Experiences with an Extraperitoneal Transvesicoscopic Repair of a Vesicovaginal Fistula

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Purpose: A vesicovaginal fistula (VVF) is a debilitating condition for women in terms of both its personal and social impacts. A reported transperitoneal laparoscopic approach to treatment has some limitations such as risk of intra-peritoneal organ injury and unnecessary bladder dissection. We here report on our experiences with an extra-peritoneal transvesicoscopic approach to a VVF repair, which overcomes these drawbacks.

Materials and Methods: Seven VVF patients were treated using the transvesicoscopic approach. Under general anesthesia, patients were placed in the dorsal lithotomy position. The VVF orifice was obstructed via the vaginal canal using a Foley catheter. The bladder was then filled with normal saline under cystoscopic inspection, and a 5 mm trocar was inserted into it at the suprapubic area. The bladder wall was next fixed to the anterior abdominal wall. Thereafter, two 3 mm ports were punctured at the interspinous skin crease allowing the fistula margin to be cut and sutured in layers.

Results: Six of the study subjects in whom we attempted a transvesicoscopic repair of VVF had undergone a hysterectomy due to myoma and one had an intraabdominal abscess removal with Behcet's disease. One myoma patient who had a preexisting vesicoperitoneal fistula was converted to an open transabdominal VVF repair. The mean age of the 6 remaining patients was 46.0 ± 7.2 years (range, 35-57). The mean operation time was 273 ± 40.6 minutes (range, 223-323). There was no instances of significant pain or other immediate complications. Five patients showed no recurrence of the fistula during the follow-up period (8.7 ± 5.1 months).

Conclusion: A transvesicoscopic approach is an effective modality for the repair of a VVF that is more minimally invasive and has a lower morbidity than a transabdominal procedure.

Keywords: vesicovaginal fistula; laparoscopy; extraperitoneal transvesical approach

INTRODUCTION

A vesicovaginal fistula (VVF) is one of the most frequent urinary fistulas with a long history of occurrence in women.[1] Hiton reported that the annual incidence of VVFs has now approached 500,000 worldwide.[2] VVF is a debilitating condition both before and after treatment that commonly causes wet soiling of clothes, bad odors, and a mistaken diagnosis venereal disease.[3] Sexual intercourse is usually avoided by affected women, which can lead to marital problems and divorce if the condition is untreated.[3] After VVF repair, however, these women sometimes experience gynatresia and dyspareunia due to the severity of the damage and subsequent fibrosis.[4] In addition, the first VVF repair attempt is very important because successive attempts have an increased failure rate.[5] Repeated surgical treatments can also cause more tissue damage and fibrosis. This in turn also results in lower success rates and possible difficulties in sexual relationships. Effective methods of treating a VVF that minimize tissue manipulation are therefore needed.

Transvaginal or transabdominal approaches have been the traditional interventions for VVFs. The benefits of a transvaginal approach include a shorter hospital stay, avoidance of an indwelling cystostomy catheter, a lower rate of blood loss.[6] These methods also have better cosmetic outcomes than a transabdominal approach. However, a transvaginal approach becomes difficult if the fistula is located in the vaginal vault. The transabdominal approach can be performed when the transvaginal approach is not deemed possible due to characteristics such as highly located fistulas, more complicated fistulas, an immobile vaginal vault, and instances where a combined surgery is needed.[7] Nonetheless, a large abdominal incision, an invasion of the peritoneal space, and an opening the bladder is required for these procedures and this necessarily increases the morbidity and the recovery time.

To overcome these disadvantages of transabdominal surgeries for VVF repair, a laparoscopic method has been introduced. The laparoscopic transperitoneal supravesical approach is a far more minimally invasive technique but has some of the same disadvantages as the transabdominal approach such as intra-abdominal organ injury risk. Several years ago, our hospital has been conducting a transvesicoscopic approach in Cohen operations for pediatric vesicoureteral reflux surgery.

