

Minimally invasive complete urinary tract drainage in the treatment of vesicovaginal fistula: A case report

SHENGHAO NIU^{1,2*}, YUNPENG LI^{1,2*}, SONG TU^{1,2}, SHIJIE NIU^{1,2},
JUN QIAN², FAYING YANG^{1,2} and JIAXI YAO^{1,2}

¹Department of Urology, Hexi University Affiliated Zhangye People's Hospital;

²Institute of Urology, Hexi University, Zhangye, Gansu 734000, P.R. China

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Abstract. Vesicovaginal fistula is one of the most common types of female genitourinary fistulas encountered in clinical practice, and its treatment is determined by the disease characteristics and at the discretion of the attending physician. The present study describes a unique conservative approach to the management of vesicovaginal fistulas. A 56-year-old woman developed a vesicovaginal fistula after laparoscopic hysterectomy. A bilateral ureteral single-J tube drainage through suprapubic bladder puncture with indwelling catheterization was performed. Thus, urine diversion and bladder emptying were achieved. In addition, the healing of the vesicovaginal fistula was promoted and the trauma of open or laparoscopic surgery was avoided. This minimally invasive method is simple and convenient, has few complications, and may be used as an alternative method for treating vesicovaginal fistulas.

Introduction

Vesicovaginal fistula is an abnormal anatomical passage between the bladder and vagina and is mainly characterized by spontaneous vaginal leakage. It is one of the most common types of genitourinary fistulas in women, and it markedly affects the patients' quality of life and physical and mental health (1-3). Vesicovaginal fistula is most commonly related to iatrogenic injuries, including gynecological and pelvic tumor surgeries as well as radiotherapy, with abdominal hysterectomy as its most common cause (1). Its diagnosis is mainly based on the patient's clinical symptoms, including

persistent vaginal leakage, genital itching and pain, macerated dermatitis, and recurrent urogenital infection. The diagnosis may be confirmed using imaging methods, such as intravenous pyelography or computed tomography urography (CTU). The bladder methylene blue injection test and cystoscopy may further clarify the location, size, and number of fistulas, along with other relevant information.

At present, the treatment methods for vesicovaginal fistula vary, each having its advantages and disadvantages. In general, for treating newly formed and simple vesicovaginal fistulas, conservative continuous bladder drainage may be adopted (4), along with an indwelling catheter placement for 3-4 weeks. Concurrently, antibiotics should be used to prevent infections. If conservative treatment fails, surgical repair is recommended (5). Surgical repairs are categorized as follows (6-9): i) transabdominal repair for patients with poor vaginal conditions-laparoscopic or robotic-assisted laparoscopic repair is recommended; ii) repair through the bladder for high bladder fistulas located in the upper part of the bladder trigone and bottom of the bladder; iii) transvaginal repair for patients with sufficient vaginal volume, soft vaginal wall with good blood supply, and sufficient healthy tissue in the vaginal wall around the fistula; iv) filling with a pedunculated graft, at times used in complex cases, as in patients with poor local tissue condition after radiotherapy; v) urinary diversion, a palliative treatment that may be performed after failed treatments for complex vesicovaginal fistulas, or when repair is difficult due to poor local tissue conditions.

At present, there is no unified standard protocol for optimal operative timing and methods of treatment, as all the above methods have their own advantages and disadvantages. These methods are associated with either prolonged treatment or substantial trauma. The present study reports a case of vesicovaginal fistula that was successfully treated with bilateral ureteral single J-tube placement and drainage through a suprapubic bladder puncture with indwelling catheterization.

