

Case Report

Treatment of female vesicovaginal fistula with complete urethral rupture: a report of 6 cases

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Received January 15, 2020; Accepted March 3, 2020; Epub May 15, 2020; Published May 30, 2020

Abstract: Objective: To explore the surgical methods and their preliminary efficacy in female patients with vesicovaginal fistula accompanying complete urethral rupture. Methods: The clinical data and follow-up results of 6 female patients with vesicovaginal fistula and complete urethral rupture were analyzed retrospectively. Five of the patients underwent urethroplasty with flipped anterior bladder wall flaps by abdomino-vaginal approach, while 1 patient received urethroplasty with proximal tissue from the rupture by vaginal approach. After surgery, all patients were followed regularly for postoperative condition, quality of life, urinary voiding and continence at months 3, 6, 12 and 24, respectively. Results: The 6 female patients all had vesicovaginal fistula accompanying complete urethral rupture secondary to dystocia. The course of disease was 10 to 30 years (mean, 20 years). Among the 5 patients undergoing urethroplasty with flipped anterior bladder wall flaps, 4 healed well, was continent and voided normally; 1 patient was lost to follow up. The patients who had been treated with urethroplasty using proximal tissue from the rupture by vaginal approach healed well, had normal urinary voiding and mild stress urinary incontinence after surgery. At month 3, urethral constriction was performed in the patients and the symptoms of urinary incontinence resolved after surgery. Quality of life was significantly improved in 5 patients who were followed regularly after surgery. Conclusion: Urethroplasty with flipped anterior bladder wall flaps by abdomino-vaginal approach is effective in treatment of female vesicovaginal fistula accompanying complete urethral rupture. Urethroplasty with proximal tissue is optional if focal conditions are favorable.

Keywords: Vesicovaginal fistula, urethral rupture, anterior bladder wall flap, urethroplasty, proximal tissue

Introduction

The female urethra, a tubular structure of approximately 4 cm in length and 6 mm in diameter, begins at the neck of the bladder and travels forward and downward behind the pubic symphysis, is then embedded in the anterior vaginal wall, and finally opens into the external orifice of the urethra. The bladder neck and the internal sphincter muscle of urethra play an important role in urinary continence. If they are impaired, the patient's urinary continence may be impacted badly [1, 2]. Abnormal fistula may be present between the bladder neck and vagina in women, which is called vesicovaginal fistula. Clinically, the disease manifests persistent escape of urine. If not treated, vesicovaginal fistula may cause such complications as urinary tract infection, persistent vaginal leakage and urinary incontinence. The diffi-

culty of surgical treatment for vesicovaginal fistula is mainly caused by speciality of physiological position, the occurrence of urinary fistula with evident inflammation and edema, and repair difficulty [3]. In the past, urethrovaginal fistula with complete urethral rupture was primarily associated with labor trauma, operative injury and trauma, but the disease rarely resulted from tuberculosis, tumor, radiotherapy and vaginal foreign body [4-6].

In recent years, however, with the rapid development of economy, the improvements in obstetric technology and promotion of scientific delivery, urethrovaginal fistula with complete urethral rupture induced by obstetric factors has become rare [7]. The female urethra, as compared with male urethra, has a lower probability of external force-caused injury due to its special anatomical structure. It is report-

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ed that a common cause of female urethral rupture is pelvic fracture caused by traffic accidents. 63% of urethral ruptures are observed in children, with an incidence of 1 to 6%. The probability of complete urethral rupture is very low thanks to timely repairs [8, 9]. Although urethrovaginal fistula with complete urethral rupture is rarely present in women, it may severely affect quality of life and family harmony in the patients if it occurs [10, 11].

