Robot-Assisted Laparoscopic Repair of Supratrigonal Vesicovaginal Fistulae with Peritoneal Flap Inlay

Michael Kurz and Hubert John

Introduction

Vesicovaginal fistulae have always been a highly problematic complication. Nowadays, most cases are complications after hysterectomy or obstetric surgery, whereas obstructed labour is the main aetiology in underdeveloped countries. The localisations and dimensions of the fistulae are very different dependent on their aetiology. Obstructed labour leads to necrosis of the anterior vaginal wall and consequently to a lower, urethrovaginal, vesicovaginal or combined fistula. After hysterectomy, we know that fistulae occur in about 1/1800 cases [1]. At a rate of 600,000 hysterectomies in the United States in 2003 [2], we can assume approximately 330 fistulae had to be treated in that year. This makes it not only a social but also an economic issue. These fistulae are usually found to be supratrigonal and sometimes located high on the bladder dome. This fact makes it very demanding or even impossible to operate transvaginally. They occur after inadvertent lesion of the bladder or ureters, operation-site infection or tumourous diseases. The success rate of either repair is between 75 and 97% [3–5] depending on the method and complexity. Smaller fistulae can be treated by transurethral drainage and sometimes by transurethral coagulation of the bladder wall, depending on their aetiology. However, the long-term results are not very impressive (7–12.5%) [6, 7]. A valuable alternative to conservative treatment is the use of fibrin glue [8]. In case of failure, the operative access is still available.

Materials and Methods

Patients

From July 2006 until February 2011, we treated three cases aged 40–64 year. All were diagnosed with a supratrigonal fistula as a complication of abdominal hysterectomy with no malignancy. In all cases, a conservative treatment was not an option since the fistulae were too large and the symptoms were almost devastating for the patients.

The fistulae could be diagnosed and localised by cystoscopy and conventional cystography.

They all suffered from continuous incontinence 3 months following the hysterectomy. One patient showed large adhesions after an old uterus fixation operation in 1971 and a sigma diverticulitis. These adhesions were also in the spatium vesicovaginale including an omentum attached to the bladder dome. Altogether, there were no postoperative complications besides the occurrence of the fistulae. The patients had no significant concomitant diseases that could be responsible for wound healing disorders. One patient suf-

M. Kurz • H. John (✉)
Department of Urology, Kantonsspital Winterthur, Winterthur, Switzerland
e-mail: hubert.john@ksw.ch

fered from acute intermittent porphyria. During the hospitalisation, we did not see any problems as she did not suffer any acute episode. The fistula repair was done immediately after being diagnosed, 3 months after primary operation on average.

Operative Technique

The patients received 2 g (Cefazolin) Kefzol® when anaesthesia was begun. We started with the vaginoscopy in lithotomy position. First, we inserted a 5 F Fogarty catheter through the fistula into the bladder using a vaginal speculum. Then, a cystoscopy was performed to verify the position of the Fogarty and to insert DJ catheters to protect the ureters and the ureteric orifices. For easier identification of the vagina intraoperatively, a sponge stick was inserted. Thereafter, we continued in a low lithotomy position with a Trendelenburg tilt. The complete abdomen and the genitals were disinfected using povidone-iodine. After establishing the pneumoperitoneum via the 12-mm camera port, all ports could be installed according to the scheme of the 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 was installed right of the camera port, ca. 3 cm proximally.

Initially we had to perform adhesiolysis due to postoperative, intra-abdominal scarring. We continued 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, we opened the vagina and localised the Fogarty catheter and thereafter searched for the fistula (Fig. 43.1). We subsequently opened the bladder and prepared it towards the fistula to finally resect it 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. 43.2). The next and very important step was to mobilise the bladder dorsally to get a tension-free suture. The closure of the vagina was performed using 2–0 Vicryl®. Before the closure of the bladder, we mobilised the adjacent peritoneum to use it as a vital layer between the vaginal and bladder sutures (Fig. 43.3). The bladder was finally closed using 4–0 Biosyn® (Fig. 43.4). After performing a leakage test of the bladder, we removed all the ports.

The mean operation time was 240 min including DJ insertion and transfers. There was no significant blood loss.
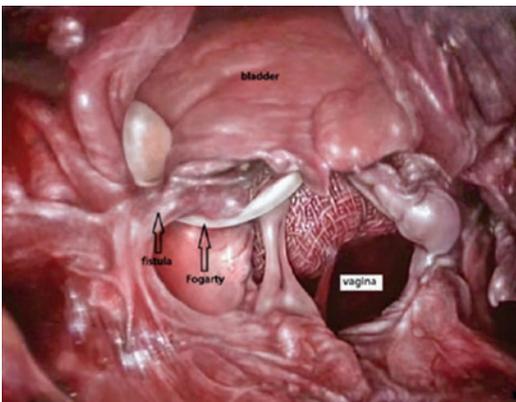
Fig. 43.1 View into the bladder and the opened vagina. The Fogarty catheter is seen with its balloon on the left side. It was inserted into the fistula and is still in situ. The excision of the fistula will follow next
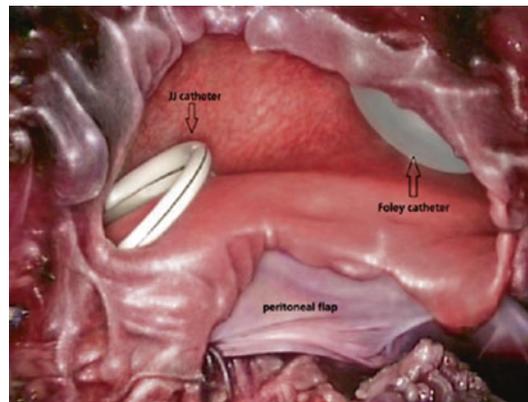
Fig. 43.3 The vagina is now closed and the peritoneal flap lies above its suture. A DJ catheter was inserted into both ureters before the operation. Here, the left one is seen in the picture
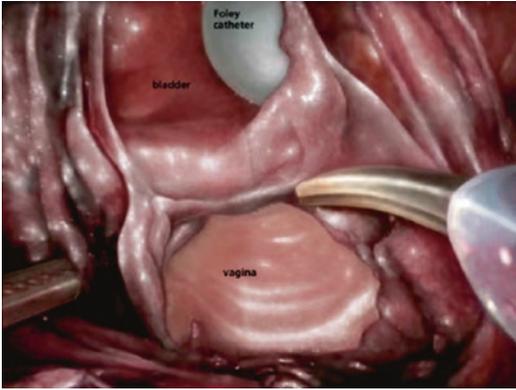
Fig. 43.2 After complete resection of the fistula and adherent scar tissue, the next step will be the bladder mobilisation