Case report

A 56-year-old woman was admitted to the Department of Urology of Hexi University Affiliated Zhangye People's Hospital (Zhangye, China) due to vaginal leakage for

Correspondence to: Dr Jiayi Yao or Dr Faying Yang, Department of Urology, Hexi University Affiliated Zhangye People's Hospital, 67 Xihuan Road, Zhangye, Gansu 734000, P.R. China
E-mail: 1611210057@fudan.edu.cn
E-mail: yangfy120@163.com

*Contributed equally

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1 week, occurring 22 days after hysterectomy. The patient had undergone laparoscopic total hysterectomy and bilateral salpingectomy at the gynecology department of our hospital in late November 2020 for multiple uterine leiomyomas, stress urinary incontinence, and stage II anterior vaginal wall prolapse. The patient had intermittent fever after surgery and received anti-infective drug therapy. The patient was discharged from the hospital after the fever subsided. In early December 2020, 1 week after surgery, the patient noted a large amount of clear vaginal discharge. The patient had no frequent urination, urinary urgency or fever. During admission, a large amount of clear vaginal discharge was observed. The vaginal mucosa was smooth and rosy. The suspected diagnosis was vesicovaginal fistula due to hysterectomy.

CTU examination indicated a liquid-density shadow at the operative site connecting the bladder and vagina, and enhanced images revealed contrast agent overflow, suggesting the presence of a vesicovaginal fistula. During cystoscopy, the bilateral ureteral orifices were clearly visible, and a fistula of approximately 1 cm in diameter was noted in the posterior bladder wall (Video S1). The stump suture and fistula were visible through the vagina. Cystography was performed using 250 ml of iodofluorohydrin-sodium chloride solution injected through the catheter, revealing an accumulation of contrast medium behind the bladder, with a circular appearance. Furthermore, the upright plain radiograph revealed an air-fluid level in the bladder and contrast medium extravasation. Immediately following the cystography, a full-abdominal CT examination was performed, and it displayed contrast medium at the operative site, suggesting the presence of a vesicovaginal fistula (Fig. 1). The patient's final diagnosis was post-hysterectomy vesicovaginal fistula.

After explaining the procedure to the patient and obtaining written informed consent, a bilateral ureteral single J-tube placement and drainage through a suprapubic bladder puncture with indwelling catheterization were performed. First, a resectoscope was inserted into the bladder through the urethra for examination, revealing slit-shaped bilateral ureteral orifices and normal peristaltic effluent. A fistula was visible on the posterior bladder wall, with an approximate diameter of 1 cm. Vaginal examination revealed the absorbable sutures at the vaginal stump and a fistula on the anterior wall. A ureteroscopy was used to enter the bladder through the urethra, and both ureteral lumens were checked for patency under the guidance of a zebra wire. The ureteroscopy was replaced with the resectoscope, and the bladder was entered through the urethra. After filling the bladder with isotonic sodium chloride solution, bladder puncture was performed using a 20-ml syringe needle, which was inserted 2 cm above the pubic bone in the midline. The puncture needle smoothly entered the bladder, and a guide wire was placed through the inner core of the puncture needle. An 8-F dilation tube was used to expand the puncture channel after withdrawing the needle. The resectoscope was replaced with a nephroscope, again entering the bladder through the urethra. With the aid of forceps, the guide wire and the front end of the single J-tube was slowly inserted into the ureteral orifice (Video S2). A single J-tube was successfully placed into each ureter and properly attached to the skin with sutures, with the end of each connected to a sterile drainage bag. Subsequently, a catheter was inserted, and the operation was

successfully completed (Fig. 2). The urine drainage volumes from the catheter and single J-tubes were closely observed after the operation. The drainage output of the J-tube in each ureter was satisfactory. Most of the urine drained through the J-tubes; the daily urine volume through the urinary catheter was <10 ml. The urinary catheter was removed 1 week after the minimally invasive drainage treatment, improving the patient's quality of life. At 3 months postoperatively, a follow-up CTU (Fig. 1E), cystoscopy (Fig. 1F), cystography (Fig. 1G), and colposcopy (Fig. 1H) confirmed complete healing of the vesicovaginal fistula, and both ureteral J-tubes were removed. No urinary catheter was placed after the J-tubes were removed, because the injury was minimal and located on the anterior bladder wall. After the J-tubes were removed, the patient was monitored for symptoms such as fever or lower abdominal pain. At the 6-month and 1-year follow-ups, there was no urinary incontinence, bladder spasm, vaginismus, or any other complications. The patient was satisfied with the treatment outcomes.