There are only a few reports about the treatment of female vesicovaginal fistula with complete urethral rupture, and most of them are case reports. Moreover, there is still no consensus on the best treatment regimens for the disease. Clinically, flipped anterior bladder wall flap is significantly effective in repairing urethral rupture induced by various factors. In a study, Xu et al. used flipped flaps to reconstruct the urethra to treat complicated urethral stricture in 44 female patients, leading to 93% of successful urethra anatomical repairs, and 91% of successful function repairs [12]. Urinary incontinence did not occur in 2 of the 44 patients with ureteroplasty using bladder flaps. In the study, they only reported the application of ureteroplasty using bladder flaps in treating urethral rupture; however, the efficacy of the technique in the treatment of female vesicovaginal fistula accompanying complete urethral rupture was still unclear.

In our present study, a retrospective analysis was performed on the clinical data which had been collected from 6 female patients admitted to the Second Affiliated Hospital of Kunming Medical University from January 2007 to September 2018. Additionally, the etiology of urethral rupture was analyzed in the female patients, and the therapeutic effect and experience of flipped anterior bladder wall flaps and proximal tissue from the rupture in treating female vesicovaginal fistula accompanying complete urethral rupture were also summarized. We hope our study can provide useful evidence for the treatment of female vesicovaginal fistula accompanying complete urethral rupture.

Materials and methods

General data

The clinical data were collected from 6 female patients suffering from vesicovaginal fistula

accompanying complete urethral rupture admitted to the Second Affiliated Hospital of Kunming Medical University from January 2007 to September 2018 and analyzed retrospectively. The patients ranged in age from 39 to 52 years old, with a mean age of 44.0 years old. Persistent vaginal leakage was the major clinical manifestation in the 6 patients. Bladder and vaginal calculi were found in one patient, as confirmed on transvaginal ultrasound.

Inclusion criteria: Patients were eligible for enrollment in this study if they were diagnosed as having vesicovaginal fistula accompanying complete urethral rupture on transvaginal ultrasound in our hospital, had an etiology of dystocia (prolonged labor), and underwent urethroplasty with flipped anterior bladder wall flaps by abdomino-vaginal approach or urethroplasty with proximal tissue from the rupture by vaginal approach.

Exclusion criteria: Patients were excluded from the study if they had tuberculosis, tumor or trauma, were pregnant, were reluctant to receive the surgical treatment, had incomplete data or were lost to follow-up.

This study was approved by the hospital ethics committee, and patients and their families provided informed written consent.

Preoperative examination and preparation

Patients were inquired for medical history in details and received physical examination before surgery. The pelvic floor examination revealed no visible external urethral orifice, the bladder neck opened from the vagina, and urine flowed uncontrollably from the bladder neck into the vagina. Cystoscopy showed normal distance from the bilateral ureteral orifice to bladder neck. Excretory urography, CT or MRI were used to assess the integrity of the upper urinary tract. One patient was diagnosed by cystoscopy and CT as having bladder and vaginal calculi. Each patient washed the vagina with iodophor twice a day for 3 days before surgery. Results of urinalysis indicated that patients with infection were treated with antibiotics.

Surgical procedures

Of all the enrolled patients, 5 underwent urethroplasty with flipped anterior bladder wall

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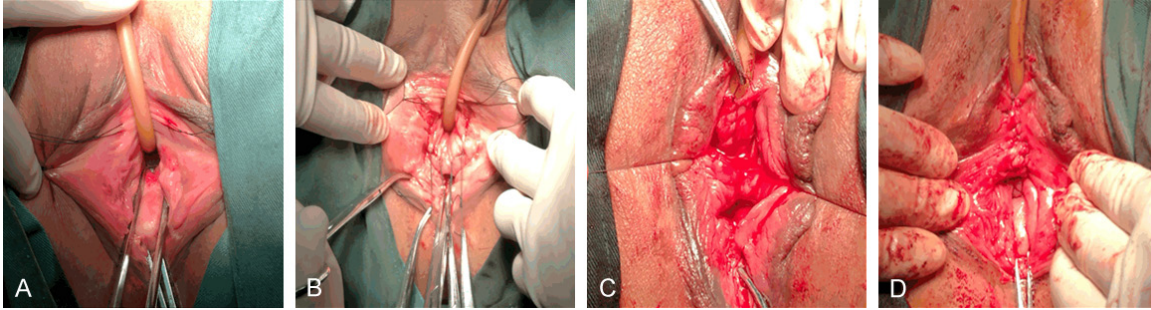


