

Early Repair of Vesicovaginal Fistula

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2. Key words

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1. Abstract

1.1. Background: Vesicovaginal fistula is a common acquired fistula in obstetrics and gynecology. With the development of obstetric technology, the main cause of vesicovaginal fistula is benign gynecological operation. About 80% of vesicovaginal fistula the caused by abdominal hysterectomy. The treatment of vesicovaginal fistula is surgical repair, which can be done through abdominal (open or minimally invasive) and vaginal. It is usually wait 3-6 months for abdominal or vaginal repair to improve the success rate of surgical repair. However, early repair of vesicovaginal fistula is rare.

1.2. Objective: Our objective was to investigate the therapeutic effect of early repair of vesicovaginal fistula.

1.3. Study Design: A retrospective analysis was made of 14 cases who underwent repair of vesicovaginal fistula within 2 months after gynecological operation from January 2013 to April 2019. 13 cases underwent close suture of the fistula opening under laparoscope to increase the coverage of the omental wound. 1 case only underwent close suture of the fistula opening under laparoscope because of omental adhesion.

1.4. Results: During this retrospective analysis of 14 cases, we found that the operation time was 105-197 min, (146.2 ± 24.3) min; the bleeding volume was 80-120 ml, (102.9 ± 11.7) ml. 13 cases were repaired successfully, 1 case was only repaired by fistula and failed, the leakage of urine was repeated 5 days after the operation, and the second surgery was succeed 3 months later. 14 cases were followed up for 7-24 months, no recurrence of leakage and normal urination.

1.5. Conclusion: We found that the early repair of vesicovaginal fistula with omentum cover is effective.

3. Introduction

Vesicovaginal fistula is a common acquired fistula in obstetrics and gynecology. With the development of obstetric technology, the main cause of vesicovaginal fistula is benign gynecological operation. About 80% of vesicovaginal fistula the caused by abdominal hysterectomy [1]. The treatment of vesicovaginal fistula is surgical repair, which can be done through abdominal (open or minimally invasive) and vaginal [2-3].

For vesicovaginal fistulas, it is usually wait 3-6 months for abdominal or vaginal repair to improve the success rate of surgical repair [4]. From January 2013 to April 2019, we performed laparoscopic vesicovaginal fistula repair in 14 patients within 2 months after gynecological operation. Now we have a retrospective analysis to explore the methods and feasibility of early vesicovaginal fistula repair.

4. Clinical data and Methods

4.1 General Information

There were 14 cases in this group, aged 33-58 years old. Total hysterectomy was performed in 5 cases because of uterine fibroid and 5 cases because of adenomyosis and 3 cases because of endometrial polyps. 1 case had transvaginal cesarean scar pregnancy resection (the patient had two cesarean sections, in 2012 and 2016). Laparoscopic operation was performed in 8 cases and transabdominal operation in 6 cases. The leakage time was 4-23 days (13.6 ± 5.3 days). In physical examination, there was fluid outflow from the top of vagina, and in methylene blue test of bladder, there was blue staining of gauze in vagina. Cystoscopy was performed in all 14 patients. The fistula was located at the triangle or bottom of bladder, 0.5-3cm away from the ureteral opening. Two of the fistula were 0.5cm away from the ureteral opening. Double J pipes are placed in

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all cases. The time of vesicovaginal fistula repair was 6-46 days (26.9 ± 12.4) after uterine surgery.

4.2 Operation Method

The urinary catheter was placed before surgery and patients were in lithotomy position. The first trocar was placed on the upper edge of the umbilicus. Three auxiliary trocars were placed on the left lower abdomen, the right lower abdomen and the left side of the umbilicus. In the exploration of the pelvic cavity, the omentum and the intestinal adhered to the abdominal wall and the pelvic wall in varying degrees. The adhesions in pelvic cavity and abdominal cavity, the adhesions at the top of vagina and the retroflexure of bladder peritoneum were separated, and the bladder was exposed to the bottom of bladder. The bladder was perfused with 3ml methylene blue and deliquate with 400ml normal saline retrogradely through the urinary tube to confirm the size, position and quantity of the fistula, and then the methylene blue solution in the bladder was released. The adhesion between the posterior wall of the bladder and the vagina around the fistula was completely free (Figure 1 and Figure 2), and the necrotic tissue and scar around the fistula were cut off. 1 cm from the edge of the fistula, use "0" absorbable suture U-shaped intermittent and continuous suture twice (Figure 3). Once again, inject methylene blue solution into the bladder through the urinary tube, and confirm that there is no leakage of blue liquid (Figure 4). The greater omentum was cut off from the mesocolon along the avascular area, the greater omentum with vascular pedicle was fixed on the surface of the fistula, and the greater omentum was kept without tension (Figure 5). The coverage area of the greater omentum should be 2-3cm beyond the suture edge. The pelvic drainage tube was placed routinely after operation. Keep the catheter continuous opening for 2-3 weeks and pull it out after the routine urine test is normal. Antibiotics were given to prevent infection.



Figure 1: In laparoscopic surgery, bladder fistula was exposed.