Discussion

Vesicovaginal fistula is the most common type of female genitourinary fistula and has serious physical and psychological effects (3,10,11). Considering the iatrogenic causes of the disease, physicians are cautious regarding its diagnosis and treatment, and the final diagnosis may only be confirmed by standard and convincing evidence (10). The treatment plan for this disease must also be carefully designed, particularly when surgery is to be performed. A reasonable surgical plan is required to ensure operational success, as the local condition of the operative site is optimal during the first operation, providing the greatest probability of treatment success (12,13). If the first repair fails, the subsequent treatment attempts may encounter difficulties. However, there is currently no unified standard protocol for the optimal route and timing of surgical treatment of vesicovaginal fistulas (1,10,13-15).

The adverse consequences of urinary leakage not only markedly affect the patients' physical and mental health, but also cause great psychological distress to the surgeon who caused the fistula (16). Thus, it is important to remedy the condition and help the patients reintegrate back into the community as soon as possible (17). However, for open surgery or laparoscopic repair, patients are generally required to wait 10-12 weeks; during this period, the local inflammation of the fistula subsides, the scar softens, and the local tissue obtains adequate blood supply, leading to the best possible surgical conditions (13,18). However, during this time, patients continue to endure the physical and mental distress of urinary leakage, which significantly affects their quality of life (11,19). Traditional repair surgery, whether through the abdominal, bladder, or vaginal route, causes secondary trauma and carries a risk of complications, such as fistula recurrence, urinary incontinence, vaginismus, and bladder spasm (9,12).

It is important to identify the optimal method for early treatment of vesicovaginal fistulas - a treatment that not only relieves the physical pain and psychological distress from urinary leakage, but also creates favorable conditions for fistula

