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Ten Cases of Colovesical Fistula due to Sigmoid Diverticulitis

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ABSTRACT

Colovesical fistula (CVF) resulting from colon diverticulosis is a comparatively rare disease, and neither the diagnosis nor treatment has been established. Our experience with CVF due to sigmoid diverticulitis over a 9-year period was reviewed to clarify the clinical presentation and diagnostic confirmation. Ten patients with CVF were identified in this period, and chief complaints, laboratory findings, presenting symptoms, diagnostic investigations, and subsequent treatments were reviewed. Preoperative urinalysis showing bacteriuria (100%) was the most common presentation, followed by fecaluria (40%), abdominal pain (40%), pneumaturia (30%), hematuria (30%), pain on urination (30%), pollakiuria (10%), and dysuria (10%). The abilities of various preoperative investigations to identify CVF were: computed tomography (CT), 88.9%; magnetic resonance imaging, 40%; cystoscopy, 30%, and gastrografin irrigoscopy, 22.2%. Colonoscopy (0%) was not diagnostic. Bowel resection was performed in nine of ten patients. When inflammation was intense, covering ileostomy was performed, and an omental plasty was placed between the bowel anastomosis and bladder. When CVF is suspected, we recommend CT followed by colonoscopy and cystoscopy as a first-line investigation to rule out malignancy as a cause. Other modalities should only be used if the diagnosis is in doubt or additional information is needed to plan operative management. Primary colic anastomosis appears to be safely performed by applying omental plasty and covering ileostomy.

Key words: *Colovesical fistula, Diverticulitis*

Colovesical fistula (CVF) is an abnormal communication between the bladder and large intestine, usually the sigmoid colon, which can be caused by various inflammatory and neoplastic conditions. This entity was first described by Cripps in 1888 and is a well-recognized complication of diverticulitis[2]. Other conditions, including colon cancer, bladder cancer, radiation, Crohn's disease, and ruptured appendix, have also been known to result in CVF[1,5], and sigmoid diverticulitis represents the most frequent cause of this pathology[13,17,20]. The incidence of CVF in diverticular disease has been reported to range between 2% and 23%[1,2,5,13,17,20]. The underlying mechanism is the direct extension of a ruptured diverticulum or the erosion of a peridiverticular abscess into the bladder. The diagnosis of CVF can be challenging and patients are frequently followed up for months before the condition is recognized and effective treatment initiated. While the origin of CVF secondary to diverticular disease is the colon, patients usually present with urinary symptoms such as persistent infections, dysuria, or pneumaturia and fecaluria. Urological surgeons may thus be involved in the diagnosis and treatment of these patients. In our medical center, over a period of more than 9 years, 10 patients have been identified with CVF due to diverticulitis of the sigmoid colon. The aim of this retrospective study was to evaluate the diagnostic and surgical management of CVF in a single medical center.

PATIENTS AND METHODS

Ten male patients with a diagnosis of CVF resulting from colon diverticulosis were identified in our department over the period ranging from January, 2005 to December, 2013. The medical records of these patients were reviewed retrospectively and demographic, diagnostic, surgical treatment and follow-up information were collected. Presenting

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symptoms were also recorded and reviewed. Preoperative evaluation of the patients included a multitude of invasive and noninvasive modalities, including computed tomography (CT), magnetic resonance imaging (MRI), gastrografin irrigoscopy, cystoscopy, and colonoscopy (CF). The CT findings used to confirm the presence of CVF included the presence of gas in the bladder (intravesical air) in patients without urinary instrumentation immediately before scanning, local colonic thickening immediately adjacent to an area of locally thickened bladder, and abscess between the bladder and sigmoid colon. This study was approved by the Institutional Review Board for Human Studies at our institution.

RESULTS

Patient profiles and Clinical symptoms (Table 1)

Mean age at presentation of CVF was 63.6 years (range, 44-84 years). All patients were male. The interval from initial presentation of symptoms to definitive treatment varied from 1 week to 12 months (mean, 13.2 weeks). Presenting symptoms were fecaluria (40.0%), abdominal pain (40.0%), pneumaturia (30.0%), hematuria (30.0%), pain on urination (30.0%), pollakiuria (10.0%), dysuria (10.0%), and scrotal pain (10.0%).

