



Management of Enterovesical Fistulas: Analysis of 33 Patients Treated at a Single Tertiary Reference Center

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Abstract

Background: Enterovesical Fistula (EVF) is defined as a pathological communication between the intestinal lumen and the urinary bladder. EVF is a relatively rare finding in a complicated diverticular disease, inflammatory bowel disease, malignancy, radiation or trauma. We presented our ten-year experience in the field of EVF management.

Methods: Thirty-three patients were enrolled into this study. This retrospective study investigated the clinical presentation, underlying pathology, diagnostic tests, and surgical management including urinary bladder, perioperative complications and the long-term outcome obtained by administering a phone survey as a follow-up.

Results: The most common underlying etiologies of EVF were Crohn's disease (n=11) and colorectal cancer (n=10). The most common symptom was a nonspecific suprapubic pain reported in 60.6% of patients. The pathognomonic symptoms such as pneumaturia and faecaluria were present in 51.5% and 39.4% of the patients, respectively. Barium enema was the diagnostic study of choice performed in 63.6% of the patients. In 14 patients, the resection with primary anastomosis was performed. Ten patients developed perioperative complications. No recurrent fistulas were observed at the time of follow-up.

Conclusion: Resection with primary anastomosis is feasible and safe in the majority of patients. In cases of advanced colorectal cancer, we recommended Hartmann's procedure as a method of choice. Surgery performed in well-experienced centers determines the effectiveness of the EVF management characterized by the low mortality rate and perioperative complications.

Keywords: Enterovesical fistula; Intestinal fistula; Primary anastomosis; Surgery

Introduction

Enterovesical Fistula (EVF) is a rare pathology characterized by the communication between the intestinal lumen and urinary bladder. Sigmoid diverticulitis is the most common cause of EVF [1-4]. Remaining causes of EVF consist of inflammatory bowel disease, colorectal cancer, radiation or trauma.

Although patients usually present pathognomonic symptoms such as pneumaturia, faecaluria and recurrent urinary tract infection, the diagnosis of EVF is sometimes challenging and thus usually it is delayed. A wide range of EVF diagnostic studies include: Poppy seed test, barium enema, CT scan, MRI, colonoscopy, cystoscopy and others used rarely.

EVF occurs usually in adults, most commonly in the sixth and seventh decade with 3:1 male prediction [5]. The prevalence of EVF is approximately 1:3000 of general hospital admission [6].

Although the first report of EVF is dated on AD 200 presented by Rufus of Ephesus, it was in 1888 when Cripps first described EVF [7].

Management of EVF is challenging, characterized by the high complication rate and usually requires a multidisciplinary approach [5]. The current gold standard management is one-stage procedure with the primary anastomosis. However, in patients in poor condition as well as in cases with high surgical risk, two- or three- stage procedures are recommended [8,9].

The aim of the study was to evaluate the management of EVF as well as the long-term outcome of 33 patients treated at a single tertiary reference center.

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Material and Methods

Thirty-three patients diagnosed with enterovesical fistula were included into this study. All patients were hospitalized and treated in our Department between 2004 and 2014.

The study was approved by the Bioethics Committee at Poznan University of Medical Sciences (approval no 955/14).

Medical charts were retrospectively reviewed to analyze patient demographics, presenting symptoms, underlying pathology, point of fistula origin, type of surgery, bladder management, coexisting fistulas, type of diagnostic studies and perioperative complications. To evaluate long-term outcome, follow-up data was collected via a phone survey.

Mostly, all surgeries were performed by two well-experienced senior surgeons. In cases of advanced colorectal cancer with infiltration of the urinary bladder, urologist was asked to assist to the surgery. Routinely, the intention of the surgery was to perform the primary anastomosis without defunctioning stoma if not needed.

Surgical management

Routinely, patients were counseled preoperatively by stoma nurse for the purpose of marking the optimal site for a potential stoma. Cefazolin and metronidazole as an antibiotic prophylaxis were routinely used and the regimen was prolonged with three doses following the surgery. All surgical procedures were performed using laparotomy with midline incision. The dissection of the affected part of the bowel was made. The fistula was divided using both blunt and sharp dissection. Urinary bladder was closed with two layers of absorbable sutures. Once the evidence of carcinoma infiltration was revealed, the appropriate part of affected bladder wall was excised with the preservation of negative surgical margins. Routinely following the urinary bladder suturing evaluation of potential leakage was performed with the air test through Foley catheter. Usually, the splenic flexure was mobilized in cases of left colon lesions. Depending on the part of the affected colon, the appropriate length of the bowel was resected with the intention of primary anastomosis. Regardless of the point of origin of the colon or the underlying pathology, the primary anastomosis was usually performed using stapler devices. In cases of coexisting intraperitoneal abscess, severe diverticulosis or Crohn's disease, Hartmann's procedure was the method of choice. In patients with concomitant coexisting fistulas, all fistulas were excised en-bloc with multiple intestinal anastomosis if needed. Usually, the Foley catheter was left for 7 to 10 days postoperatively to decompress the urinary bladder. Cystoscopy was not performed routinely after the surgery.