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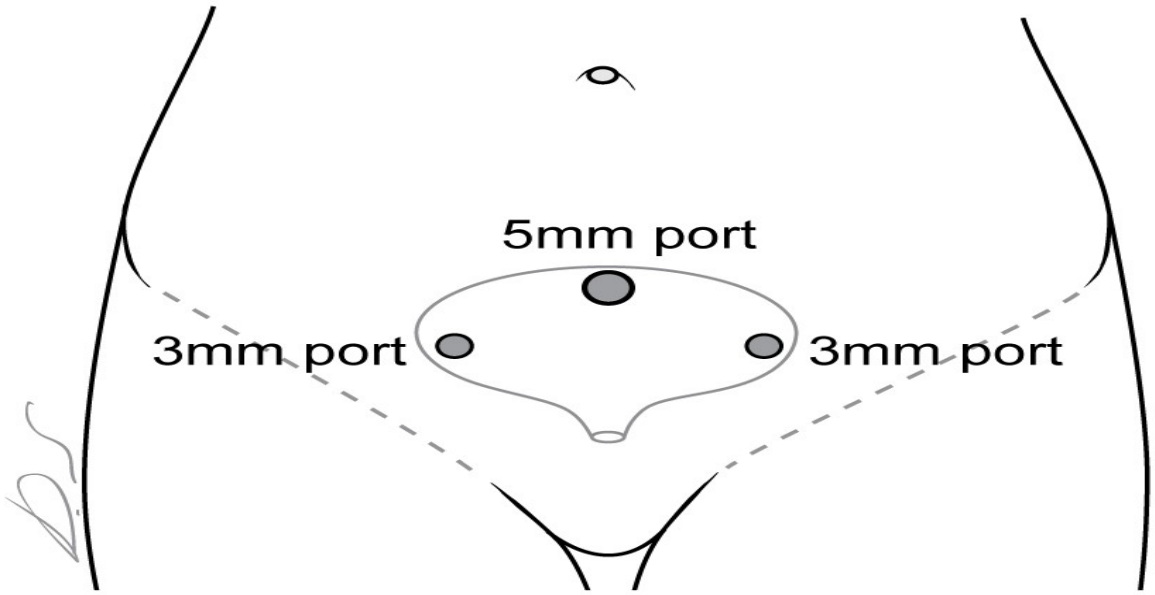

Figure 1. Abdominal marks at the trocar insertion sites. An imaginary bladder line was drawn by filling the bladder with normal saline.

This procedure retains some the advantages of both the transvesical and laparoscopic methods such as minimal invasion and requires no violation of the peritoneal space or opening of the bladder. We have applied the transvesicoscopic approach to VVF repair.

Nowadays, robot-assisted laparoscopic VVF repair is performed and has many advantages. However, it is still difficult to perform widely due to relatively long operation time and high cost. Therefore, we think that the transvesicoscopic approach to VVF repair, which we previously conducted, can be an alternative. We herein outline our experiences with this in a small cohort.

MATERIALS AND METHODS

Patients

A total of seven VVF patients were treated at our hospital with the transvesicoscopic approach between April 2010 and September 2011 in our hospital. Informed consent to participate in this study was received from all patients. Six cases of VVF in this group occurred within