Pre-operative examination ① (Table 2)

Positive results for inflammatory markers (white

Table 1. Patients' profiles and Clinical symptoms

Case	Age (years)	Sex	Duration of illness(weeks)	fecaluria	Abdominal pain	pneumatouria	hematuria	pain on urination	pollakiuria	dysuria	scrotal pain
1	76	M	3	+	+	+	–	+	–	–	–
2	70	M	2	+	–	–	–	–	–	–	–
3	51	M	48	–	+	–	–	–	+	–	–
4	44	M	1	–	–	–	–	–	–	–	+
5	56	M	2	+	–	+	+	+	–	–	–
6	84	M	8	+	+	–	–	–	–	–	–
7	79	M	12	–	–	–	+	–	–	+	–
8	49	M	12	–	–	+	+	–	–	–	–
9	55	M	4	–	–	–	–	+	–	–	–
10	72	M	40	–	+	–	–	–	–	–	–
Average	63.6		13.2								
Detection rate				40.0%	40.0%	30.0%	30.0%	30.0%	10.0%	10.0%	10.0%

Table 2. Pre-operative examination①

Case	Preoperative WBC (/μl) +:WBC8500<	Preoperative CRP (mg/dl) +:CRP0.3<	Preoperative urinalysis +:bacteriuria	Detected bacteria
1	5000 –	0.33 +	+	*Streptococcus parasanguis, Candida albicans*
2	6400 –	0.01 –	+	*S.aureus* MRSA
3	4900 –	0.04 –	+	*E.coli, Citrobacter freundii, Enterococcus faecalis, S.aureus* MSSA
4	5400 –	0.05 –	+	Non-enforcement
5	8300 –	3.79 +	+	Non-enforcement
6	8400 –	8.89 +	+	Non-enforcement
7	8600 +	2.35 +	+	Non-enforcement
8	9500 +	0.31 +	+	Negative
9	5200 –	0.91 +	+	*E.coli, Klebsiella pneumoniae, Candida glabrata, Candida albicans*
10	10600 +	2.59 +	+	*E.coli, Enterococcus faecalis*
Detection rate	30.0%	70.0%	100.0%	

blood cell (WBC) count, >8500/μl; C-reactive protein (CRP), >0.3 mg/dl) were seen in 30.0% and 70.0%, respectively. Bacteriuria was seen in all cases. In six of ten cases, an examination of urine cultures was conducted preoperatively. *E.coli* was detected in three cases, and *Enterococcus faecalis* in two cases.

Pre-operative examination ② (Table 3)

Preoperative evaluations included CT in 9 patients (90%), MRI in 5 patients (50%), cystoscopy in 10 patients (100%), irrigoscopy in 9 patients (90%), and CF in 10 patients (100%). Several patients had undergone repeated performance of the same imaging studies before the CVF was diagnosed. The mean number of different studies performed preoperatively per patient was 4.3 (range, 3-5). The ability of these investigations to identify CVF was: CT, 88.9%; MRI, 40.0%; cystoscopy, 30.0%; and irrigoscopy, 22.2%. However, CF proved non-diagnostic (0%).

Operative procedures (Table 4)

The aim of operative management is to resect and re-anastomose the offending bowel segment and to close the bladder. Bowel resection was performed in nine of ten patients. In one case, where primary resection was excluded because of the general condition of the elderly patient, transverse double-barreled colostomy was performed. Treatment in these cases involved single-stage (n=5) or two-stage (n=4) procedures. Single-stage procedures involved sigmoidectomy and primary anastomosis without a protective ileostomy in 5 cases. In double-stage procedures, resection and primary anastomosis with covering ileostomy was performed in all 4 cases. Staged procedures have been advocated for patients with gross fecal contamination and large intervening pelvic abscesses.

