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ORIGINAL ARTICLE

Laparoscopic Vesicovaginal Fistula Repair with Limited Cystotomy: A Rewarding Treatment Option

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Bastab Ghosh after completion of Mch. Urology from prestigious J.I.P.M.E.R., Puducherry, joined as Assistant professor at Department of Urology, I.P.G.M.E.R., Kolkata, India. His main interests include Endourology and Laparoscopic surgery. He is also specially interested in management of urogynecologic fistulas. He has performed many ureterovaginal fistula and vesicovaginal fistula repairs by means of laparoscopic technique.

Abstract

Introduction Vesicovaginal fistula (VVF) is the most common type of urogenital fistula. Gynecologic surgery is the most common cause associated with it. Laparoscopic approach for VVF repair gives the benefit of minimally invasive surgery with principles similar to open transabdominal approach.

Materials and Methods We retrospectively reviewed data of 13 patients who underwent laparoscopic vesicovaginal repair at our department from December 2012 to December 2014. Transperitoneal transvesical laparoscopic vesicovaginal repair using 4 ports was performed in all cases. Small cystotomy was performed instead of classical bivalving of the bladder. In most of the cases, the sigmoid epiploic appendix was used for augmentation. Per urethral catheter was kept for 10 days.

Results In all patients, the procedure was successfully completed. Repairs were performed between 8 and 28 weeks (mean 15.8 ± 5.7) following the injury. All fistulas were at supratrigonal region. Fistula size ranged from 1 to 3.5 cm (mean 2.2 ± 0.9). Mean operative time was 157 ± 29.8 min (range 110–210), and estimated blood loss was 73.8 ± 18.2 ml (range 45–110). Average hospital stay was 4.6 days. In the postoperative period, three patients had urinary tract infection, which was treated with oral antibiotics. Apart from these, no major complications were seen. Follow-up time ranged from 4 to 27 months (mean 15.7). During the follow-up, no patient had recurrence or voiding symptoms.

Conclusions Laparoscopic transabdominal transvesical VVF repair with limited cystotomy and sigmoid epiploic

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appendix flap coverage can be performed safely with short operative time, good success rate, less morbidity, and quick convalescence.

Keywords Fistula · Laparoscopic · Vesicovaginal · VVF

Introduction

Vesicovaginal fistula (VVF) is the most common type of urogenital fistula. Gynecologic surgery is the most common cause associated with it [1, 2]. In developed countries, VVF mostly occurs due to iatrogenic injury secondary to gynecologic surgery, of which hysterectomy is the leading cause. Recently reported rate of VVF during hysterectomy is 1 in 788 [3–5]. In developing countries, poor obstetric care is the leading cause of VVF [2, 6]. The majority of low-lying VVF can be repaired through transvaginal route. The abdominal route is indicated for multiple fistulas, supratrigonal fistulas, associated ureterovaginal fistula, small capacity bladder which requires augmentation, multiple failed transvaginal repairs, and less capacious vagina [7, 8]. The laparoscopic approach gives the benefit of minimally invasive surgery with principles similar to open transabdominal approach. Here, we present our experience of laparoscopic VVF repair by transabdominal route.

Materials and Methods

After clearance by the Institute's Review Board, we retrospectively reviewed the data of patients who underwent VVF repair in our department from December 2012 to December 2014. Data analysis of 13 patients who underwent laparoscopic vesicovaginal fistula repair in this period was done. In all cases, gynecologic surgery was the cause of the VVF. Out of 13 patients, six had laparoscopic hysterectomy; four had open abdominal hysterectomy for benign diseases of uterus unrelated to pregnancy; two cases had lower segment Cesarean section (LSCS); and one patient had emergency open hysterectomy for ruptured uterus due to obstructed labor. Patients were referred to our institute between 8 and 28 weeks following the gynecologic surgery which caused the VVF. Workup of the patients included a thorough history, physical examination, and pelvic examination with per speculum examination of the vagina. Radiological imaging included intravenous urography (IVU) (Fig. 1a, b). Retrograde pyelography was done in selected cases where concomitant ureteral injury is suspected on IVU. Cystoscopy and vaginoscopy were performed to characterize the site, size, number of the fistula, and the feasibility of transvaginal repair if possible (Fig. 1c).

