46 Vesicovaginal Fistula: Epidemiology, Diagnostics and Robotic Assisted Repair with Peritoneal Flap Inlay

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Introduction

Epidemiology of Vesicovaginal Fistula (VVF)

The Latin term for fistula is "pipe" or "tube" and means an extra-anatomic anastomosis between two hollow organs (or an hollow organ and the environment). A fistula between the lower urinary tract and the vagina is termed vesicovaginal (VVF) or vesicourethral fistula; in high income countries, both fistula are almost exclusively iatrogenic, but may also result from, malignancy, inflammation or appear as congenital fistula.

These acquired urinary fistula are associated with a pronounced physical disability and a paramount reduction of patients quality of life. While vesicourethral fistula typically occurs after sling placement for incontinence, VVF is a known complication after pelvic surgery (that is mostly hysterectomy) or radiation therapy in industrialized countries with an estimated incidence of approximately 0.3–2% [1]. The mechanism for VVF after hysterectomy is an (thermal) injury and necrosis of the posterior bladder wall occurring during the mobilization of the vagina. In contrast, the main reason for VVF in low and middle income countries is the obstetric trauma due to prolonged labour with soft tissue compression and ischemia. In most cases, these VVF appear to be larger, because of a broader area of injury coming from a cephalopelvic disproportion. Therefore, obstetric VVF are commonly more complex and may include urethral loss, rectovaginal fistula formation as well as anal sphincter incompetence and osteitis pubis [2]. In African countries such as Ethiopia, the estimated prevalence was reported to be roughly 1.5 per 1000 women with a median number of days in labour of 3–8 days [3]. Notably, there seems to be an increasing incidence of VVF in low income countries indicating a limited access to obstetric intervention in particular among the rural poor population [4]. Figure 46.1 depicts a large VVF in a women after prolonged labour. Figure 46.2 shows the typical appearance of VVF on cyst-urethrogram.

Diagnosis of VVF

Usually, VVF occurs within 6 weeks after hysterectomy or obstetric surgery [5]. The typical symptom is a urinary discharge through the vagina. The diagnosis is usually made by cystoscopy and cyst-urethrogram (Fig. 46.2). Malignancy should be ruled out by tissue biopsy. In addition, a CT scan might be helpful in exactly

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Fig. 46.1 Hugh scared VVF in a African women with prolonged labour. The ureters are marked with two ureteral stents that appear through the meatus. Note the fibrotic tissue at the wall of the fistula

Fig. 46.2 Typical picture of a Cyst-urethrogram in a women with VVF after laparoscopic hysterectomy

locating the fistula, especially if small in size. However, a more challenging step is the intraoperative location of the fistula. Some authors reported the use of intraoperative cystoscopy with the cystoscope focussing on the fistula while the robotic camera light is switched off [6]. In our department, we prefer to insert a catheter or a guide wire through the VVF in order to mark the region that needs to be excised, as well placing ureteral stens preoperatively, especially in fistulae near the ureteral orifices.

Treatment of VVF

Small fistulae might be treated by transurethral drainage and sometimes by transurethral coagulation of the bladder wall, depending on their aetiology. However, the long-term success rate is low (7–12.5%). The abdominal robotic approach in particular for supratrigonal fistula should be the preferred approach.

Robotic Repair with Peritoneal Flap Inlay

In our department, we use our previous published robotic approach for VVF repair with a peritoneal flap inlay [7–9].

The patients receive 2 g (Cefazolin) Kefzol® when anaesthesia is begun. We usually start with the colposcopy in lithotomy position and insert a 5F Fogarty catheter through the fistula into the bladder using a vaginal speculum. Also, the catheterizaton of the fistula might be performed from the bladder side by cystoscopy. The cystoscopy verifies the position of the Fogarty Ureteral and ureteral stents are placed to protect the ureters and the ureteric orifices. For easier identification of the vagina and dissection of the vesico-vaginal space, a sponge stick is inserted (Fig. 46.3). Thereafter, we continue in a low lithotomy position with a Trendelenburg tilt. The complete abdomen and the genitals are disinfected using povidone-iodine. After establishing the pneumoperitoneum via the 12-mm camera port, all ports are installed according to the scheme of a 4-arm-radical prostatectomy. One 8-mm da Vinci port left and right to the umbilicus, one 12-mm Versaport™ in the right lower quadrant (ca 3-cm craniomedial of the anterior iliac spine) and one 5-mm port is installed right of the camera port 3 cm proximally. We then continue with sharp and blunt dissection using the PK bipolar forceps and monopolar curved scissors to expose the abdominal surface of the bladder and the vaginal stump. After getting a good exposition of the vesico-vaginal space, the fistula and vagina are opened (Fig. 46.3). We subsequently open the bladder and prepare the bladder wall towards the fistula to finally resect the fistula completely