Our standard surgical procedure for CVF was

Table 3. Pre-operative examination②

Case	CT	MRI	Cystoscopy	Irrigoscopy (gastografin)	Colonoscopy
1	+	–	+	–	–
2	+	+	–	–	–
3	+	Non-enforcement	+	–	–
4	+	Non-enforcement	–	+	–
5	+	–	+	+	–
6	+	Non-enforcement	–	–	–
7	+	–	–	–	–
8	Non-enforcement	+	–	–	–
9	+	Non-enforcement	–	–	–
10	–	Non-enforcement	–	Non-enforcement	–
Detection rate	88.9%	40.0%	30.0%	22.2%	0.0%

Table 4. Operative procedures

Case	Method of treatment of the intestine	Covering ileostomy	Omental plasty	Method of treatment of the bladder
1	sigmoidectomy	–	+	Serosal suture Peritoneal flap
2	sigmoidectomy	–	+	Partial cystectomy
3	sigmoidectomy	+	+	Partial cystectomy
4	sigmoidectomy	–	+	Partial cystectomy
5	sigmoidectomy	+	+	Peritoneal flap
6	Transverse colostomy			
7	sigmoidectomy	+	+	Serosal suture Peritoneal flap
8	sigmoidectomy	+	+	Partial cystectomy
9	sigmoidectomy	–	+	Partial cystectomy
10	sigmoidectomy	–		Partial cystectomy

Table 5. Postoperative complications

Complications	4 (40%)	Urinary tract infection	1 (10%)
		Leakage from bladder	2 (20%)
		Intestinovesical fistula	1 (10%)
No complications	6 (60%)		
Mortality	0 (0%)		

as follows. The patient was given antibiotics preoperatively and a urinary catheter was placed. Surgery was undertaken through a midline incision. The ureter was actively identified and the sigmoid colon was mobilized both proximal and distal to the fistula. Vascular transection was performed close to the colon, as no malignancy was expected. The actual CVF was sharply dissected (3 cases), or partial cystectomy was performed (6 cases). An omental plasty was placed between the colonic anastomosis and bladder (8 cases).

Postoperative complications (Table 5)

The postoperative course was uneventful in 4 of the 10 patients (60%). Postoperative complications were leakage from bladder (n=2, 20%), urinary tract infection (n=1, 10%), and intestinovesical fistula (n=1, 10%). No postoperative leakage from colonic sutures was identified. The mortality rate was 0% in this study.

DISCUSSION

CVF was first reported as an abnormal communication between the bowel and bladder by Cripps in 1888[2]. Symptoms of CVF may originate from both the urinary and gastrointestinal tracts. However, patients with CVF usually present with lower urinary tract symptoms including pneumaturia (a common symptom, occurring in 50-70% of cases), fecaluria (reported in up to 50%), frequency, urgency, suprapubic pain, and hematuria[9,12]. The present research showed that patients ultimately diagnosed with CVF presented with pneumaturia and/or fecaluria in only 5 of the 10 cases (50%), although all patients presented with bacteriuria. The pathognomotic features of pneumaturia, fecaluria, and recurrent urinary tract infections have been reported to be due to *Escherichia coli*, coliform bacteria and mixed growth, or enterococci[3,9,12]. In our cases, some kind of bacteria was detected in five of the six cases when an examination of urine cultures was conducted preoperatively. *E. coli* and *Enterococcus faecalis* were detected in three and two cases, respectively. The average age of patients that we experienced in this hospital was 63.6 years old, little different from the average age reported by other institutions. Our cases were all male patients, which is consistent with previous reports from other institutions that predominantly male patients underwent CVF. In females, because the uterus intervenes anatomically between colon and bladder, inflammation from the colon hardly involves the bladder directly nor forms a fistula between them.

The problem with symptoms like pneumaturia and fecaluria is that the patient rarely describes them spontaneously. In this research, 10.0-30.0% of patients presented with symptoms of pain on urination, pollakiuria, and dysuria. In addition, positive WBC counts were not found in a particularly high proportion of patients (30.0%), and fever was not commonly reported[15]. The time from initial presentation of symptoms to definitive treatment varied widely, from 1 week to 12 months (mean, 13.2 weeks). The key to the diagnosis of CVF is for the physician to be aware that this diagnosis may be appropriate if the patient complains of malodorous urine or debris in the urine and urinalysis identifies bacteriuria.