All cases underwent surgery with similar surgical steps. Under general anesthesia, patient was first placed in lithotomy position. Cystoscopy was done, and ureteric catheters were placed bilaterally. A different colored ureteric catheter/guidewire was placed in the fistulous tract from the bladder into the vagina for easy identification of fistula after cystotomy. 20 F Foley's catheter was inserted, and both ureteric catheters were secured to it. Vagina was packed with vaseline-soaked gauze to prevent leakage during bladder filling and escape of CO_2 after cystotomy. The patient was then placed in supine position with 15°–30° Trendelenburg tilt. Initial 10-mm trocar was placed at infraumbilical site by open method. Two working ports, 10 mm at right iliac fossa and 5 mm at left iliac fossa over the spino-umbilical line were placed under vision after establishing pneumoperitoneum. Another 5-mm trocar was placed in lower abdomen according to the requirement. After adhesiolysis, the bladder was filled with about 100–150 ml saline to see the bladder outline. Near the midline, a limited cystotomy of about 2 cm was performed just above the vaginal vault, which was identified by the adhering bowel loop to the vault or reflection of rectosigmoid (Fig. 1d). The above technique helped in limiting the cystotomy size from the classical description given by O'Connor. The fistula was then identified by the different colored ureteric catheter/guidewire (Fig. 2a). The cystotomy was then extended up to the fistula. Two patients had a double fistula, which were incised and joined to from a single opening and repaired as a single fistula (Fig. 2b). A plane was created between bladder and vagina for about 1–1.5 cm all around the fistulous opening (Fig. 3a). Edges of the fistula were not excised. Vaginal opening was repaired with 2-0 polyglactin suture in a single-layer continuous manner placing the suture line horizontally (Fig. 3b). We augmented the repair with either omentum or epiploical appendix of sigmoid colon (Fig. 4a) according to availability except two cases where fistulae were small. Cystotomy was closed with 2-0 polyglactin suture in a single layer continuous manner in vertical orientation to get a nonoverlapping suture line with respect to vaginal suture line (Fig. 4b). The bladder was filled with about 250 ml of saline mixed with methylene blue to assess a watertight repair. Interrupted sutures with 2-0 polyglactin suture were taken according to necessity where a leak was identified. An 18 F Ryle's tube was kept in the pelvis as a drain. No suprapubic cystostomy was used. The 10 mm trocar sites were closed with 2-0 polyglactin suture. Patients were mobilized and oral liquids were allowed at the evening of the surgery according to tolerance. Oral anticholinergics were given till removal of the Foley's catheter. Ureteral catheters were removed 48 h after surgery. Then drain was removed once the output was below 50 ml/day. Patients were discharged after removal of the drain. Per urethral catheter was removed on the 10th postoperative day following cystogram, if there was no suspicion