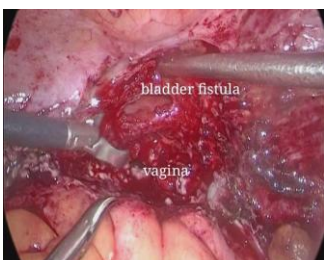


Figure 2: In laparoscopic surgery, bladder fistula and vagina were exposed.

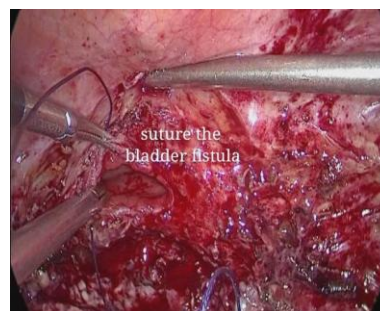


Figure 3: In laparoscopic surgery, use "0" absorbable suture the bladder fistula.

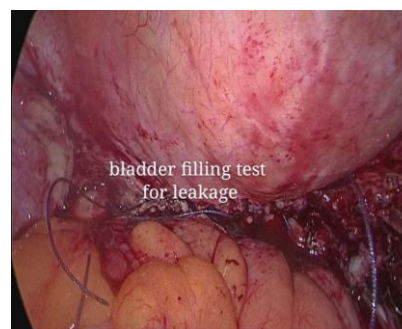


Figure 4: In laparoscopic surgery, inject methylene blue solution into the bladder through the urinary tube to confirm that there is no leakage of blue-liquid.



Figure 5: In laparoscopic surgery, the greater omentum was fixed on the surface of the fistula.

4.3 Clinical Efficacy Evaluation

All cases have postoperative follow-up one month and three months after the operation. The operation is successful if there was no leakage of urine in vagina and the urination was normal.

5. Results

One case did not cover the omentum due to omentum adhesion, and the other 13 cases were covered with the omentum in vesicovaginal fistula repair. The operation time was 105-197 min (146.2 ± 24.3 min). The amount of bleeding was 80-120 ml, (102.9 ± 11.7) ml. The size of the fistula was 5-20 min (13.2 ± 4.6 min). No serious complications such as intestinal injury, ureter injury and massive hemorrhage occurred during the operation. 5 cases had transient fever within 3 days after operation (< 38.5 °C). One case failed to repair the fistula without increasing the coverage of the omental wound, and the leakage of urine occurred again 5 days

after the operation. 3 months later, the patient was transferred to the urology department for the second repair and succeed; 13 cases were successfully repaired and the catheter was pulled out 2-3 weeks after the operation. 1 month after operation, the outpatient reexamination showed that there was no vaginal leakage, and the urination was normal. 14 cases were followed up for 7-24 months (median 16 months), no recurrence of leakage and the urination is normal. 7 patients complained of slight abdominal pain in outpatient reexamination one month after operation, and ultrasound showed heterogeneous mass in pelvic cavity. 4 cases had symptoms of frequent urination and urgency. The routine urination showed that the count of leukocytes and bacteria was increased. The diagnosis was urinary tract infection. Antibiotic anti infection therapy was used and cured.

6. Discussion

6.1 Method and Feasibility of Early Repair Of Vesicovaginal Fistula

The success of the vesicovaginal fistula repair depends on many factors, such as the size and location of the fistula, the time and reason of the vesicovaginal fistula, the severity of the symptoms, the quality of the surrounding tissue, clinical experience and surgical skills of the surgeon [5]. Vesicovaginal fistula surgery can be performed via vagina, abdomen or laparoscopy [6].

The traditional operation method of vesicovaginal fistula is to repair the fistula through abdomen or vagina 3 to 6 months after the fistula appears, when the inflammation and edema around the fistula subside, so as to improve the success rate of repair [4]. Pshak et al think that 6 weeks after the formation of the fistula is enough to reduce the inflammation and can be suitable for surgery. No matter for the primary or recurrent vesicovaginal fistula, it is not necessary to wait 6-8 weeks for surgery [7]. According to Zinman et al, early intervention of uncomplicated fistula does not affect success rate unless there are contraindications such as severe infection, acute pelvic inflammatory symptoms and radiotherapy-related fistula [8]. For ureteral fistula, early ureteral stent or surgical repair is advocated. With those concept of early surgical repair of vesicovaginal fistula, we performed laparoscopic repair of the vesicovaginal fistula with omentum coverage within 2 months. All of the 13 cases were successful. One case of laparoscopic repair of the fistula without omentum coverage failed. Therefore, it is feasible to repair the vesicovaginal fistula by laparoscopy in the early stage and cover it with the omentum.

6.2 The Effect of Omentum Cover in the Repair of Vesicovaginal Fistula

There are some reports on the laparoscopic repair of vesicovaginal fistula [9]. Tiong, HY et al. had use omentum cover the fistula during vesicovaginal fistula repair and succeed [10].

