E-VIDEO

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Robotic approach for the treatment of giant colonic diverticulum

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INTRODUCTION

Giant colonic diverticulum (GCD) is defined as a diverticulum with more than 4 cm. It is a rare manifestation of colonic diverticulum and appear mostly (90%), but not solely, in the sigmoid and is usually 4–9 cm in diameter (range 5–40 cm)[1].

Abdominal pain is the most common clinical manifestation (69%), while abdominal mass, fever and abdominal tenderness are frequent physical signs[2,3]. Additional symptoms are rectal bleeding, diarrhea, vomiting and constipation[4].

The diagnosis of GCD relies mainly on image studies, such as contrast enhanced computed tomography (CT-scan) and magnetic resonance (MRI). It usually appears as a gas-filled structure containing fluid and with communication with the colon, and the main differential diagnosis is a colonic perforation with abscess formation. These image study modalities may provide important further information, such as wall thickening, infiltration of adjacent fat and localized peritonitis, suggestive of an acute inflammatory complication (diverticulitis)[4]. Diagnostic colonoscopy and barium enema are not usually considered necessary or helpful for the diagnosis of GCD[5].

While a non-surgical conservative approach may be considered for asymptomatic high-risk patients, elective segmental colonic resection with primary anastomosis is recommended for asymptomatic patients and en bloc resection of the diverticulum with terminal temporary colostomy (Hartmann's procedure) is suggested for symptomatic complicated cases[2,4]. Diverticulectomies are the least used option, performed in only 10.2% of the cases[2].

While the adoption of the minimally invasive laparoscopic approach for colonic resection has been slower than to other procedures, it is now widely recognized that it results in decreased use of postoperative analgesics, shorter hospital stays and better short-term outcomes when compared to the traditional open approach[5]. The robotic surgical platform has emerged, in the last two decades, in order to overcome several technical limitations of the laparoscopic approach. Different from the slow initial adoption of the laparoscopic approach, the robotic colorectal surgery paved the way for the spread of this minimally invasive technology, as the benefits of the robotic surgery were first noted without a doubt during left colectomies[6]. It has several advantages when compared to the laparoscopic approach, such as wristed instrumentation, more degrees of motion than even the human hand, improved ergonomics, high definition three-dimensional imaging, control of the camera by the surgeon and tremor filtering with superior dexterity[7,8].

METHODS

In this multimedia article we present the totally robotic approach for the treatment of a symptomatic GCD.

The patient was a 42-year-old woman with previous hypothyroidism and systemic lupus erythematosus admitted with a 2-day history of left lower quadrant abdominal pain, abdominal swelling and nausea. The patient reported episodic abdominal pain for 3 months prior to admission. She did not report any changes in bowel habits. Previous surgeries included an appendectomy in her childhood. The patient's weight was 60 kg, with a body mass index of 23. On clinical examination the abdomen was distended, soft, and mildly tender on the lower abdominal quadrants, where a large palpable mass.

She was submitted to investigation with a CT-scan of the abdomen that disclosed an 6 cm cystic lesion containing air and fluid with communication with the sigmoid colon, with signs of acute inflammation such as surrounding fat stranding and intense wall thickening (FIGURE 1. A, B). After being conservatively treated with analgesics and antibiotics, she was submitted to an abdominal MRI 2 months after, that disclosed enlargement of the cystic lesion to 8 cm, cranial displacement of the mass when compared to the CT-scan and resolution of the signs of acute inflammation (FIGURE 1. C, D). As she presented recurrent symptoms of abdominal pain and nausea, surgical treatment with a totally robotic approach was proposed using the da Vinci Si platform.

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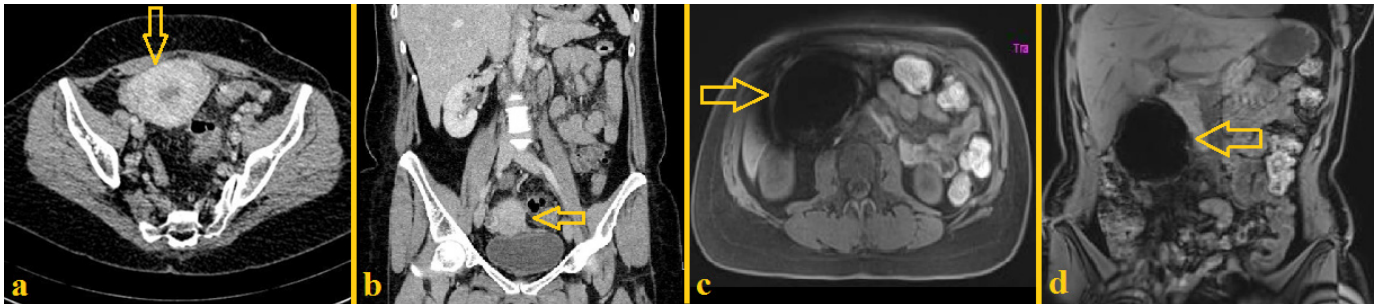

FIGURE 1. Image studies performed on a patient with GCD. **a, b)** CT-scan disclosing a pelvic cystic mass with wall thickening, fat stranding and communication with the sigmoid colon (yellow arrows): **a)** axial plane; **b)** coronal plane. **c, d)** Contrast enhanced MRI performed 2 months after initial presentation disclosing cranial displacement, enlargement, reduction of wall thickening and fat stranding of the GCD (yellow arrows): **c)** axial plane; **d)** coronal plane.
GCD: giant colonic diverticulum; CT-scan: computed tomography; MRI: magnetic resonance.