All described data is presented as mean and standard deviation (mean \pm SD). These findings were analyzed using Statistica 10.0 StatSoft software (StatSoft, Inc. Tulsa, USA).

Results

Based on the retrospective analysis, 33 patients were enrolled into the study. Women comprised minority of the study group (n=11), whereas men comprised 22 patients. The mean age of patients at the time of hospital stay was 50.9 years (SD=17.2). The most common symptom was a nonspecific suprapubic pain reported in 60.6% of patients (n=20). The remaining symptoms included: recurrent urinary tract infection (30.3%), pneumaturia (51.5%) and faecaluria (39.4%).



Figure 1: View of a fistula in barium enema examination. Bladder abnormally filled with contrast (open arrow) during barium enema examination.



Figure 2: View of a fistula in endoscopy. Colonoscopy revealed the origin of EVF (black arrow).

Table 1: Origin point of fistulas.

Origin point	No. of patients (n=33)	Percentage (%)
Sigmoid colon	n=15	45,45
Rectum	n=7	21,21
Ileocecal	n=8	24,24
Others:	n=3	9,09
- Transverse colon	n=1	3,03
- "J" Pouch	n=1	3,03
- Rectal stump	n=1	3,03

The most common diagnostic study was CT scan performed in 23 patients (69.7%) followed by barium enema examination performed in 21 patients (63.6%) (Figure 1), endoscopy (n=15, 45.5%) (Figure 2) and cystoscopy (n=11, 33.3%). Usually, CT scan was performed as an adjunct investigation following barium enema or as supplementary to other imaging diagnostic studies. The intestinal points of origin are listed in (Table 1). The underlying pathologies are summarized in (Table 2). The most common underlying etiologies of EVF included Crohn's disease (n=11) and colorectal cancer (n=10). Only one patient did not undergo any surgery because of poor general condition and as well as to high risk for anesthesia (ASA IV). The underlying pathology was cervix carcinoma followed with pelvic radiotherapy because disseminated carcinomatosis. The remaining patients (n=32) were qualified for surgery (Table 3). The most common type of EVF management was resection with primary anastomosis performed in 14 patients (42.4%). The resected part of intestine includes sigmoid colon (n=7), rectum (n=2) and ileocecum (n=5). In one patient (n=1) resection with primary anastomosis and temporary defunctioning stoma was performed. In two patients (n=2) defunctioning stoma was performed as a method of choice included loop colostomy (n=1) and loop ileostomy (n=1). Hartmann's procedure was performed in 12

Table 2: Underlying pathology of EVF.

Pathology	No. of patients (n=33)	Percentage (%)
Crohn's disease	n=11	33,3
Colorectal carcinoma:	n=10	30,3
- Rectum	n=4	12,1
- Sigmoid colon	n=5	15,15
- Others	n=1	3,03
Diverticular disease	n=5	15,15
Pelvic radiotherapy:	n=6	18,18
- Rectum	n=1	3,03
- Cervix uteri	n=2	6,06
- Others	n=3	9,09
Ulcerative colitis	n=1	3,03

Table 3: Surgery management of EVF.

Type of surgery	No. of patients (n=33)	Percentage (%)
Resection with primary anastomosis:	n=14	42,42
- Sigmoid colectomy	n=7	21,21
- Anterior resection	n=2	6,06
- Ileocecal resection	n=5	15,1
Resection with primary anastomosis and defunctioning stoma	n=1	3,03
Defunctioning surgery:	n=2	6,06
- Loop colostomy	n=1	3,03
- Loop ileostomy	n=1	3,03
Hartmann's procedure	n=12	36,36
Hemicolectomy:	n=2	6,06
- Left	n=1	3,03
- Right	n=1	3,03
Others:	n=1	3,03
- Abdominoperineal resection	n=1	3,03
No surgery	n=1	3,03

patients (36.4%) usually because of palliative resection of malignancy. Eleven patients developed coexistent fistulas at the time of admission to department, with the ileoileal fistula reported as the most common (n=6). The most common pathology underlying the multiple fistulas was Crohn's disease (n=4). The most common underlying pathology of enterovaginal fistulas (n=4) was radiotherapy due to rectal or cervical cancer.