It has been reported that the omentum has the functions of absorption, secretion, encapsulation and adhesion, anti-inflammatory protection [11], which can control the spread of inflammation, promote the reconstruction of blood circulation, structural remodeling and tissue regeneration. Transposition of omentum has been successfully used in the treatment of infection, such as mediastinitis and chronic osteomyelitis of skull [12]. Using the characteristics of repair and wrapping of omentum, we fixed and covered the repaired fistula with omentum, so as to absorb the leakage around the fistula after repair, and successfully repair the vesicovaginal fistula when is still in the stage of inflammation and edema. Von Theobald et al. described the insertion of the omentum flap during laparoscopic repair of vesicovaginal fistula, which is a better alternative to traditional abdominal surgery [13].

6.3 Key Points to Early Vesicovaginal Fistula Repair

Tension free suture should be used in the early repair of vesicovaginal fistula is the key to the success repair [4]. However, in the early repair of fistula, the surrounding tissue was seriously edematous and could not be sutured without tension. We used tight suturing, that is, repeatedly and continuously or intermittently suturing the tissues around the fistulas, based on the fact that there was no leakage when filling the bladder, and then fixed and covered the repair site with the help of the omentum with vascular pedicle, and closed the fistulas with the characteristics of anti-inflammatory, wrapping and adhesion of the omentum. If only tight suturing was performed without covering the wound with omentum, even if there was no leakage at the time of leakage test, the leakage of urine would still occur after the inflammation and edema of the tissue at the mouth of the fistula subsided. In this group, one case of operation failure was sutured strictly, and leakage of urine occurred again 5 days after surgery. Therefore, the key to ensure the success of early fistula repair is to close suture and increase omentum coverage.

6.4 Advantages of Laparoscopic Repair

There is no standardized treatment for vesicovaginal fistula repair. Bodner Adler et al [14] have systematic review the repair of vesicovaginal fistula and show that the main surgery method is still vaginal repair (39%), and then open surgery (36%), laparoscopic repair (15%), combined abdominal and vaginal repair (3%). The success rate of endoscopic repair is 98.87%, while the vaginal and open repair is 93.82% and 97.05% respectively. There was no difference in the success rate. Laparoscopic repair has developed rapidly in the past 10 years. Tenggardjaja et al [15] believed that laparoscopic repair has the advantages of less pain, shorter hospital stay and recovery time than open surgery. We believe that laparoscopic repair has the characteristics of minimally invasive, less pain, fast recovery and good exposure of surgical field. Laparoscopic tissue is easy to separate, greater omentum is easy to obtain, and patients and their families are easy to accept.

6.5 Operation Skills

① Using "0" absorbable suture to sew continuously, with moderate tension, so as to avoid cutting edematous tissue. ② The needle should be inserted more than 1 cm from the edge of the fistula, and the suture should be done 2-3 times continuously, whichever is tight and no leakage. ③ Pay attention to the position of ureteral opening to avoid secondary injury during suturing. If the fistula is close to the ureteral opening, ureteral stent can be placed to prevent injury. ④ After suturing, 400 ml methylene blue solution was injected into the bladder through the catheter to test the leakage. If there is leakage, it can be sutured and reinforced at the leakage place. ⑤ A segment of the greater omentum with vascular pedicle was cut off, and the repaired fistula was sutured and covered. When the greater omentum was dragged to the fistula, there should be no tension, so as to avoid the avulsion of the greater omentum. The coverage of greater omentum should exceed the wound and all sutures, which is the key to the success of early repair. ⑥ The difficulty of laparoscopic operation is adhesion separation and microsurgical suture, which requires high professional skills and experience of the operator [15,16]. It is suggested that the operation should be performed by a doctor experienced in laparoscopic operation.

6.6 Surgical Complications

Harkki et al. [17] consider that if bladder injury was found during operation, laparoscopic repair was recommended immediately, but the success rate was only 35%. Bladder injury should wait for 3-6 months in other situation, because the tissues and organs are seriously edematous and conglutinated, and it is easy to have serious complications such as intestinal tube rupture during separation within 3 months. Theofanides et al. [2] reported that the incidence of complications after repair of vesicovaginal fistula was 15%, the most common was urinary tract infection (8%), other complications included blood transfusion (3%), superficial wound infection (2%), sepsis or septic shock (1.5%) and deep vein thrombosis (0.5%). However, early laparoscopic repair of vesicovaginal fistula has the following characteristics: ① most of the fistulas are located in the lowest position of the pelvic cavity, close to the top of the vagina or the back wall of the bladder, far away from the small intestinal activity area and rectum, the occurrence of adhesion between the intestine and the fistulas is rare, which can avoid the damage of the intestine. ② Although the adhesion of the pelvic cavity is serious, it is easy to separate under laparoscopy. In this group, 13 cases had no serious complications such as intestinal injury, ureter injury and massive hemorrhage. 5 cases had transient fever within 3 days after operation ($< 38.5^{\circ}\text{C}$). 7 cases had slight abdominal pain, and heterogeneous was found by ultrasound in pelvis, which was omentum around the fistula, which need no special treatment. In conclusion, laparoscopic repair of vesicovaginal fistula with omentum coverage in the early stage has a high success rate and

few complications, which is of great significance to improve the quality of life of patients. However, this study is a retrospective study, and the sample size is small, which needs to be verified by large-scale comparative study.

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