RESULTS

At inspection, a large diverticulum of the sigmoid colon was found, and the resection of the diverticulum of the sigmoid colon and primary colonic anastomosis were performed (FIGURE 2. a-c, E-VIDEO). The pathology examination showed a 7 cm true GCD with acute and chronic inflammation with no evidence of malignancy (FIGURE 2. d). The postoperative course was uneventful, and the patient was discharged on postoperative day 4. At 12 months follow-up, the patient was asymptomatic without any complication.

It is known that the first description of a GCD dates back to 1946 by Bonvin and Bonte, and the first description by radiologic examination is attributed to Hughes and Greene in 1953[3]. It is a rare presentation of colonic diverticulum, with less than 200 cases described in the literature[1-3]. A segmental colectomy with en-bloc diverticular resection and primary anastomosis with or without a diverting ileostomy is the preferred surgical treatment option. Minimally invasive surgery can be a valuable alternative to open procedures[2,5].

DISCUSSION

While the the first laparoscopic approach for colorectal surgery was performed by Semm at the University of Kiel in 1981 and is the usual approach for the treatment of colonic diverticulum, the robotic colorectal surgery was reported only in 2002 by

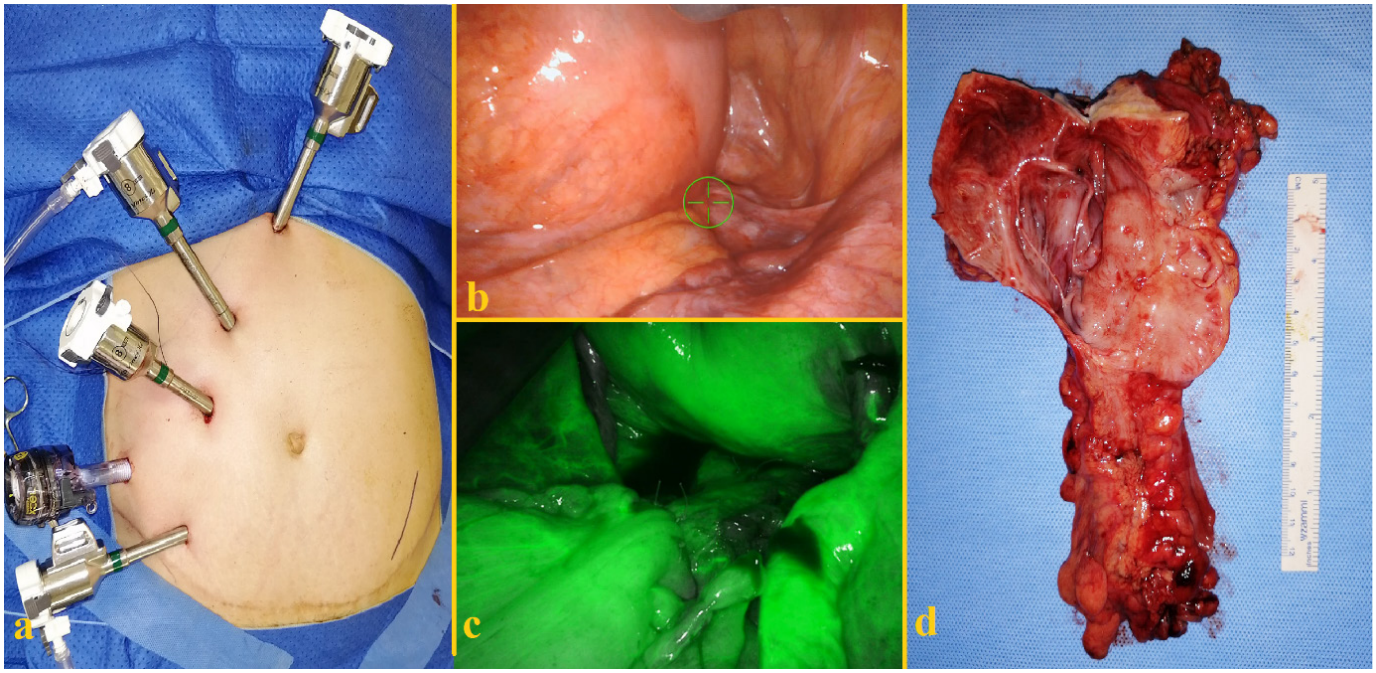

FIGURE 2. Robotic approach for the treatment of a GCD. **a)** Trocar placement; **b)** GCD at inspection; **c)** Fluorescence evaluation of the vascularization of the anastomosis; **d)** Surgical specimen.
GCD: giant colonic diverticulum.

Weber et al. for benign disease and by Hashizume et al. for malignant disease[9,10]. To our knowledge this is only the second GCD treated by the Robotic approach described in the literature[11].

In the current case a robotic atypical colon wedge resection was safely performed. This option might be considered as an alternative to extended resections, such as a formal left colectomy. The use of real-time near-infrared robotic fluorescence using intravenous indocyanine green as contrast agent allowed precise evaluation of the vascularization of the anastomosis, an important feature of atypical colonic resections. Localization of the GCD and the simultaneous existence of diverticular disease are the main criteria for the decision between the different operative approaches[2].

CONCLUSION

Therefore, the totally robotic surgical treatment of GCD with resection of the diverticulum and adjacent colon with primary anastomosis is a feasible and safe alternative, with potential advantages over the conventional open and laparoscopic approaches.

Author's contribution

Bustamante-Lopez LA and Surjan RCT: wrote the article. Surjan RCT and Bustamante-Lopez LA: designed the study. Silveira SP performed data collection. Surjan RCT, Silveira SP and Bustamante-Lopez LA: provided critical advice. All authors discussed the results and commented on the article and take full responsibility on the manuscript.

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