The diagnosis of a CVF poses a significant challenge, as no consensus has yet been reached on a clear gold standard for CVF workup. Nevertheless, diagnostic verification of CVF is necessary not only to establish the presence of the fistula, but also to exclude stricture of the bowel and the presence of abscess and to evaluate the anatomy of the involved intestine to guide subsequent surgery[18]. Investigative options include CT, cystoscopy, irrigoscopy, and CF. In the present study, the fistulas were demonstrated by CT in 8 of 9 patients (88.9%) and by MRI in 2 of 5 patients (40.0%). An intravesical air image on CT or MRI can be easily interpreted and it should be emphasized that the frequency of detecting this finding is high. Cystoscopy demonstrated CVF in 3 of 10 patients (30.0%), irrigoscopy in 2 of 9 patients (22.2%), and CF in 0 of 10 patients (0%). This suggests that CT represents the most accurate diagnostic tool available for demonstrating CVF and should therefore supplant the use of other less sensitive diagnostic tests.

Cystoscopy revealed inflammatory changes of the bladder, including erythema, edema, and congestion, in all 10 cases, although endoscopic evaluation failed to identify CVF in 7 of 10 patients (70.0%), as described above. This was consistent with previous reports that endoscopic evaluation of the urinary bladder failed to identify CVF in 54-65% of cases[10,18]. However, cystoscopy appears necessary to confirm the patency of the ureteral orifice and to exclude malignancy. In addition, CVF could not be confirmed by CF alone, but CF accompanied by irrigoscopy with gastrografin identified CVF in 2 of 10 cases. This finding suggests that CF was not particularly valuable for detecting a fistula, and that irrigoscopy has a limited role in the diagnosis of CVF. The detection rate for CVF using CF has already been reported to be as low as 8.5%[6,8]. However, as 10-15% of CVF cases

occur secondary to neoplasm, CF should remain an integral part of the CVF workup and is helpful in determining the nature of the bowel pathology responsible for the fistula formation.

In one case where primary resection was excluded because of the general condition of the elderly patient, transverse double-barreled colostomy was performed. Six of the nine patients were treated with a single-stage procedure (sigmoidectomy with primary anastomosis, n=5). The remaining four patients received two-stage procedures (sigmoidectomy with covering ileostomy followed by stoma closure) because of intense inflammation. Bowel resection with primary anastomosis is advocated in the majority of CVF cases[7,11]. The surgical technique involves blunt dissection of the bowel from the bladder, resection of the intestine, and primary anastomosis. The type of bladder repair, whether by excision or by oversewing, is not of critical importance, since small defects do not require closure and may be left to heal spontaneously[16]. Because of the complication of an intestinovesical fistula in an initial case, 8 subsequent patients received an omental flap between the bladder and intestine. There was no recurrence of a fistula nor leakage from the gastointestinal tract in them. Such a maneuver might facilitate healing and reduce the fistula recurrence rate due to the high vascularity and immunological properties of the omentum[14]. In this study, the postoperative complication rate was 40.0% (4/10), falling within the range of postoperative complication rates shown in previous studies[4,6,10,17-19], and these postoperative complications were dealt with appropriately.

In conclusion, CT is the most sensitive test for identifying CVF and is useful for excluding big abscess and colon perforation. Cystoscopy and colonoscopy appear to be necessary to exclude malignancy, and are also excellent diagnostic tools for defining the localization of CVF. It appears that primary colic anastomosis can be safely performed by applying omental plasty and covering the ileostomy even if inflammation is intense.