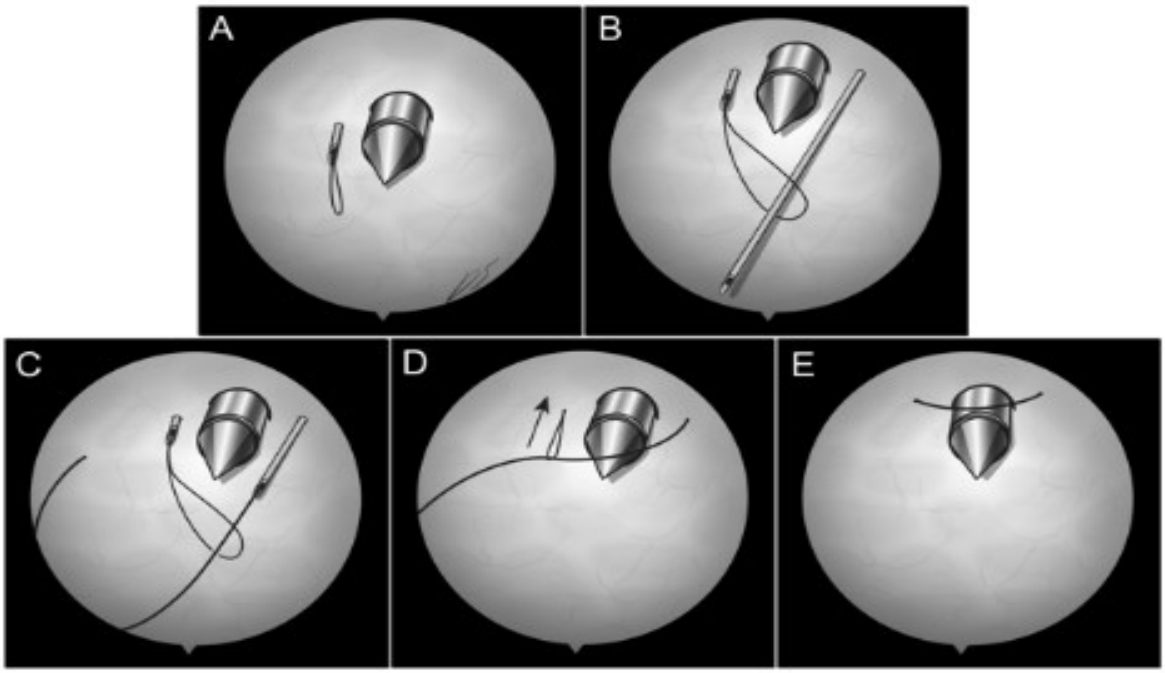

Figure 2. Transvesicoscopic Port insertion and fixation

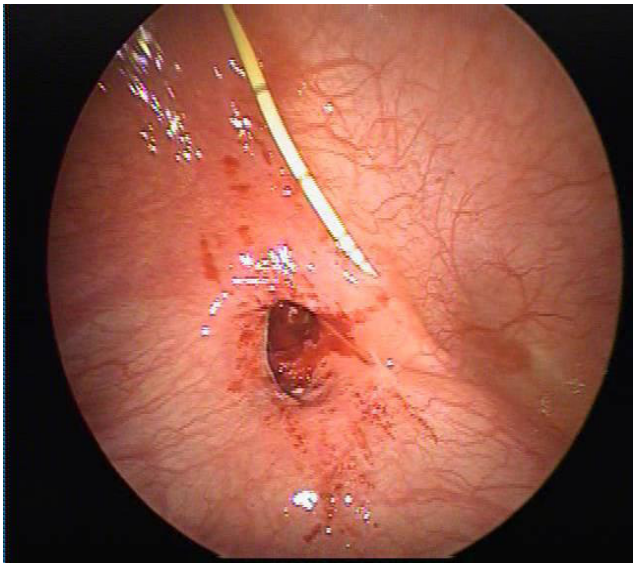

Figure 3. Transvesicoscopic view of a VVF after removing the obstructive Foley catheter.

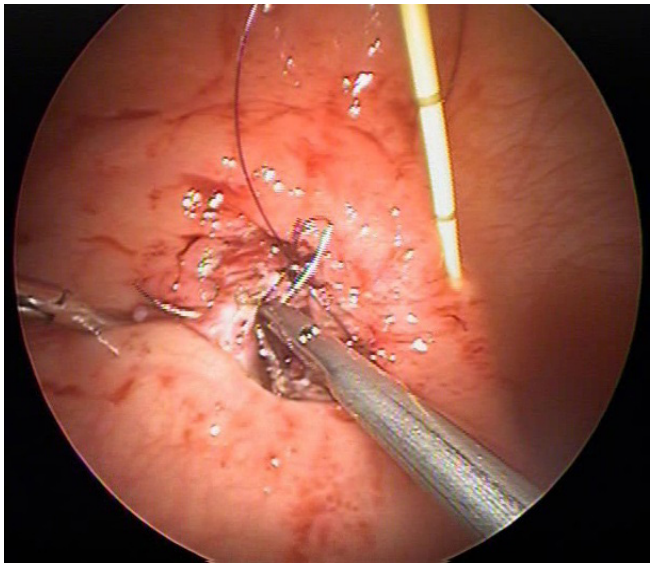

Figure 5. The fistula tract was closed layer by layer.