including peri-fistular scar and inflammation tissue. Sharp dissection is used in order to protect the ureteric orifices and to prevent wide excisions (Fig. 46.4). The next and very important step is the mobilisation of the bladder circumferentially to get a tension-free closure. Before the closure of the bladder, we mobilise the adjacent peritoneum to use it as a vital layer between the vaginal and bladder sutures (Figs. 46.5 and 46.6). The suture of the vagina is performed using 2-0 Vicryl®. The bladder is finally closed using 4-0 Biosyn® (Fig. 46.7). After performing a final leakage test of the bladder, all the ports are removed.

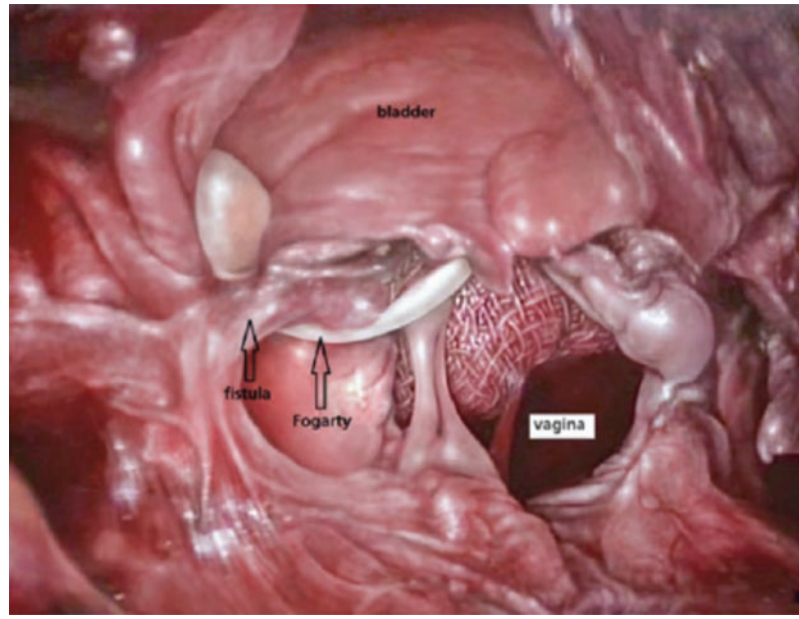

Fig. 46.3 Laparoscopic view into the bladder and the opened vagina. The Fogarty catheter is seen with its balloon on the left side. It was inserted into the fistula and is still in situ. The excision of the fistula will follow next

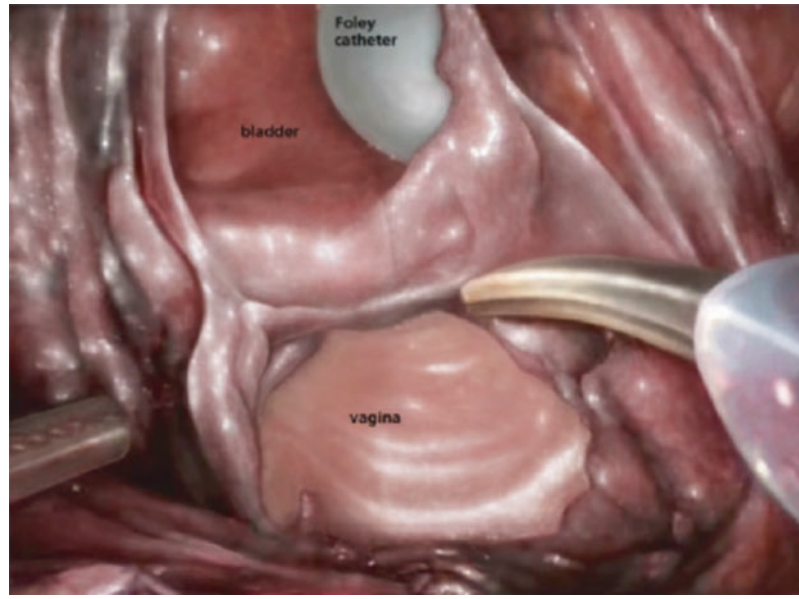

Fig. 46.4 After complete resection of the fistula and adherent scar tissue, the next step will be the bladder mobilisation

