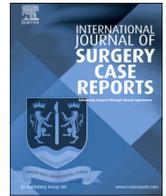




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## The colovesical fistula in diverticular disease: Laparoscopic approach in two different cases

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### ABSTRACT

**INTRODUCTION:** The colovesical fistula is one of the complications of diverticular disease. It can cause significant symptoms like pneumaturia and fecaluria affecting the quality of life and sometimes leading to death, usually secondary to sepsis. We describe two cases of colovesical fistula treated by laparoscopic approach in patients with diagnosis of complicated acute diverticulitis.

**CASE REPORT:** We studied two patients with clinical, radiological and endoscopic diagnosis of colovesical fistula as a consequence of diverticular disease. We performed a totally laparoscopic treatment with colonic resection and colo-proctoanastomosis after the closure of the fistula with intracorporeal sutures.

**DISCUSSION:** Colovesical fistula should be suspected in patients who present fever with persistent dysuria, pneumaturia or fecaluria. The diagnosis is confirmed by a CT abdominal scan, a colonoscopy in order to rule out a colon cancer and a cystoscopy to assess the grade of bladder involvement.

**CONCLUSION:** Although colovesical fistulas caused by diverticular disease were once considered a contraindication to laparoscopic resection, nowadays they are increasingly treated by experienced surgeons using laparoscopic techniques. Compared with laparoscopic surgery for uncomplicated diverticulitis the mini-invasive treatment of colovesical fistulas requires a longer operative time and advanced surgical skills.

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### 1. Introduction

Approximately 25% of patients with acute diverticulitis or persistent chronic diverticular inflammation have consensual complications as bowel obstruction because of a colonic stricture, development of abdominal and/or pelvic abscesses, a colonic free perforation with consequent peritonitis and fistulas [1]. Fistula formation is present in 17–27% of surgically treated cases of diverticular disease and the colovesical one is found in 3–4% of these patients. So it should be suspected in patients with diverticular disease who present symptoms like pneumaturia or fecaluria often with fever and lower abdominal pain [2]. Radiological findings, colonoscopy and cystoscopy can supports the diagnosis confirmed during surgical procedure [3,4]. We describe two patients with clinical evidences of pneumaturia and fecaluria as a consequence of a complicated diverticular disease confirmed with CT abdominal

scan and colonoscopy and totally managed with laparoscopic technique with identification, colonic resection and bladder repair in line with the SCARE criteria [5].

### 2. Presentation of cases

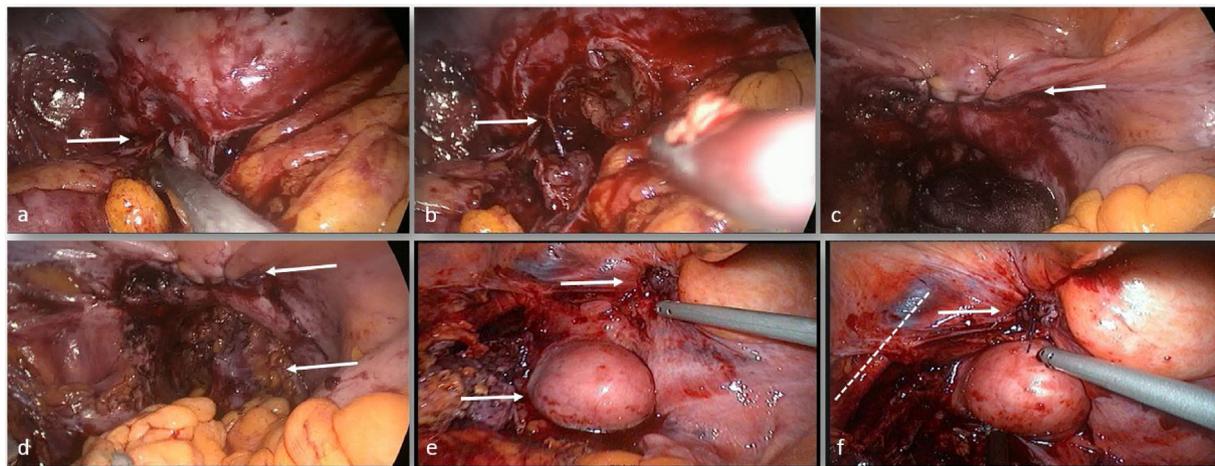
We studied two patients with clinical, radiological and endoscopic diagnosis of colovesical fistula as a consequence of complicated diverticular disease. The first patient was a 79-years old male (BMI 28.4 kg/m<sup>2</sup>) who suffered from hypertension, chronic obstructive pulmonary disease. He had had an acute myocardial infarction 10 years earlier. He arrived to our observation in elective setting after three month of gravative abdominal pain in left flank and in suprapubic region. In the last two week he referred fever with turbid and foul-smelling urine with contemporary emission of air. White blood cell count was 13 × 10<sup>3</sup>/mmc. We performed a CT abdominal scan that showed sigmoid colon with thickened walls and with no cleavage planes from bladder. Colonoscopy confirmed a picture of severe chronic diverticulitis with strong suspicion of colovesical fistula. Cystoscopy demonstrated the fistulous orifice in bladder dome and urinoculture revealed infection from *Klebsiella* spp. The second patient was a 76-years old female (BMI 27.3 kg/m<sup>2</sup>) with hypertension who went to emergency room with an acute abdominal pain in suprapubic region with no diarrhea or