one month (0.25~1) of a hysterectomy (4 LAVH and 2 TAH) due to a uterine myoma. The remaining patient had had Behcet's disease and underwent an exploratory laparotomy due to a spontaneous bowel perforation. The fistula occurred 2 months after the repair of this perforation. Conservative treatment had been unsuccessfully attempted in all of our current study patients. One of these cases (TAH) had undergone a transvaginal surgical treatment for VVF prior to the transvesicoscopic repair. Baseline evaluations were performed in all seven subjects including medical histories, physical examinations, pelvic examinations, and cystoscopy.

Following Institutional Review Board approval (4-2011-0734), we retrospectively analyzed the clinical utility of an extraperitoneal transvesicoscopic repair of a VVF. All operations were performed by the same surgeon.

Set-up and surgical technique

Under general anesthesia, patients were placed in the modified lithotomy position with abducted thighs. The surgeon stood on the right side of the patient. Video monitors were positioned on the left side of the patient. The camera was located on the right side of the doctor. Prior to the VVF repair, all patients underwent repeat cystoscopic examinations with normal saline to determine the location and size of the fistula. A 5 Fr open-end catheter was inserted into the ureter through the urethra to evacuate any urine to an extravesical urine bag. This also prevented filling of the bladder and allowed for easy identification of any ureteral injury. The VVF tract was occluded using a Foley catheter passed

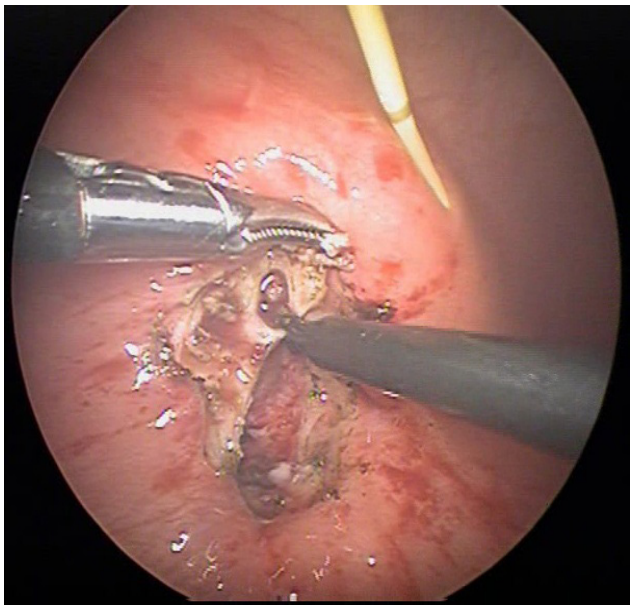

Figure 4. Circular dissection of the fistula margin.

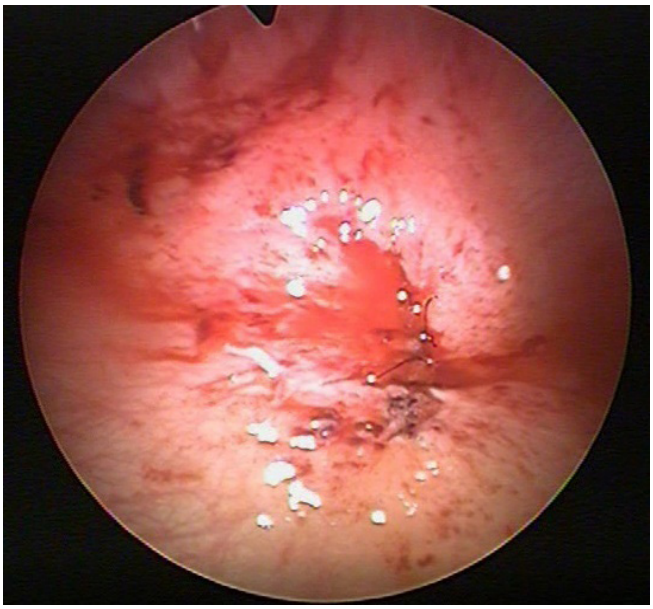

Figure 6. After closing the bladder.

through the vaginal canal, and the bladder was then filled with normal saline.