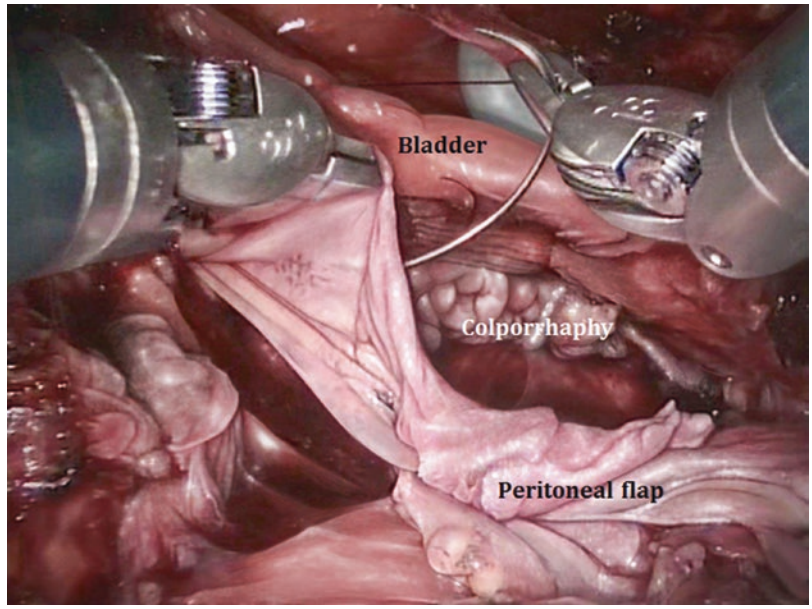

Fig. 46.5 The peritoneal flap is used to cover the space between the bladder and the vagina

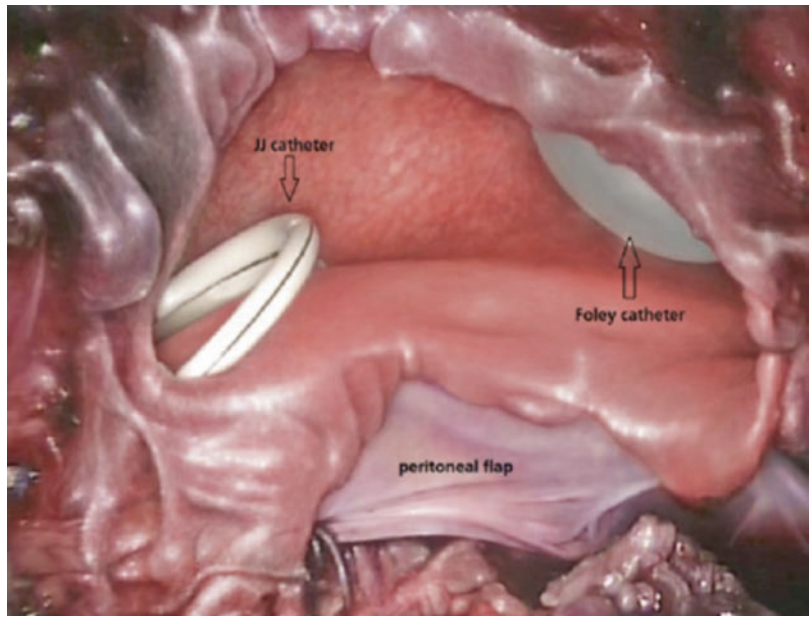

Fig. 46.6 The vagina is now closed and the peritoneal flap lies above its suture. A JJ catheter was inserted into both ureters before the operation. Here, the left one is seen in the picture

Postoperative Management

The wound drain is removed after 24 h as there is no evidence of bleeding or urinary leakage. The patients are discharged after 5 days with the indwelling Foley catheter. After 10 days, cystography is performed prior to the catheter removal. However, there is evidence that 7 day bladder catheterisation is non-inferior to 14 day catheterisation [10]. Sexual intercourse is prohibited for 4 weeks and the ureteral catheters are cystoscopically removed after 4 weeks.