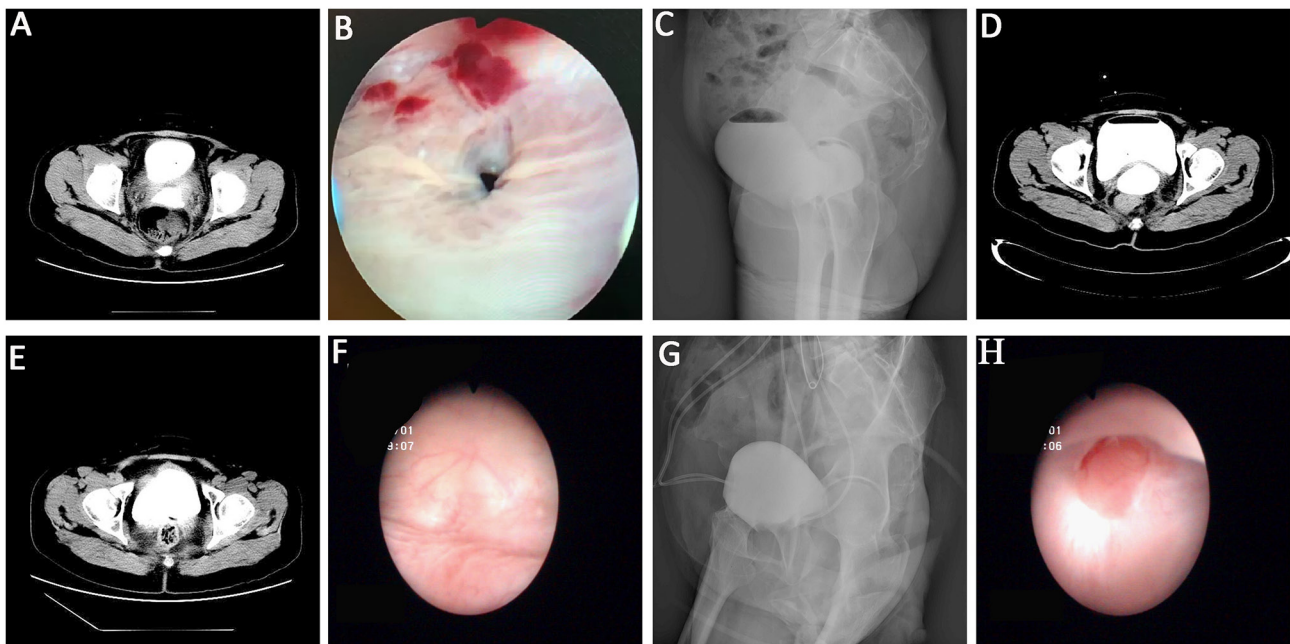


Figure 1. (A) Contrast-enhanced CT images of the urinary system on admission. (B) Cystoscopy indicated a vesicovaginal fistula. (C) Cystography indicated a vesicovaginal fistula. (D) CT images of the urinary system after cystography. (E) Contrast-enhanced CT images of the patient's urinary system at 3 months postoperatively. (F) A healed fistula was observed using cystoscopy at 3 months postoperatively. (G) A healed fistula was seen using cystography at 3 months postoperatively. (H) Colposcopy revealed a healed fistula with visible scarring at 3 months postoperatively. CT, computed tomography.