Figure 1. This is seen during urethroplasty using adjacent tissue from the rupture through the vagina. A. Full exposure to the surgical field; B. The adjacent tissue of the interception defect; C. A tubular structure was formed with the urinary duct as a scaffold; D. The flap edge was closed around the neourethra and the neourethra was embedded and sutured to form the new urethra.

flaps by abdomino-vaginal approach. Under general anesthesia, each of the 5 patients was placed on the operating table in the lithotomy position, and surgical drapes were sterilized routinely. Subsequently, a longitudinal mid-line incision of approximately 8 cm was made at the level of two finger breadths above the pubic symphysis. The abdominal cavity was opened to fully expose the anterior wall of the bladder. The upper margin of the bladder neck and anterior wall of the bladder were marked with sutures respectively to form the shape of a trapezoid with an upper base of 3.5 cm, a lower base of 4 cm, and a height of 4 cm. The anterior wall of the bladder was incised in a full layer along the margin of the sutures. The lower base, i.e., the bladder tissue at the bladder neck, was preserved to form flipped bladder flaps. The reversed suture of the dissected anterior bladder wall flap was pulled out of the neck orifice. By means of everting suture, the two sides of the base were sutured at the bladder neck with 4-0 absorbable suture. The two sides of the flap margin were folded in half and closed in layers with 4-0 absorbable suture. The dissected bladder flaps, with a Fr14 or 16 urethral catheter as a scaffold, were sutured in layers with the use of 4-0 absorbable sutures, to form tubulated neourethra at a diameter of 5-6 mm and length of 4 cm. The neourethra was embedded at the position of the original urethra with 2-0 absorbable sutures and the tissues surrounding the vagina, and the urethral catheter balloon was fixed by infusing water, followed by suture of the abdominal cavity and placement of an iodophor gauze into the vagina.

In contrast, 1 patient received urethroplasty with proximal tissue from the rupture by vaginal

approach. Under general anesthesia, the patient was placed on the operating table in the lithotomy position, and surgical drapes were sterilized routinely. A Fr14 urethral catheter was placed into the bladder neck, and the urethral catheter balloon was fixed by infusing water. The catheter was pulled outward to expose the bladder neck and surgical field. Free flaps were dissected concentrically at a position 3-4 cm around the urethral rupture to bladder neck. The base around the bladder neck was preserved and flipped flaps were formed. The catheter was used as a scaffold, and free flaps were flipped to embed the catheter and sutured against the incision with a 4-0 absorbable suture to form a tubular structure embedding the catheter (about 6 mm in inner diameter), and then the neourethra was sutured to fix at the position of the external orifice of the original urethra with 2-0 absorbable sutures. After complete hemostasis, the margins of the flaps were closed to the new urethra for embedding suture, and an iodophor gauze was placed into the vagina as shown in **Figure 1**.

Postoperative treatment

The iodophor gauze was taken out of the vagina 24 hours after surgery. Patients washed the vagina with iodophor twice a day after surgery to keep the perineum clean and dry. The Fr14 or 16 catheter was indwelled to drain urine smoothly for 2 weeks. The patients took a sit bath with diluted potassium permanganate solution for 10-15 min per day within one month after removal of the catheter. They should avoid strenuous manual labor and sexual life within 3 months, and keep their bowels open. They were followed up regularly for the