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REFERENCES

1. **Cockell, A., McQuillan, T., Doyle, T.N. and Reid, D.J.** 1990. Colovesical fistula caused by appendicitis. Br. J. Clin. Pract. **44:** 682-683.
2. **Cripps, W.H.** 1888. The passage of air and feces per urethra. In: Cancer of the rectum: its pathology, diagnosis and treatment. Including a portion of the Jacksonian Prize Essay for 1876. J & A Churchill, London.
3. **Daniels, I.R., Bekdash, B., Scott, H.J., Marks, C.G. and Donaldson, D.R.** 2002. Diagnostic lessons learnt from a series of enterovesical fistulae. Colorectal Dis. **4:** 459-462.
4. **Garcea, G., Majid, I., Sutton, C.D., Pattenden, C.J. and Thomas, W.M.** 2006. Diagnosis and management of colovesical fistulae, six-year experience of 90 consecutive cases. Colorectal Dis. **8:** 347-352.
5. **Gruner, J.S., Sehon, J.K. and Johnson, L.W.** 2002. Diagnosis and management of enterovesical fistulas in patients with Crohn's disease. Am. J. Surg. **68:** 714-719.
6. **Kavanagh, D., Neary, P., Dodd, J.D., Sheahan, K.M., O'Donoghue, D. and Hyland, J.M.** 2005. Diagnosis and treatment of enterovesical fistulae. Colorectal Dis. **7:** 286-291.
7. **Krco, M.J., Malangoni, M.A., Jacobs, S.C. and Lawson, R.K.** 1984. Colovesical fistulas. Urology **23:** 340-342.
8. **Kwon, E.O., Armenakas, N.A., Scharf, S.C., Panagopoulos, G. and Fracchia, J.A.** 2008. The poppy seed test for colovesical fistula: big bang, little bucks! J. Urol. **179:** 1425-1427.
9. **McBeath, R.B., Schiff, Jr., M., Allen, V., Bottaccini, M.R., Miller, J.I. and Ehreth, J.T.** 1994. A 12-year experience with enterovesical fistulas. Urology **44:** 661-665.
10. **Melchior, S., Cudovic, D., Jones, J., Thomas, C., Gillitzer, R. and Thüroff, J.** 2009. Diagnosis and surgical management of colovesical fistulas due to sigmoid diverticulitis. J. Urol. **182:** 978-982.
11. **Mileski, W.J., Joehl, R.J., Rege, R.V. and Nahrwold, D.L.** 1987. One-stage resection and anastomosis in the management of colovesical fistula. Am. J. Surg. **153:** 75-79.
12. **Najjar, S.F., Jamal, M.K., Savas, J.F. and Miller, T.A.** 2004. The spectrum of colovesical fistula and diagnostic paradigm. Am. J. Surg. **188:** 617-621.
13. **Niebling, M., van Nunspeet, L., Zwaving, H., Eddes, E.H., Bosker, R. and Eeftinck, S.M.** 2013. Management of colovesical fistulae caused by diverticulitis: 12 years of experience in one medical centre. Acta Chir. Belg. **113:** 30-34.
14. **O'Leary, D.P.** 1999. Use of the greater omentum in colorectal surgery. Dis. Colon. Rectum. **42:** 533-539.
15. **Pontari, M.A., McMillen, M.A., Garvey, R.H. and Ballantyne, G.H.I.** 1992. Diagnosis and treatment of enterovesical fistulae. American Surgeon **58:** 258-263.
16. **Scozzari, G., Arezzo, A. and Morino, M.** 2010. Enterovesical fistulas: diagnosis and management. Tech. Coloproctol. **14:** 293-300.
17. **Shatila, A.H. and Ackerman, N.B.** 1976. Diagnosis and management of colovesical fistulas. Surg. Gynecol. Obstet. **143:** 71.
18. **Solkar, M.H., Forshaw, M.J., Sankararajah, D., Stewart, M. and Parker, M.C.** 2005. Colovesical fistula-is a surgical approach always justified? Colorectal Dis. **7:** 467-471.
19. **Walker, K.G., Anderson, J.H, Iskander, N., McKee, R.F. and Finlay, I.G.** 2002. Colonic resection for colovesical fistula: 5-year follow-up. Colorectal Dis. **4:** 270-274.
20. **Youssef, A., Achiche, M.A., Rezgui, H., Chouchene, A. and Balti, M.H.** 2007. Sigmoid-vesical fistula: a case report. Tunis Med. **85:** 1075-1077.