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**Fig. 1.** Intraoperative findings of colovesical fistulas: a–b) male patient with a wide colovesical fistula (arrows); we performed a blunt dissection in order to avoid vascular or visceral injuries; c) double line adsorbable barbed suture; d) complete view of the bladder suture and colonic anastomosis (arrows); e) female patient with subcentimetric fistula and its position respect to uterus (arrows); f) course of the hypogastric vessels (dotted line).

fever. The patient referred recurrent cystitis in the last six months unresponsive to antibiotic therapy and pneumaturia. White blood cell count was  $16 \times 10^3/\text{mmc}$ . Also in this case we performed a CT abdominal scan with findings of sigmoid diverticulitis with no abscess or perforation. The urologist carried out a cystoscopy that highlighted a colovesical fistula and urinoculture identified *E. coli*. None of these patients had previous abdominal surgery and there were no contraindications to laparoscopic surgery. On the basis of these preoperative clinical and instrumental findings we decided to perform a laparoscopic approach for both cases in elective setting with conversion to open surgery in case of severe pelvic inflammatory syndrome and risk for visceral and/or vascular injuries (e.g. ureter, iliac vessels, small bowel, vaginal dome). The procedures were performed by a senior resident with an equipe experienced in laparoscopic surgery. We decided to perform a laparoscopic approach for both cases. The procedures were performed by a senior resident with an equipe experienced in laparoscopic surgery. We induced pneumoperitoneum by Veress needle [6] and a 10-mm optical trocar was placed in the right para-umbilical region. We placed other three trocars respectively in the right hypochondrium (5 mm), in the right iliac fossa (12 mm) and in the left flank (5 mm) [7]. On laparoscopic exploration of abdominal cavity the sigmoid colon appeared convoluted and with thickened wall firmly attached to the bladder dome configuring a picture of severe diverticular inflammation (Fig. 1). We chose a medial to lateral dissection with isolation of mesenteric inferior vein and artery and then we mobilized the left colon up to the splenic flexure. After identification and preservation of the left ureter under the Gerota fascia, we detached the strict adhesions between the sigmoid colon and the bladder [8]. During these maneuvers we identified the colovesical fistula and a bladder double layer suture with intracorporeal knotting was performed. In the male patient we found a wider fistula with need for resection of the bladder dome in order to obtain an undamaged margin. In the other case, we saw a subcentimetric fistula for whom it was not appropriate to carry out the resection but only the suture in double layer [9]. In both cases we tested laparoscopic suture with bladder filling with indocyanine green that demonstrated no vesical dye spillage. At the end of this procedure we completed the left hemicolectomy performing a mechanical colo-proctoanastomosis. The patients were satisfied with the treatment received with typical advantages of laparoscopic surgery with rapid postoperative recovery, earlier food intake and less postoperative pain. The postoperative course was uneventful and both patients were discharged on POD 7.