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Table 1. The condition of 6 female patients with bladder cervicovaginal fistula accompanying complete urethral rupture

| Patients | 1 | 2 | 3 | 4 | 5 | 6 |
|---|--|--|--|--|--|--|
| Ages (years) | 42 | 49 | 52 | 40 | 39 | 42 |
| Cause of disease | dystocia | dystocia | dystocia | dystocia | dystocia | dystocia |
| Course of disease (years) | 18 | 26 | 30 | 15 | 10 | 21 |
| Surgical approach | transabdominal vaginal union | transvaginal association | transabdominal vaginal union | transabdominal vaginal union | transabdominal vaginal union | transabdominal vaginal union |
| Postoperative catheterization time (days) | 14 | 14 | 14 | 14 | 14 | 14 |
| Follow-up time (months) | 24 | 24 | 24 | 24 | 24 | |
| Result | the wound healed well and urination was smooth | the wound healed well and urination was smooth | the wound healed well and urination was smooth | the wound healed well and urination was smooth | the wound healed well and urination was smooth | the wound healed well and urination was smooth |

condition of the incisions, quality of life, urinary voiding and continence at 3, 6, 12 and 24 months after surgery. Moreover, they completed more tests including pelvic floor examination, cystourethrography, ultrasonography of the uropoietic system, and residual urine volume measured by bladder ultrasonography.

Results

Complete urethral rupture of bladder neck was secondary to dystocia in the 6 patients. The course from dystocia to urethral reconstruction was 10-30 years, with a mean course of 20 years. During the postoperative follow-up, 4 patients voided normally without incontinence; 1 patient had mild stress urinary incontinence, but 3 months later, the symptoms of urinary incontinence disappeared after dilatation of urethral stricture. The results of pelvic floor examination of 5 patients showed good healing of operative incision, no cicatricose tissue in large area, no retraction of external urethra orifice, and no leakage of urine. Cystourethrography revealed good contour of urethra and no urethral stricture. Ultrasonography of the uropoietic system suggested no hydronephrosis or residual urine. The follow-up results of the 5 patients were satisfactory, and 1 patient was lost to follow up (**Table 1**).

Discussion

Vesicovaginal fistula is related to a variety of factors. In the present study, dystocia was the main cause for vesicovaginal fistula accompanying urethral rupture. Prolonged labor resulted in too long compression on the tissue of the urinary tract by the first exposed body part of the fetus. The compressed tissue developed chronic ischemia and edema, then necrosis,

and fell away. Finally, the condition deteriorated into complete urethral rupture, and then urinary incontinence, i.e., the uncontrolled urine flowed out of the vagina. Due to the influence of traditional Chinese thoughts, however, patients were shy of actively going to see a doctor in time. The 5 patients all had a course of disease for decades. Because they had to have diapers for a long time, the perineal regions were soaked in urine for a long time. Skin rashes or ulcers occurred in the perineal region, and the body emitted special odors. As a result, they felt a sense of inferiority, and were reluctant to communicate with others, or even unwilling to go out, which adversely affected their physical and mental health as well as family harmony.

It is not difficult to identify female urethral rupture. Pelvic floor examination may reveal urethral rupture under the bladder neck. For example, the bladder neck opens from the vagina, and urine flows from the bladder neck through the vagina uncontrollably. In addition, it is also necessary to improve cystoscopy and relevant imaging examinations before surgery. In recent years, ultrasound has been widely used in diagnosis of urethral rupture and vaginal fistula [13, 14]. It is utilized to exclude upper urinary tract injury and other pelvic floor diseases. In the present study, bladder and vaginal calculi were observed in 1 patient by cystoscopy and imaging examination. During the surgery, urethral reconstruction was performed in the patient after removal of the calculi. The patient recovered well and had no complications after surgery.

In the present study, 5 patients received urethroplasty with flipped anterior bladder wall