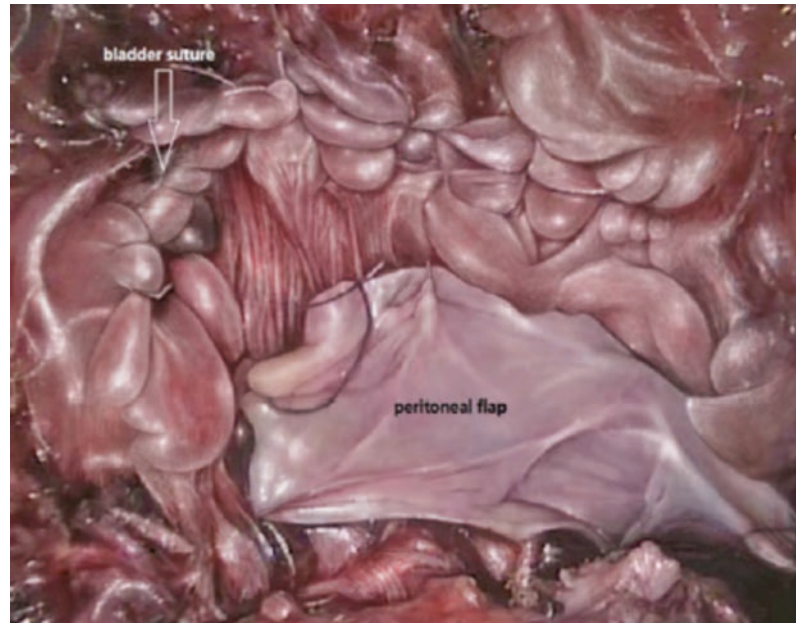

Fig. 46.7 View at the end of the operation. The bladder is now closed and watertight. The peritoneal flap is in situ and covers the vaginal suture

Risk Factors Associated with Fistula Recurrence

Recurrent VVF is the most comment complication after fistula repair. Thus several attempts have been made to risk stratify VVF. There are currently a couple of risk scores or classifying systems, but the clinical usefulness remains to be discussed. Older systems like the one by Lawson [11] simply include the rough location of the fistula (such as "juxtaurethral" or "juxtavaginal"). More recent classification systems such as Goh [12] include the distance from the external urinary meatus to the distal edge of the fistula (from >3.5 cm to <1.5 cm), the diameter as well as the degree of fibrosis. Waaldijk include the size, involving of the urethra and the closing mechanism [13]. It is reasonable that a more extended VVF with more perifocal fibrosis, involvement of other anatomical strictures (such as the urethra) or VVF after irradiation have a greater risk of recurrence than those without these "risk factors". Notably, most of the current classification system have a poor to fair performance with an Area under curve of 0.60–0.63 only [14]. In addition, there are many other important clinical, technical and anatomical variables that might need to be involved in a classification system. There is also evidence that moderate of severe perifistula fibrosis as well as the presence of multiple fistula have been reported to negatively affect the recurrence rate of VVF [15]. Another risk factor might be the size of the fistula: Some studies have reported lower success rates for fistula >1 cm [16] or >3 cm [17], while other authors found no difference for fistula size but for bladder capacity, urethra involvement, fibrosis and prior surgery [18]. From a practical point of view, the ability to mobilize local tissue for a tension-free cover of the lesion is probably one of the most important factor influencing the success rate. Commonly reported recurrence rates vary between 0 and 30%. Taken together, surgery for VVF might be technically challenging. Complete continence and recurrence free postoperative course after robotic surgery must be the main focus in order to restore patients's quality of life.