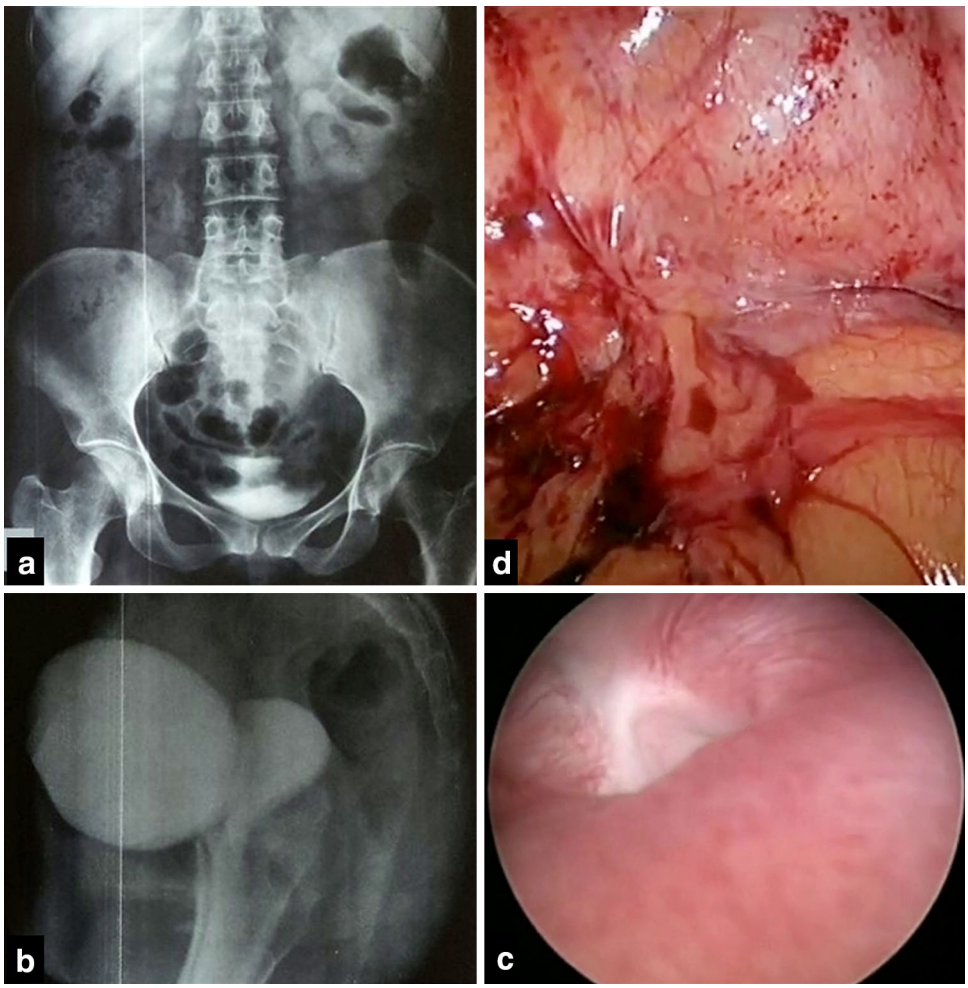

Fig. 1 **a** IVU showing cup-in-saucer appearance in VVF. **b** Contrast in both bladder and vagina (IVU lateral view). **c** Cystoscopy showing VVF. **d** Bowel loops adhering to vaginal vault

of leakage. Complications were recorded according to Clavien–Dindo grading system for the classification of surgical complications [9]. All cases were advised to abstain from sexual intercourse for 2 months following surgery.

Results

In all patients, the procedure was successfully completed. Repairs were performed between 8 and 28 weeks (mean 15.8 ± 5.7) following the injury. All fistulas were at supratrigonal region (Table 1). Fistula size ranged from 1 to 3.5 cm (mean 2.2 ± 0.9). Mean age was 37 years (range 25–48); BMI was 27.2 ± 3.5 kg/m^2 (range 21.2–33.5). Mean operative time was 157 ± 29.8 min (range 110–210) and estimated blood loss was 73.8 ± 18.2 ml (range 45–110). Mean requirement of diclofenac sodium was 261.5 ± 76.8 mg for postoperative pain control. Average hospital stay was 4.6 days. In the postoperative period, three patients had urinary tract infection after catheter removal which was treated with a course of oral antibiotic (Grade-II, Clavien–Dindo system). Apart from these, no major complications were seen. Follow-up time ranges from 4 to 27 months (mean 15.7). During follow-up, no patient had recurrence or voiding symptoms (Table 1).

Discussion

In developing countries, although obstructed labor is the leading cause of urogenital fistula, iatrogenic injury during gynecologic surgeries still accounts for a major portion of urogenital fistulas [1, 2]. One in every 1800 hysterectomies accounts for urogenital fistula [6]. The overall incidence of urinary tract injury in pelvic surgery is 0.33 %. The most common type of urinary tract injury is bladder injury. Possible predisposing factors are coexisting pelvic adhesion, distortion of normal pelvic anatomy, previous irradiation history, previous operation history, and the extent of surgery [10]. A study in the United Kingdom showed a 0.12 % incidence of vesicovaginal fistula following all types of hysterectomy. The highest incidence occurred

