.

DISCUSSION

Reports of colonic perforation in the literature are exceedingly rare when using CTC and have been mostly associated to an obstructive carcinoma or bowel wall abnormalities in the context of inflammatory bowel disease.[3,4] Large-bowel perforation in a patient with an otherwise normal bowel wall has been recently recognized at the level of the cecum, possibly resulting from overdistention.[5] However, in the present case, a combination of factors was probably present, associating overdistention to an obstructive, mechanical strain resulting from the bowel entrapment within the inguinal hernia. Colonic perforation is a well-known complication of conventional colonoscopy and has an estimated rate of approximately 0.08 percent in large series.[6–8] The incidence of perforation increases when therapeutic procedures, such as thermal injury from hot biopsy or polypectomy, are performed or from an inadvertent full-thickness wall biopsy. During diagnostic colonoscopy, perforations can occur as a result of the increased mechanical forces or pneumatic pressure from the insufflation procedure, which causes stretching of the wall and linear tears. Mechanical forces are thus responsible for the majority of perforations seen during diagnostic colonoscopy. The intraperitoneal sigmoid colon is the most susceptible area to mechanical injury because of its redundancy, tortuosity, propensity for diverticulosis, and adhesions from pelvic processes. Another mechanism of perforations is barotrauma. LaPlace's law states that wall tension is directly proportional to the radius of the cylinder. Thus, the expandable, thin-walled cecum and the right colon are prone to pneumatic perforation.[8]

Double-contrast barium enema has an estimated risk of perforation between 0.02 and 0.04 percent.[4] Perforation is usually attributed to one of three causes: damage of the rectal wall caused by the introduction of the balloon catheter; excess pneumatic or hydrostatic pressure to normal bowel wall; or localized weakness of bowel wall caused by ischemia, recent biopsy, toxic megacolon, or steroid use.[9]

Because bowel insufflation on CTC is not performed under fluoroscopic control, it is possible that inadvertent perforation may be only recognized

when the colon has been distended to its full capacity.[9] However, according to Sosna *et al.*,[10] of more than 11,870 CTC examinations, a perforation rate of 0.059 percent was reported: 1 per 1,696 examinations. It should be emphasized that this estimated risk is only slightly less than the risk reported for optical colonoscopy.

Clinical signs and symptoms of perforation include abdominal pain, distention, nausea, fever, increased blood pressure, increased heart rate, respiratory distress, and diffuse peritonitis. However, because perforation in CTC occurs in the setting of a previously "clean" colon, symptoms may be totally absent as it happened in the present case.

It must be stressed that surgery is not mandatory for all cases of colonic perforations, and the choice between a conservative or surgical treatment depends on factors, such as the patient medical condition, completeness of bowel preparation, and the type of procedure performed.[11] Conservative treatment has been advocated for small contained wall perforation resulting from endoscopic procedures, because, at least theoretically, the defect may spontaneously seal off. The conservative approach consists of intravenous antibiotics, nasogastric tube decompression, bowel rest, and strict surveillance. Surgery is mandatory in cases of generalized peritonitis, significant amount of extraluminal air, or failure of the conservative treatment.[12]

CONCLUSIONS

We described a case of sigmoid colon perforation in a patient with a mechanical constraint caused by inguinal hernias containing large-bowel segments in an otherwise normal colon. Radiologists involved in performing CTC examinations must be aware of this potential but rare complication.

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