Transvesicoscopic port insertion and fixation

A small midline skin incision was made midway between the umbilicus and symphysis pubis, and a 5 mm diameter trocar was then introduced into the bladder under cystoscopic inspection (**Figure 1**).[8] The anterior bladder wall was next fixed to the anterior abdominal wall and a 17-gauge needle was inserted beside the camera port and passed into the bladder. A loop was then made inside the bladder. A 21-gauge spinal needle was next inserted into the bladder on the opposite side of the camera port and passed into the loop. A 3-0 suture was then inserted into the loop through the 21-gauge spinal needle. This suture was trapped by the loop in the bladder and extracted outside the skin by pulling the loop upward. The suture was tied at the site of abdomen incision for fixation (**Figure 2**). After the saline was drained, CO_2 gas was instilled into the bladder. Pneumovesicum of 10 mmHg was then commenced at a flow of 2L/min and a vesicoscope was inserted via the 5 mm diameter trocar. Two additional lateral trocars (3 mm) were next introduced under vesicoscopic vision (or cystoscopic vision) through the anterolateral wall of the bladder along the interspinous skin crease (**Figure 1**). The transvaginal occlusive Foley catheter was removed (**Figure 3**) and the vagina was packed with Betadine gauze to prevent any gas leakage. Alternatively, the vaginal introitus was occluded with a water-filled glove, if the Betadine gauze occlusion was incomplete.

Vesicoscopic fistulectomy and suture

Under vesicoscopic vision, the fistula margin was cut circumferentially with a electrocautery hook (**Figure 4**). The vaginal wall and detrusor muscle layer were then sutured separately in layers using an absorbable 4-0 synthetic absorbable monofilament surgical suture in an interrupted manner (**Figure 5**). There is no more gas leakage after the bladder muscle layer is closed. Consequently, no more vaginal packing is then needed. The bladder mucosa was closed using interrupted sutures with an absorbable 4-0 synthetic monofilament surgical suture (**Figure 6**).

Wound closure

A suprapubic cystostomy catheter was placed through the 5 mm trocar site which was removed 2-3weeks after surgery in all cases except the prior VVF repair patient (4 weeks). The 3 mm trocar sites were closed with subcutaneous sutures. A urethral Foley catheter was also inserted at the end of the surgery and removed the next day.

Follow-up

In the follow-up period, all patients underwent a pelvic examination and cystoscopic evaluation to confirm the VVF healing state. A telephone interview was used to check the status of each patient's sexual relationship and dyspareunia. Responses were taken during these interviews using the Korean Version of the Female Sexual Function Index (FSFI) questionnaire and the International Consultation on Incontinence modular questionnaire (ICIQ) for incontinence, respectively.

RESULTS

Transvesicoscopic repair of a VVF was attempted in seven women at our hospital. One patient required conversion to an open laparotomy due to a small sizes concomitant vesicoperitoneal fistula found incidentally at the start of the surgery and because persistent CO2 gas leakage prevented pneumovesicum from being achieved. She had no abdominal pain, abdominal distention and other related symptoms. The mean age of the remaining six patients was 46.0 ± 7.2 years (range, 35-57). The interval between fistula occurrence and VVF repair was 10.8± 18.2 months (range, 2-48 months).