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flaps. The surgery was satisfactory. The key points of the surgery were as follows: First, urethroplasty by abdomino-vaginal approach was performed to ensure the full field exposure and meticulous operation. Second, there was abundant blood supply in the flipped anterior bladder wall flaps, so necrosis and urinary fistula were less likely to develop after surgery if the flaps were used to reconstruct a new urethra. Third, the sutures were used to mark the free flaps from the anterior bladder wall, preserve bladder neck, and reduce damage to the bladder neck, which ensures normal urinary continence after surgery. Fourth, with a Fr14 or 16 catheter as a scaffold, the flaps were sutured continuously with 4-0 absorbable suture to form neourethra with flipped tubular structure (5-6 mm in diameter and 4 cm in length); the neourethra was more suitable to the physiological features of the urethra as it not only restored anatomical structure of the urethra, but also had good urinary continence. No postoperative complications such as urinary incontinence occurred in the patients after surgery. Fifth, the upper end of the neourethra was fixed on the bladder neck, and the external orifice was embedded and fixed on the skin of the vulva, resulting in small area of trauma, and avoiding urethral retraction caused by too much tension after surgery. Last, urethral reconstruction with anterior bladder wall flaps, as compared with the trigone and bladder posterior wall flaps, is simpler to operate, leading to smaller impacts on the urethral orifice and less damage. The surgery is also easier to master by surgeons, and patients are less likely to have complications. Besides, urethral reconstruction with anterior bladder wall flaps is also effective in the treatment of complete urethral stricture, traumatic urethral rupture and lower urinary tract vaginal fistula in female patients. The patients can restore normal physiological structure of the urethra and have better urinary continence with the neourethra than with a urethra reconstructed with other flaps [15-18].

In the present study, 1 patient received urethra reconstruction performed by using the tissue around the rupture. The reconstructed urethra matched with the physiological length of urethra. During the follow-up after surgery, the patient voided normally but had mild stress uri-

nary incontinence. According to the findings detected by the urethral probe, the internal diameter of the new urethra became greater. Therefore, urethral constriction was performed. The symptoms of urinary incontinence disappeared after surgery. No other complications occurred during the later follow-ups, which suggests that the reconstructed neourethra should match with the physiological internal diameter and length of the urethra, and vaginal urethroplasty with proximal tissue from the rupture will be easier and more feasible if the tissue around the urethral rupture is in good condition.

Proper postoperative management is one of the key steps to enhance the success rate of the surgery and reduce postoperative complications [19, 20]. The postoperative persistent bladder drainage can reduce the stimulation of urine to the surgical incision, promote its healing, and reduce the risk of postoperative urinary fistula. Besides, the catheter can also be utilized as a urethral scaffold to prevent postoperative urethral stricture. It is recommended that the best time for catheter indwelling is 14 days as too short indwelling time may be not conducive to healing of the orifice, and too long indwelling time may increase the probability of urinary tract infection and affect daily life of patients. To keep the perineal region clean and dry, patients should wash the vagina with iodophor twice a day after surgery, and take a sit bath with diluted potassium permanganate solution for 10-15 min per day within one month after removal of the catheter. Additionally, they should also avoid strenuous manual labor and sexual life within 3 months, and keep their bowels open. If necessary, they should do pelvic floor exercise to strengthen the contraction function of the pelvic floor muscles, and to minimize long-term complications [21, 22].

In the present study, 4 patients were followed regularly for 2 years. After surgery, the patients had normal urinary voiding and continence, which significantly improved their quality of life. All this proves the feasibility of the surgery and it is an ideal technique for the treatment of urethral rupture in female patients; urethroplasty with proximal tissue is also an optional method if local conditions are favorable. Two surgical techniques were used in the present

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study to treat vesicovaginal fistula accompanying complete urethral rupture in female patients, and the postoperative therapeutic effects were satisfactory. Nevertheless, there are still some limitations in the present study. Firstly, it is a retrospective study, with small sample size, short follow-up and unpredictable long-term effect. Secondly, it is a single center study, with limited disease types. In the future, more multi-center studies with larger sample size are needed for further validation.

In conclusion, urethroplasty with flipped anterior bladder wall flaps by abdomino-vaginal approach was used for the treatment of vesicovaginal fistula and complete urethral rupture in female patients after dystocia. The materials for the surgery were easy to obtain and its success rate was high. Hence, it is worthy of clinical generalization.

Acknowledgements

This work was supported by the Young and Middle-aged Academic and Technical Leaders in Yunnan Province (2017-HB038), Yunnan Province Health and Family Planning Commission Medical Discipline Leader (D-201615), and Engineering Research Center for Female Pelvic Floor Diseases in Yunnan Province.

Disclosure of conflict of interest

None.

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