### 3. Discussion

Diverticular disease in Western countries usually involves the sigmoid colon and fistulas most frequently arise from this segment. The most common types of fistulas are colovesical fistulas (65%) and colovaginal fistulas (25%), followed by coloenteric (7%), colouterine (3%), colocutaneous fistulas and complex fistulas with involvement of multiple pelvic organs (10%) [10]. Although diverticulitis occurs with a slight female predominance colovesical fistulas secondary to diverticulitis have a distinct (2 to 3:1) male predominance because the uterus preserves the bladder from the inflamed sigmoid colon. Patients typically present laboratory findings of leukocytosis in association with urinary symptoms including dysuria or recurrent urinary tract infections often cause of fever (100%), pneumaturia (71%) and fecaluria (51%). Other symptoms occurring in fewer than 50% of patients are chronic abdominal pain, diarrhea, hematuria and loss of urine via rectum [11,12]. On CT abdominal scan we can find suggestive features of acute diverticulitis including the presence of localized bowel wall thickening ( $>4$  mm), an increase in soft tissue density within the pericolonic fat secondary to inflammation and the presence of colonic diverticula. The sensitivity and specificity of CT scan for the diagnosis of acute diverticulitis are respectively 94 and 99%. The integration with colonoscopy, cystoscopy or intravenous urography (IVU) is fundamental to preoperatively confirm the diagnosis of colovesical fistula even if nowadays there is not a gold standard test [13,14]. Regarding the operative technique, laparoscopic left colonic resection does not provide difficult maneuvers for experienced surgical team, but the presence of a colovesical fistula or other complex fistulas [15] significantly increases the technical challenge of the procedure and consequently these operation should be performed by a skilled surgeon in advanced laparoscopic surgery [16–20]. Surgical treatment of colovesical fistulas provides the identification and dissection of the fistula, resection of the involved colon and bladder repair [21,22]. An incomplete colonic resection or a simple division of the colovesical fistula without colonic resection will lead to higher recurrence rates. The presence of a diverticular colovesical fistula is rarely an indication for urgent surgical procedure (2%). An elective one-stage procedure with primary resection and anastomosis (PRA) is safe and feasible in the most of cases (84%) [23–25]. The one-stage procedure is associated with decreased morbidity and length of hospital stay.

#### 4. Conclusion

The diagnosis and treatment of a colovesical fistula requires multidisciplinary involvement with the radiologist, endoscopist, urologist and surgeon. Treatment requires colonic resection and closure of the fistula in order to reduce the recurrence rate. Laparoscopic left colonic or sigmoid resection does not provide difficult maneuvers for experienced surgical team, but the presence of a colovesical fistula or other complex fistulas significantly increases the technical challenge of the procedure and consequently these procedures should be performed by a skilled surgeon in advanced laparoscopic surgery.

#### Declaration of Competing Interest

The authors report no declarations of interest.

#### Funding

Di Buono Giuseppe and other co-authors have no study sponsor.

#### Ethical approval

Ethical Approval was not necessary for this study.  
We obtained written patient consent to publication.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Author contribution

Di Buono Giuseppe: study design, data collections, data analysis and writing.  
Bonventre Giulia: study design, data collections, data analysis and writing.  
Buscemi Salvatore: data collections.  
Randisi Brenda: data collection.  
Romano Giorgio: study design, data collections, data analysis and writing.  
Agrusa Antonino: study design, data collections, data analysis and writing.

#### Registration of research studies

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#### Guarantor

Di Buono Giuseppe.  
Agrusa Antonino.

#### Provenance and peer review

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#### Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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