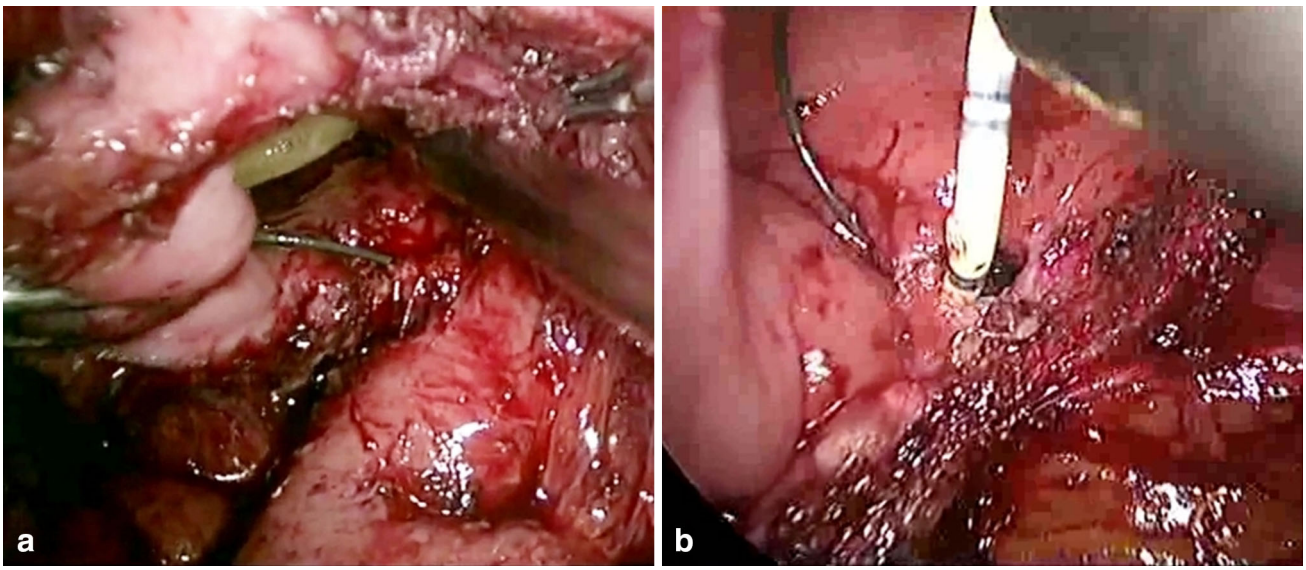

Fig. 2 **a** Single fistula. **b** Double fistula

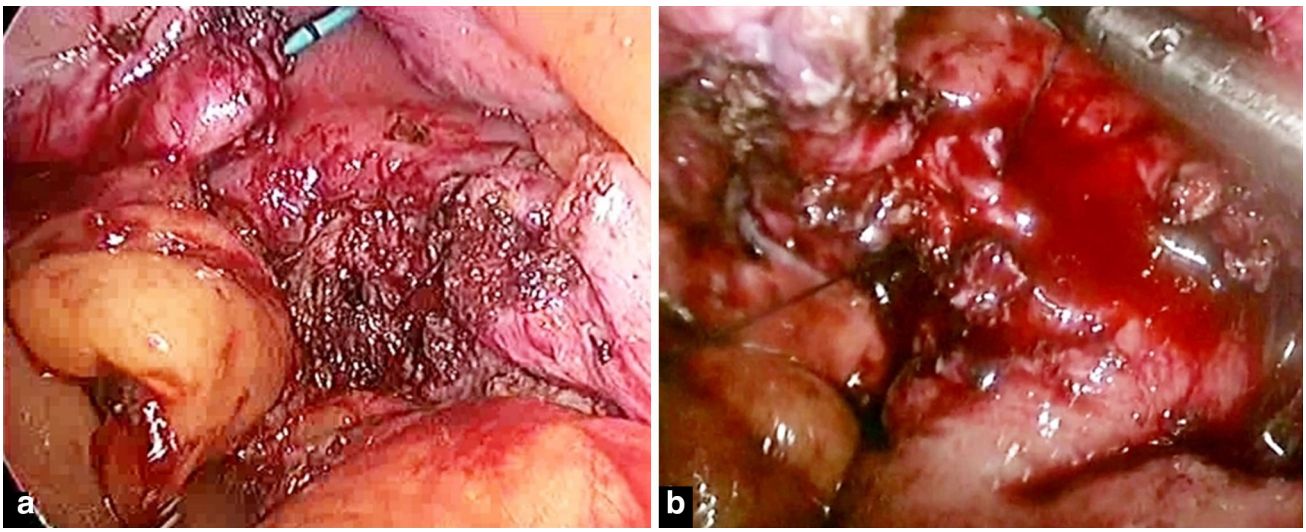

Fig. 3 **a** Bladder mobilized from vaginal opening. **b** Vagina closed horizontally

following radical hysterectomy, with a rate of 1.14 %, and the lowest rate was 0.02 % following vaginal hysterectomy for pelvic organ prolapse [3]. The mechanism proposed for post-hysterectomy VVF is most commonly from an incidental unrecognized iatrogenic cystotomy near the vaginal cuff [11]. However, in laparoscopic hysterectomy, it is due to thermal injury.