The sizes of the fistulas ranged from about 0.5-2.0 cm. The fistulas were located superior to the trigone with a narrow vagina in all of the study cases.[9] Blood loss was minimal in all patients (< 50 ml) and the operation time ranged from 223-323 minutes (273 ± 40.6). In the immediate postoperative period, no patient noted any pain above a minimal level and none developed any obvious complications. Oral intake was commenced on post-operative days 1-2 in all six study subjects, and the hospital stays for these cases ranged from 1-6 days (4 ± 1.7days). Five patients did not show fistula recurrence by vaginal examination and cystoscopy during the mean follow-up period of 12.5 ± 8.1 months (range, 2.5-19). The Behcet's disease patient who had a history of spontaneous small bowel perforation developed a new fistula about 1 cm away from the right side of the original repair site at one-month post-surgery. She had been on immunosuppressive medication due to the Behcet's disease and died of an intra-abdominal abscess that occurred 4 months later. The remaining five patients reported a comparable sex life that prior to the VVF occurrence. One patient was a follow-up loss at 19 months but had reported no incontinence or dyspareunia up to that point. The remaining four patients conducted incontinence and sexual relationship surveys by telephone at a follow-up of 36.25 ± 9.0 months (range, 27-40). With regard to the incontinence questions, Q1 and Q2 on the ICIQ questionnaire had a response of 0 (no leakage). With regard to sexual satisfaction queries, the responses to FSFI Q16 were all 'About equally satisfied and dissatisfied'. With regard to dyspareunia, the response to Q19 were all 'Very low or none at all'. All of these women were satisfied with their operation results. The surgical scars were too small to find out about in the last follow-up.

DISCUSSION

Our approach to VVF repair showed good surgical results except for patients with underlying disease during follow-up despite the need to overcome technical difficulties and long surgical times.

There are different options for the treatment of VVF. One approach is conservative therapy, which consists of an indwelling catheter and anticholinergic medication for at least 2 to 3 weeks, and may be used for small, newly developed VVFs.[7] Surgical therapy is the most popular treatment and several procedures have been described. A transvaginal approach has been reported in numerous studies to date. Almost all VVFs can be approached transvaginally.[6,10] The benefits of this method are its relative simplicity, shorter operating times, lower blood loss, and typically shorter hospital stay.[6] An ease of accessibility and decreased postoperative pain relative to abdominal surgery are also advantages of this option. In addition, a transvaginal approach avoids the

need for a laparotomy and its associated complications such as intraperitoneal organ injury, prolonged ileus, and a need for drainage. However, it is especially difficult to perform this type of surgery for VVF when the fistula is in a deep location in the vagina.

Another surgical option for VVF is a transabdominal approach, which can be conducted in two different ways. One option is an extraperitoneal transvesical approach, and the other is a transperitoneal supravesical method. The extraperitoneal transvesical approach also avoids laparotomy-related complications but is nonetheless restricted due to narrow spaces. Furthermore, it is nearly impossible to perform an interpositional flap placement between the bladder and vagina.[11,12] Accordingly, many surgeons prefer the transperitoneal supravesical methods.[6] The benefits of the transperitoneal supravesical approach include the accessibility of high or retracted fistulas in narrow vaginas, the possibility of ureteral reimplantation, a correctable concomitant pelvic pathology, and applicability to multiple, large fistulas or prior failed attempts.[13] In addition, it can be used for either interpositional omental flap or peritoneal flap placement. Of note however, the transperitoneal supravesical approach requires a longer recovery time, is more painful, and is associated with an increased intraperitoneal organ injury risk and larger abdominal scarring compared to the transvaginal approach.

To overcome the limits of the transperitoneal supravesical approach, a number of more minimally invasive procedures have been developed. A laparoscopic transperitoneal supravesical VVF repair was first described in 1994.[14] The benefits of laparoscopic repair are the ability to magnify the surgical field during the procedure, hemostasis, decreased abdominal pain, and a shorter hospital stay with a more rapid recovery and an earlier return to work. Sotelo et al[15] contended that the laparoscopic approach was an excellent alternative to the traditional open abdominal approach. Nevertheless, the laparoscopic transperitoneal supravesical approach has issues such as risk of bowel injury, bowel ileus, and a requirement for indwelling drainage.