Twenty-six patients presented with full thickness bladder wall defect and required urinary bladder repair using two layers of absorbable sutures. In six patients because of locally advanced colorectal cancer with bladder infiltration, the partial bladder wall resection was performed.

Ten patients developed perioperative complications. Four of them presented with surgical site infection limited to superficial surgical site infection. Every day dressing changes with cleaning the wound and antibiotic therapy were sufficient management of the surgical site infection without any further repercussions. Additionally, in two patients, Negative Pressure Wound Therapy (NPWT) was implemented. One patient developed deep venous thrombosis of the lower extremity and it was successfully treated conservatively. Five patients developed specific complications associated with EVF surgery

including anastomotic leak (n=1) and intra-abdominal abscess (n=4). Two patients because of intra-abdominal abscess required to be re-operated and the abscesses were drained. Remaining two patients with intra-abdominal abscess were successfully drained with drains placed during the primary surgery. One patient diagnosed with an anastomotic leak underwent re-laparotomy and loop-ileostomy was created. There was one perioperative death due to a multi-organ failure on the eleventh postoperative day following palliative treatment because of advanced sigmoid carcinoma.

A mortality rate within 30-days following surgery was 3.03% (n=1) whereas re-surgery rate within 30-days was 9.09 (n=3).

To assess long-term outcome of management of EVF, a follow-up study was obtained via a phone call. 27 out of the 32 patients (or their families in case of a patient's death) were successfully contacted in the follow-up study (one patient died perioperatively). Five patients were non eligible in the follow-up study. Seven of 27 eligible patients contacted *via* a phone call died. None of the deaths were associated specifically with surgical treatment of EVF. Six of seven patients died because of the advanced cancer process. One cause of death was unknown. The average time of follow-up was 53.9 ± 32.8 months (range from 5 to 125 months). None of the patients presented symptoms of recurrence of the EVF at the time of follow-up and none of them underwent further surgery due to EVF. Only three of them were operated because of other indications such as cholelithiasis (n=1), cataracts (n=1), varicose veins (n=1).

Discussion

In regards to the origin point, enterovesical fistulas can be divided into four main categories: 1) Colovesical, 2) rectovesical, 3) ileovesical, 4) appendicovesical fistulas [8]. The most common form regarding the point of origin is colovesical fistula (usually sigmoid colon).

The higher incidence of EVF in men is associated with anatomical predispositions associated with direct contact of the urinary bladder to the rectum. Supporting this evidence is a fact that EVF occurs more commonly in women who underwent hysterectomy as opposed to those who did not [10]. Kavanagh et al. reported that nine of sixteen women with diagnosed EVF underwent previously hysterectomy [11]. In our study women in the majority underwent previous hysterectomy (n=6). However, in 4 patients enterovaginal was seen as a coexisting fistula usually following pelvic radiotherapy.

Diverticulosis was proven to be the most common underlying pathology of EVF ranging between 71.5% to 75% [1-4]. In our study the most common underlying pathology of EVF was Crohn's Disease (CD) (33.3%). We suppose, it results from the specialization of the department and a lot of experience in treating inflammatory bowel disease in general and the complications of both external and internal fistulas such as EVF. The prevalence of EVF in the group of patients with CD is estimated between 3% to 8% [12,13]. Solem et al. proved that in CD patients the most common EVF origin is ileum [14]. It is consistent with the results of this study. In the group of patients with underlying pathology of CD, we also diagnosed the presence of coexistent fistulas as the most prevalent. Among 19 coexistent fistulas, 9 of them concerned patients with diagnosed Crohn's disease. It was proved that recurrence rate of CD required re-surgery in approximately 33% to 58% after ten years from initial surgery [15]. However, we did not find such a correlation based on our phone survey in the group of patients with CD.

Despite the involvement of both systems (urinary and gastrointestinal) in the pathology of EVF, most patients present with symptoms from the urinary system. The most common symptoms are: pneumaturia, fecaluria, recurrent urinary tract infections, urgency and suprapubic pain [8]. Pneumaturia and faecaluria are still considered as the two most common symptoms in patients with EVF and seem to be pathognomic for this disease [16]. Based on Walker et al. study, almost all of patients (17 of 19 patients, 89.5%) presented with either fecaluria or pneumaturia [3].

The detailed analysis of clinical symptoms should be supported by imaging studies, in order to confirm the clinical diagnosis and to evaluate the point of origin as well as the local complications and advancement of the disease [17]. There is a wide range of investigations including poppy seed test, barium enema, colonoscopy; CT scan, MRI, cystoscopy and others are rarely used.