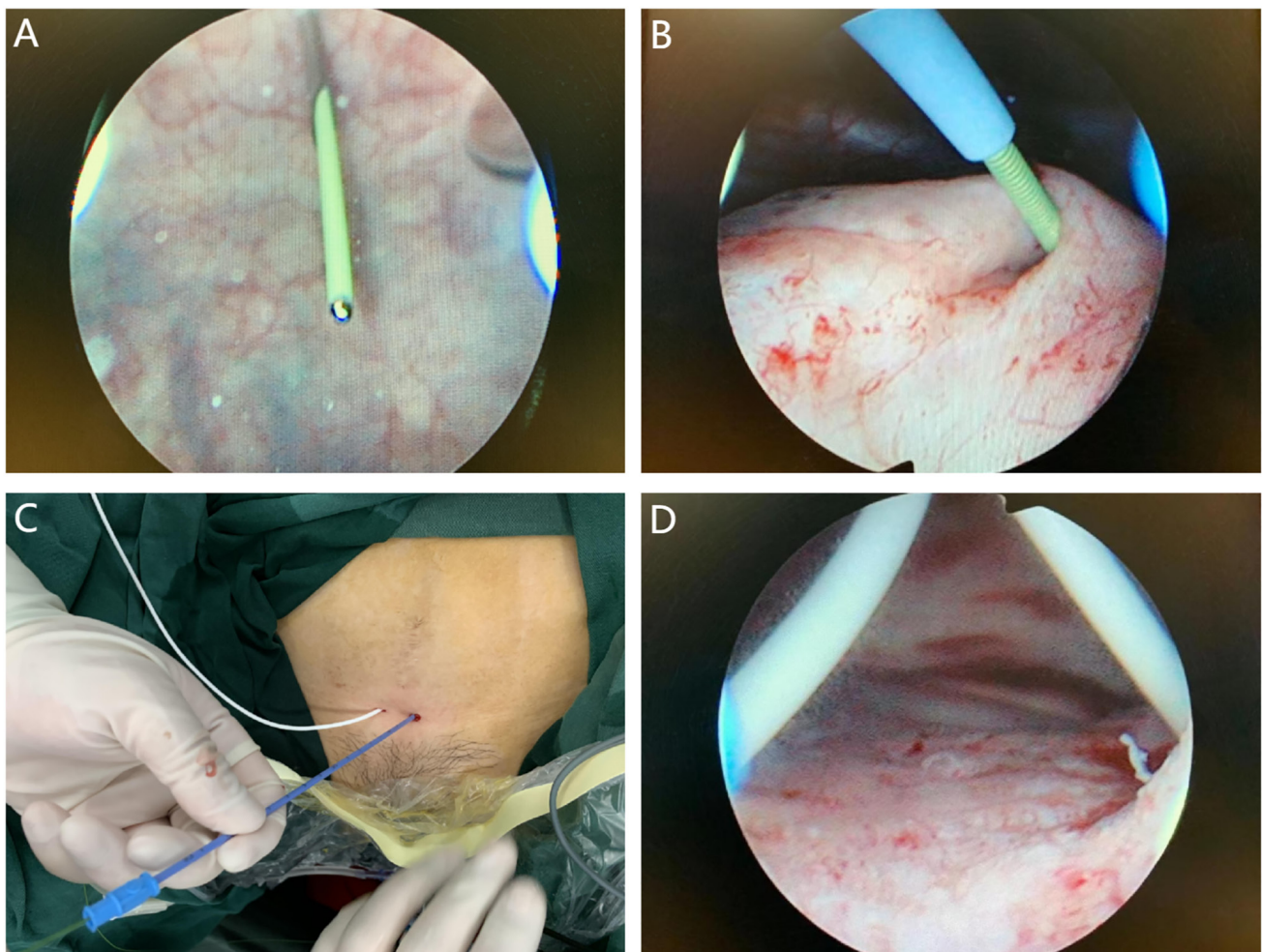


Figure 2. (A) Suprapubic bladder puncture performed under cystoscopy. (B) A single J-tube was placed using a guide wire under cystoscopy. (C) Successful placement of a single J-tube in one ureter, preparation for the placement of the other. (D) Bilateral single J-tubes successfully inserted under cystoscopy.

healing and minimizes postoperative trauma and complications. Such a method would be beneficial for both doctors and patients. The new surgical method presented in the current study completely addresses the current dilemma of long waiting time for patients with small, new-onset vesicovaginal fistulas for secondary surgical treatment. After discussion with our multi-disciplinary treatment team, we decided to perform a minimally invasive procedure-single J-tube placement and drainage in the bilateral ureters through a suprapubic bladder puncture-for the present case. The surgical outcome was good, the reexamination findings were satisfactory, and the patient was satisfied with the treatment outcome. The fistula in this patient was approximately 1 cm in diameter; therefore, we may assume that the method is safe in patients with fistulas <1 cm. Mechanical bladder injuries are easier to repair; however, our method may potentially be used for small thermal injuries, as the method of treatment is the same for both types of injury. Our reasoning is that if the bladder is kept in a low-tension state and free of urine, the small fistulas heal naturally. Previous studies have reported that conservative treatment of bladder rupture with an indwelling catheter may be successful for small mechanical injuries, just as in transurethral resection of bladder tumors; small gaps leading to bladder rupture may also be treated conservatively with an indwelling catheter (4,5). The approach of the present study is more precise than using an indwelling catheter, as the ureteral effluent is completely drained through a single J-tube, and the bladder maintains a relatively dry and clean microenvironment, which is helpful for healing a vesicovaginal fistula. The procedure has not been attempted to treat a 3-cm fistula; however, it may be possible to pursue this in order to expand patient reports and develop more precise treatment plans.

Single J-tube placement in the bilateral ureters for drainage through a suprapubic bladder puncture with indwelling catheterization is an effective method for treating vesicovaginal fistulas. It utilizes common urological techniques and surgical instruments used for inspection procedures, making it simple and convenient to perform. This minimally invasive method has few complications, and because the approach has no treatment delay, it immediately reduces the physical and mental stress experienced by patients due to urinary leakage, thereby improving their quality of life. There are still certain limitations to this study. Although the patient had no urinary incontinence, bladder spasm, vaginismus, or other complications after surgery, this study is only one case report, and a case series study and comparisons with other treatment modalities are still required to verify the efficacy of this treatment. In addition, follow-up is required to determine the long-term treatment effect of this approach.

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Availability of data and materials

All data generated and analysed during this study are included in this published article.

Authors' contributions

SHN, YPL and FYY contributed to the drafting of the manuscript and the design of the study. ST, SJN, JQ and JXY contributed substantially to the conceptualization and design of the study, as well as the completion of the surgery. FYY and JXY approved the final version of the manuscript for publication. Data authentication is not applicable. All authors have read and approved the final manuscript.

Ethics approval and consent to participate

The study was performed according to the guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Hexi University Affiliated Zhangye People's Hospital (Zhangye, China). Written informed consent was obtained from the patient.

Patient consent for publication

Written consent was obtained from the patient for publication of the patient's data/images in this manuscript.

Competing interests

The authors declare that they have no competing interests.

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