The laparoscopic extraperitoneal transvesical approach can overcome the abovementioned disadvantages of a laparotomy in relation to intraperitoneal organ complications. This approach has been applied to bladder stone removal, ureteral reimplantation, and prostatectomy.[16-19] It has the laparoscopic advantages of a clear vision directly over the VVF, easy accessibility between the fistula and both ureteral orifices, the possibility of conducting simultaneous re-implantation of the ureter, no related intraabdominal organ complications, and improved cosmesis. We chose this surgical method for our current VVF cohort for these reasons. Postoperative scarring from the laparoscopic extraperitoneal transvesical VVF repair was small, such as external skin wounds, because it is a minimally invasive technique and has reduced tissue manipulation. At the follow-up cystoscopic inspection in our present patient series, intravesical postoperative scarring was low and was limited to only the suture line. As previously mentioned, the outcome of the first VVF repair attempt is important because successive attempts have an increasing rate of failure due to tissue damage and subsequent fibrosis. A laparoscopic extraperitoneal transvesical surgery reduces the degree of tissue manipulation and thus lowers the risk of damage. This in turn improves tissue healing and reduces the occurrence of tissue fibrosis, leading to an improved success rate.

In our current results, all patients who had long term follow-ups were satisfied with the outcomes of the surgery. Sexual satisfaction was reported by only half of these women, although Eastern customs where it is considered taboo to talk about sex likely contributed to this as responses to these questions were not given by all of these patients.

The laparoscopic extraperitoneal transvesical approach to a VVF repair is not without limitations, which must be considered. First, the narrow working space will be less convenient for the surgeon in comparison to the open transperitoneal supravesical approach. Nerli et al have also reported on the use of this method for the treatment of VVF.[20] Although these authors used a 5 mm working port and instrument, they had technical difficulties at first. In our experience, the use of pediatric laparoscopic instruments could overcome this limitation because of their shorter lengths and greater ease of movement which will allow for a wider working angle. We have had an experience ourselves with adult sized 5 mm working ports and instruments for VVF repair in another hospital. The movement of this larger and longer working element in the small bladder area created difficulties with tissue manipulation and suturing. A longer operation time was also needed. A second limitation of extraperitoneal transvesical VVF repair was the longer operation time compared to the open transperitoneal supravesical approach.[21,22] This ranged from 223-323 minutes in our present cohort but did gradually decrease over subsequent surgeries. Greater experience with a given technique and the instruments involved would be expected to reduce the duration of the surgeries over time. A third drawback of this approach was that our methods did not allow an interpositional omental flap or peritoneal flap placement. Our approach would therefore not be suitable in cases needing an interpositional flap, such as patients with an irradiated fistula, large fistula, prior obstetric surgery, previous failed repairs, or a weakly repaired fistula. However, the causes of the VVF in our current patients were gynecologic and this concern did not apply.

Our present study had the following limitations of note. First, it was a retrospective study with a small sample size. Second, a pediatric instrument was used instead of the widely used adult laparoscopic instrument. Third, the follow-up period was short. Finally, the survey results in relation to sexual satisfaction post-surgery were incomplete, likely due to cultural embarrassment. Notwithstanding these issues however, with improved experience by the participating surgeons and the development of better instruments in the future, the current limitations of an extraperitoneal transvesical repair of a VVF could be significantly overcome in the near future. It will likely then become a more popular early procedure for VVF repair.

CONCLUSIONS

A laparoscopic extraperitoneal transvesicoscopic approach to a VVF repair may be one of the more effective and less invasive modality than transabdominal interventions. This procedure can potentially become the treatment of choice for an early supratrigonal VVF repair.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest in relation to this study.