Kavanagh et al. recommended colonoscopy as an obligatory imaging evaluation in all patients suspected of EVF, although the percentage of correct diagnosis did not exceed 55% [11]. However, in cases of suspicion of EVF secondary to colorectal cancer, an appropriate endoscopic evaluation of the large bowel not only allows to diagnose EVF but also provides further anatomic details of the colon involved in EVF process [11].

Because of the availability and low cost, barium enema is still a useful diagnostic study, but the effectiveness in diagnosing EVF is considered to be low and ranges between 20% to 35% [2,4,18]. However, in our study, in 21 patient's barium enema was performed and the positive result was obtained in most patients. CT scan is the recommended diagnostic study as the study of choice in the initial evaluation of EVF [19]. Because the most common cause of EVF is still diverticulosis, it seems to be rational to use this method as the first line in patients with a suspicion of EVF in the course of diverticular disease. Besides the high sensitivity of this study, CT scan allows for a detailed analysis of the advancement of the local pathology in EVF.

In the last decade we observed the changing pattern of EVF management from three-stage to one-stage procedure [20]. Currently, the treatment of EVF with primary anastomosis during one-stage surgery is feasible and safe in the majority of EVF patients [2]. The type of the procedure and its extent depends mostly on the underlying pathology causing the EVF and involvement of other adjusted organs. Single-stage strategy (primary anastomosis without defunctioning colostomy) regarding EVF is recommended as the desired treatment according to most authors [21,22]. Because of the technical advancements (such as the use of staplers) and advances in intensive care treatment, a majority of patients are qualified for this type of procedure. Single-stage strategy is associated with low mortality rate and significantly improves the patient's quality of life [2]. Garcea et al. [2] reported the use of primary anastomosis of left-sided colonic resection in 92% of patients, mainly with sigmoid colectomy (n=42) [2]. In presented study 42.4% of patients (n=14) underwent a single-stage procedure with primary anastomosis. Only one patient developed anastomotic leak and required re-surgery.

Two-stage procedure (primary anastomosis and defunctioning stoma or Hartmann procedure) is reserved for patients in serious general condition or severe local inflammatory process preventing from performing a safe primary anastomosis. According to Garcea et al. [2] eighteen percent (n=13) required a defunctioning stoma either a colostomy or an ileostomy. In our study only in one patient, the primary anastomosis was performed with a temporary defunctioning

stoma. Defunctioning ileo- and colostomy were performed in two patients. Usually, it was performed in patients with locally advanced colorectal cancer without the possibility of radical surgical resection.

Intensive technological advancement and increasingly higher experience of many centers in the treatment of EVF using laparoscopic techniques was described in recent reports concerning the laparoscopic surgery for EVF as an efficient and safe approach [23,24]. Although the results are promising, we did not perform any surgeries for the treatment of EVF using laparoscopic approach.

The defect of the urinary bladder should be repaired with surgical closure and prolonged bladder catheterization. Partial cystectomy is justified in patients with diagnosed neoplastic process involving the urinary bladder in order to fully remove the oncological changes. Prolonged bladder catheterization for 7 to 15 days postoperatively significantly improves the healing of the urinary bladder [1,25].

Despite the important aspect of bladder decompression, prolonged catheterization of the urinary bladder can lead to UTI and bladder atony [26]. Despite the absolute necessity of catheterization after the surgery, the matter of duration has not been clearly defined. Based on our experience, maintaining the catheter in the urinary bladder for 10 days is a sufficient time for the healing process of the urinary bladder.

EVF procedures are associated with high complication rate. According to Garcea et al. complication rate was up to 42% [2]. According to our results only one patient (3.03%) experienced an anastomotic leak following the primary anastomosis which confirmed the feasibility and safety of one-stage procedure.

Implementation of NPWT in two patients because of surgical site infection markedly improved the wound treatment. Our observations are consistent with other studies regarding NPWT and the fact that it significantly improves the wound healing [27].

There are some limitations of the study. The weak point of the study is the retrospective nature of the study. We also did not perform routine cystoscopy following the surgery to evaluate any fistula recurrences. However, at the time of the follow-up survey, none of the patients reported any recurrences of the EVF.

Conclusion

The most common symptom of EVF may be a nonspecific suprapubic pain resulting in delay of final diagnosis. The most useful imaging study is CT scan. Resection with primary anastomosis is feasible and safe in the majority of patients. In cases of advanced colorectal cancer, we recommended Hartmann's procedure as a method of choice. Surgery performed in well-experienced centers determines the effectiveness of the EVF management characterized by the low mortality rate and perioperative complications.

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