Surgical repair of VVF is commonly done by the vaginal route. Benefits of the transvaginal route include less morbidity and hospitalization. Repair by the abdominal route is indicated in selected cases. However, the approach chosen should be one the surgeon is most comfortable with. Most urologists are familiar with VVF repair via abdominal approach; with the use of laparoscopy, the morbidity is reduced significantly along with a better cosmetic outcome.

First laparoscopic repair of VVF was described by Nezhat et al. [12]. Since then, good success rates has been described in several studies having small number of cases (Table 2). In our series, we achieved 100 % success rate by using the transabdominal transvesical approach with limited cystotomy. Although transabdominal extravesical repair of VVF has been described which claims the benefit of avoiding cystotomy with reduced operative time and postoperative voiding dysfunction; however, in those studies, the authors described increased fear of injury to ureteric orifices [13–15]. Some authors suggest guidance by cystoscopy or vaginoscopy to aid in the dissection of the correct vesicovaginal plane during extravesical approach [14, 16]. However, no randomized trial exists which compares between transvesical and extravesical

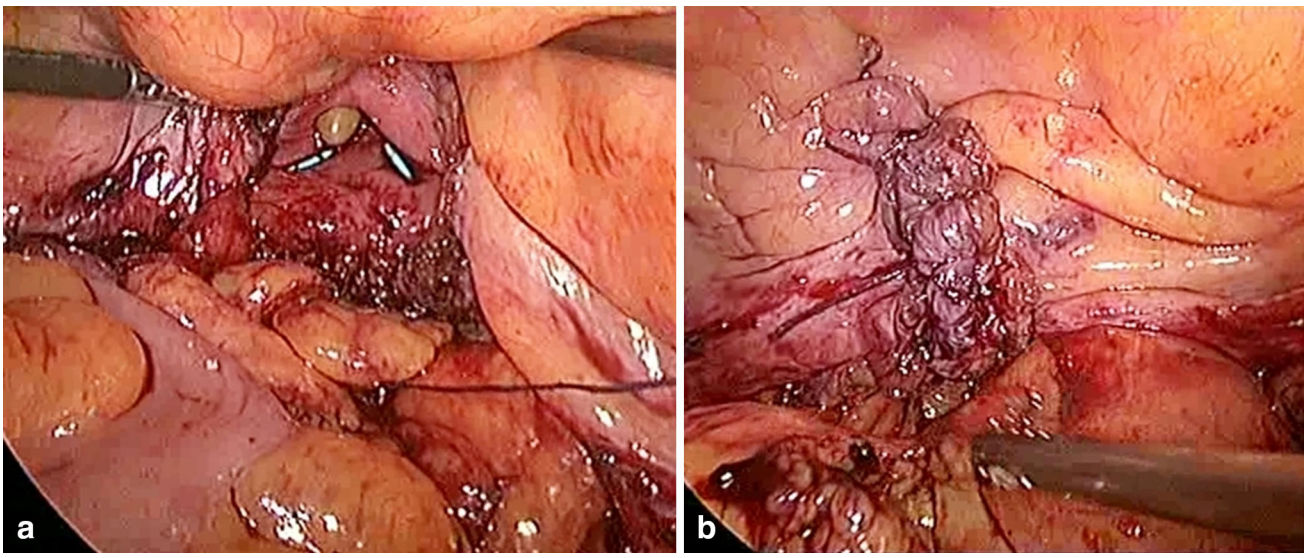

Fig. 4 **a** Vaginal repair augmented by sigmoid appendix epiploica. **b** Bladder closed in vertical manner

Table 1 Surgical outcome of patients

	Result (mean ± SD)/ observation	Range
Age (years)	37 ± 7	25–48
BMI (Kg/m^2)	27.2 ± 3.5	21.2–33.5
Number of fistula	Single-11, Double-2	
Size of fistula (cm)	2.2 ± 0.9	1–3.5
ORT (min)	157 ± 29.8	110–210
EBL (ml)	73.8 ± 18.2	45–110
Time to oral intake (h)	6.8 ± 2.3	5–14
Time to ambulation (h)	8.2 ± 4.2	6–22
Hospital stay (days)	4.6 ± 0.5	4–5
VAS at 24 h	4.2 ± 0.7	3–5
Analgesic requirement*	261.5 ± 76.8	150–450
Foleys catheter duration	11	10–14
Follow up (months)	15.6 ± 8.6	4-27