Vesicovaginal Fistula Repair: Approaches and Robotic Benefits

In fistula surgery, efforts should always be to heal at the first attempt. Therefore, a meticulous operative plan has to be established. In all cases, we should strive to operate effectively, safely and with the lowest morbidity possible. There are no consequent guidelines which way of access should be taken while the surgeons experience is mainly what counts. Gynaecologists often choose the transvaginal way wherever possible. The advantage is the possible outpatient setting, low patient morbidity, low blood loss, minimal postoperative pain and low postoperative bladder irritability [19–21]. Some authors report that an equal success rate can be observed compared to abdominal approaches using a peritoneal flap when a Martius flap was not recommended [20, 22]. Exclusion criteria of the transvaginal access can be a circumferential induration at the fistula site thicker than 2 cm, a high fistula location where the transvaginal approach gives too little exposure, fistulae involving ureters, or when patients wish the transabdominal operation [19, 23]. Combined transabdominal and transvaginal operations have also been reported [24].

When a safe transvaginal fistula repair cannot be granted, there remains only the transabdominal pathway. The transabdominal transvesical technique provides most space for exact and wide preparation of the bladder and vaginal wall, easier identification of scar and fistula tissue, and therefore provides a good basis for the complete excision. More recent techniques have become less morbid than the historical O'Connor procedure even though there are "mini" variations [25, 26].

In recent years, laparoscopy could also establish itself in fistula surgery as an equivalent option to the open operation. Nezhat was the first to perform and document this operation in 1994 [27], and it was developed continuously in the following years, and several case reports appeared [6, 21, 28–35]. The technical advantages of laparoscopic surgery are the easier access to the deep pelvis with high illumination, magnification and easy coagulation. The patient suffers less pain, and mobilisation and release from hospital is faster. Unfortunately, many surgeons avoid this technique due to its technical demands (training curve, difficult fistula resection), and it is mainly performed in special centres [36]. Especially the closure of the bladder and vagina is time consuming but very efficient and safe [21]. Here, the da Vinci Surgical System can be a very helpful assistance.

The use of the da Vinci facilitates the most important steps in this procedure and helps the surgeon to lower operation time. This may also lead to a better outcome and lower complication and recurrence rates.

It gives a three-dimensional magnification up to 15× with a superior view of all different structures including small vessels. It also filters the surgeon's tremor and gives up to seven degrees of freedom. During the last couple of years, several reports for robotic VVF repair have been published so far [37–46]. The first one was described in 2005 by Melamud et al. at the University of California [39].

We have shown the feasibility of peritoneal flap inlays and the effectiveness of the da Vinci Surgical System as an advancement in the laparoscopic approach to treat this embarrassing and compromising complication after hysterectomies where a transvaginal procedure, i.e. after Latzko or a Martius flap is not the preferred choice [7].

The surgical advantages by the use of the da Vinci Surgical system are well known and need not be mentioned. In the case of fistula surgery, we observed that patients recovered almost immediately after surgery by using the laparoscopic access which is less morbid compared to the open operation. The most difficult steps during the procedures are likely the ones that keep urologic surgeons away from the laparoscopic approach. It is the tricky preparation of previously damaged tissue and the suturing. This is where the da Vinci Surgical System gives the utmost assistance. Accessing through the vagina as a natural orifice gives less space to work and to prepare precisely, not to mention that many high fistulae are out of reach.

In a few cases, ureters can be affected by the fistula or have to be partially resected. In such cases, the operation can also be performed laparoscopically while a transvaginal access is futile.

Besides small differences such as suture material or ports, there was no difference between our procedures compared to prior case reports besides the fact that we performed peritoneal flaps in all patients. Other authors used epiploic appendix of the sigmoid colon [40]; omentum, epiploic appendix of the sigmoid colon or a peritoneal flap [38]; omentum [41]; or fibrin glue [39]. We estimate a similar functional result in all these different ways. However, of major importance is the separation of the suture lines.

One disadvantage of the da Vinci System is its inflexibility when preparation of the omentum would be necessary. Therefore, we encourage the use of a regional flap as interposition graft with no need of omental preparation or even colon mobilisation.

Despite the small number of treated patients, we can assume that the da Vinci-assisted laparoscopic method in operating high fistulae is safe and highly effective. Three out of three patients are still satisfied with the postoperative results after regaining full quality of life. Recurrences after repair are usually seen within 3 months [5], so we can consider these patients to be healed.

In summary, VVF are a rare but a devastating complication mainly after gynaecological operations, especially hysterectomy. Its repair can sometimes be even very demanding. By using the given technology, we are convinced that the da Vinci robot-assisted, laparoscopic approach is the most auspicious in most cases of high supratrigonal fistulae.

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