REFERENCES

1. Wong, C., P.N. Lam, and V.R. Lucente, Laparoscopic transabdominal transvesical vesicovaginal fistula repair. J Endourol, 2006. 20: p. 240-3; discussion 243.
2. Hilton, P., Vesico-vaginal fistulas in developing countries. Int J Gynaecol Obstet, 2003. 82: p. 285-95.
3. Ahmed, S. and S.A. Holtz, Social and economic consequences of obstetric fistula: life changed forever? Int J Gynaecol Obstet, 2007. 99 Suppl 1: p. S10-5.
4. De Ridder, D., Vesicovaginal fistula: a major healthcare problem. Curr Opin Urol, 2009. 19: p. 358-61.
5. Hilton, P. and A. Ward, Epidemiological and surgical aspects of urogenital fistulae: a review of 25 years' experience in southeast Nigeria. Int Urogynecol J Pelvic Floor Dysfunct, 1998. 9: p. 189-94.
6. Gerber, G.S. and H.W. Schoenberg, Female urinary tract fistulas. J Urol, 1993. 149: p. 229-36.
7. Campbell, M.F., A.J. Wein, and L.R. Kavoussi, Campbell-Walsh urology / editor-in-chief, Alan J. Wein ; editors, Louis R. Kavoussi ... [et al.], ed. E.S. Rovner. 2007, Philadelphia: W.B. Saunders.
8. Chung, M.S., et al., Transvesicoscopic ureteral reimplantation in children with bilateral vesicoureteral reflux: surgical technique and results. J Laparoendosc Adv Surg Tech A, 2012. 22: p. 295-300.
9. Pendergrass, P.B., et al., Comparison of vaginal shapes in Afro-American, caucasian and hispanic women as seen with vinyl polysiloxane casting. Gynecol Obstet Invest, 2000. 50: p. 54-9.
10. Lee, D. and P. Zimmern, Vaginal Approach to Vesicovaginal Fistula. Urol Clin North Am, 2019. 46: p. 123-133.
11. Angioli, R., et al., Guidelines of how to manage vesicovaginal fistula. Crit Rev Oncol Hematol, 2003. 48: p. 295-304.
12. Mellano, E.M. and C.M. Tarnay, Management of genitourinary fistula. Curr Opin Obstet Gynecol, 2014. 26: p. 415-23.
13. Lee Ra Fau - Symmonds, R.E., T.J. Symmonds Re Fau - Williams, and T.J. Williams, Current status of genitourinary fistula. Obstet Gynecol, 1988. 72: p. 313-9.
14. Nezhat, C.H., et al., Laparoscopic repair of a vesicovaginal fistula: a case report. Obstet Gynecol, 1994. 83: p. 899-901.
15. Sotelo, R., et al., Laparoscopic repair of vesicovaginal fistula. J Urol, 2005. 173: p. 1615-8.
16. Yeung Ck Fau - Sihoe, J.D.Y., P.A. Sihoe Jd Fau - Borzi, and P.A. Borzi, Endoscopic cross-trigonal ureteral reimplantation under carbon dioxide bladder insufflation: a novel technique. (0892-7790 (Print)).
17. Elbahnasy Am Fau - Farhat, Y.A., et al., Percutaneous cystolithotripsy using self-retaining laparoscopic trocar for management of large bladder stones. (1557-900X (Electronic)).
18. Desai Mm Fau - Fareed, K., et al., Single-port transvesical enucleation of the prostate: a clinical report of 34 cases. (1464-410X (Electronic)).
19. Miklos, J.R., R.D. Moore, and O. Chinthakanan, Laparoscopic and Robotic-assisted Vesicovaginal Fistula Repair: A Systematic Review of the Literature. J Minim Invasive Gynecol, 2015. 22: p. 727-36.
20. Nerli, R.B. and M. Reddy, Transvesicoscopic repair of vesicovaginal fistula. Diagn Ther Endosc, 2010. 2010: p. 760348.
21. Gupta Np Fau - Mishra, S., et al., Comparative analysis of outcome between open and robotic surgical repair of recurrent supra-trigonal vesico-vaginal fistula. J Endourol, 2010. 24: p. 1779-82.
22. Ramphal, S.R., Laparoscopic approach to vesicovaginal fistulae. Best Pract Res Clin Obstet Gynaecol, 2019. 54: p. 49-60.