BMI body mass index, *ORT* operative time (Port insertion to completion of the procedure), *EBL* estimated blood loss, *VAS* visual analog scale

* Diclofenac sodium

approaches. Most of the studies which described transvesical technique had classical cystotomy as described by O'Connor extending from bladder dome till fistulous tract. Liberal cystostomy helps in easy identification of ureteric orifices and fistula. Laparoscopic VVF repair using smaller cystotomy (Mini O'Connor technique) was first described by Rizvi et al. [17]. They described smaller cystostomy of about 2-cm size near the fistula. We in our cases used similar smaller initial cystostomy, and there was no difficulty in identification of the fistula. This avoids extensive peritoneal mobilization from bladder and mobilization of adherent bowel at the vaginal vault. It reduces the operative time and risk of bowel injury.

We used either a colonic epiploic appendix or omental flap to support the repair in 11 out of 13 patients. Initially, we used the omental flap, but in cases where omental flap coverage was not feasible due to short length, we used sigmoid colon epiploic appendices. With successful outcome, later we used the sigmoid colon epiploic appendix in all cases where feasible (seven patients). The advantages are, it lies in the vicinity of repair and easy to reach the repair site. Sometimes omentum is not sufficiently long enough to reach the depth of the pelvis due to short omentum or adhesions due to previous surgery. Although omentum can be brought down by mobilization, it increases the overall operative time. However, peritoneal flap can also be fashioned in such cases. In two patients, we omitted flap coverage due to nonavailability of suitable flap and fistulas were small about 1-cm size. In these cases, no leak was observed during cystogram at 10th postoperative day or during follow-up. As the number is too small, we cannot conclusively claim that flap coverage is not mandatory in small fistula. Well-controlled studies are needed to answer this question. Although utility of flap coverage in transabdominal VVF repair has been questioned by some authors, in a recent review, the author suggested that flap interposition (omentum, colonic epiploic appendix, or peritoneum) provides additional layer to prevent recurrence and takes limited extra time and morbidity [18]. Application of fibrin-based sealant instead of flap interposition to support the repair has also been described [17, 18].

Surgical repair of VVF is traditionally deferred for 3–6 months following the trauma to decrease inflammation

Table 2 Reported series of Laparoscopic transabdominal transvaginal VVF Repair (≥ 5 cases)

References	Number of patients	Mean operative time (min) (range)	Mean estimated blood loss (ml) (range)	Mean hospital stay (days) (range)	Duration of catheter (days)	Laparoscopic conversion (number)	Success rate (%)	Mean (range) follow up (months)
Nezhat [22]	19	NA	NA	NA	7–14	None	95	6–48
Sotelo [16]	15	170	NA	3	10	None	93.3	26–2
Chibber [23]	8	220	NA	3	14	1	87.5	3–40
Mohapatra [24]	12	166	125	5.5	14	None	91.7	3–36
Nagraj [19]	13	130	NA	4.5	15	1	91.6	21
Otsuka [25]	7	280	NA	7	NA	1	NA	NA
Shah [26]	25	145	180–200	4.5	NA	3	86	NA
Rizvi [17]	8	145	60	4	14	None	100	29 (5–50)
Simforoosh [27]	5	134	300	4	NA	None	80	8 (2–15)
Zhang [21]	18	135	95	5	15	None	100	22.7 (3–45)
Singh [28]	28	160	70	6	28	2	100	24
Sharma [29]	22	140	75	5	14	None	100	6–60
Present study	13	157	73.8	4.6	11	None	100	15.6 (4–27)

NA not available

of the tissues. There is debate over the timing of repair following injury. As a tertiary referral center, most of the patients were referred to our department very late (range 8–24 weeks) following the injury. We repaired the fistula as soon as feasible following referral to minimize the distress of urinary leakage for the patient. In three patients, we repaired the fistula within 10 weeks for fistula sizes 2, 3, and 3.5-cm respectively. In these patients, there had been adequate quality tissue for the repair, and all had a successful outcome. There have been reports of successful repair by laparoscopic techniques within 4 weeks following injury [19–21].

Conclusion

Laparoscopic transabdominal transvesical VVF repair with limited cystotomy and sigmoid epiploic appendix flap coverage can be performed safely with short operative time, good success rate, less morbidity, and quick convalescence.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval It is a retrospective study, hence formal consent is not required but Institutional ethical committee approval was taken.

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