Fig. 43.4 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

Postoperative Management

The wound drain was removed after 24–48 h as there was no evidence of bleeding or leakage. The patients were discharged after 5 days with the indwelling Foley catheter. After 14 days, cystography was performed prior to the catheter removal. 100% of the patients showed no leakage of the bladder suture. Sexual intercourse was prohibited for 4 weeks. The DJ catheters were cystoscopically removed after 4 weeks.

Follow-Up and Results

After a follow-up period of 4–42 months, all the patients stayed continent, and we saw no evidence of a recurrent fistula. One patient was hospitalised and treated with antibiotics due to a left-sided pyelonephritis 3.5 weeks following the operation. The DJ catheter could be removed under successful antibiotic therapy. We did not have to change the DJs. No patient complained about pollakisuria, low bladder volume or discomfort during sexual intercourse.

Discussion

In fistula surgery, the effort 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 [4, 9, 10]. Some authors report that an equal success can be observed compared to abdominal approaches using a peritoneal flap when a Martius flap was not recommended [4, 11]. 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 [10, 12]. Combined transabdominal and transvaginal operations have been reported [13].

Where 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 thus 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 [14, 15].

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 [16], and it was developed continuously in the following years, and several case reports appeared [9, 17–26]. 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 [27]. Especially the closure of the bladder and vagina is time consuming but very efficient and safe [9]. 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 3-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. Yet so far, only few reports can be found about robot-assisted fistula repair [28–32]. The first one was described in 2005 by Melamud et al. at the University of California [28].

The aim of this series is to show 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.

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 you the utmost assistance. Accessing through the vagina as a natural orifice gives you 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.

Colleagues used epiploic appendix of the sigmoid colon [31]; omentum, epiploic appendix of the sigmoid colon or a peritoneal flap [30]; omentum [29]; or fibrine glue [28]. 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 wanted to 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 [6], so we can consider these patients to be healed.

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

References

1. Miller EA, Webster GD. Current management of vesicovaginal fistulae. Curr Opin Urol. 2001;11(4):417–21.
2. Wu JM, et al. Hysterectomy rates in the United States, 2003. Obstet Gynecol. 2007;110(5):1091–5.

3. von Theobald P, Hamel P, Febbraro W. Laparoscopic repair of a vesicovaginal fistula using an omental J flap. Br J Obstet Gynaecol. 1998;105(11):1216–8.

4. Eilber KS, et al. Ten-year experience with transvaginal vesicovaginal fistula repair using tissue interposition. J Urol. 2003;169(3):1033–6.

5. Ijaiya MA, et al. Vesicovaginal fistula: a review of nigerian experience. West Afr J Med. 2010;29(5):293–8.

6. Hilton P, Ward A. Epidemiological and surgical aspects of urogenital fistulae: a review of 25 years' experience in southeast Nigeria. Int Urogynecol J Pelvic Floor Dysfunct. 1998;9(4):189–94.

7. Hilton P. Vesico-vaginal fistula: new perspectives. Curr Opin Obstet Gynecol. 2001;13(5):513–20.

8. Kanaoka Y, et al. Vesicovaginal fistula treated with fibrin glue. Int J Gynaecol Obstet. 2001;73(2):147–9.

9. Nagraj HK, Kishore TA, Nagalaksmi S. Early laparoscopic repair for supratrigonal vesicovaginal fistula. Int Urogynecol J Pelvic Floor Dysfunct. 2007;18(7):759–62.

10. Blaivas JG, Heritz DM, Romanzi LJ. Early versus late repair of vesicovaginal fistulas: vaginal and abdominal approaches. J Urol. 1995;153(4):1110–2; discussion 1112–3.

11. Raz S, et al. Transvaginal repair of vesicovaginal fistula using a peritoneal flap. J Urol. 1993;150(1):56–9.

12. Kumar S, Kekre NS, Gopalakrishnan G. Vesicovaginal fistula: an update. Indian J Urol. 2007;23(2):187–91.

13. Lee RA, Symmonds RE, Williams TJ. Current status of genitourinary fistula. Obstet Gynecol. 1988;72(3 Pt 1):313–9.

14. Rizvi SJ, et al. Modified laparoscopic abdominal vesico-vaginal fistula repair–"Mini-O'Conor" vesicotomy. J Laparoendosc Adv Surg Tech A. 2010;20(1):13–5.

15. Chibber PJ, Shah HN, Jain P. Laparoscopic O'Conor's repair for vesico-vaginal and vesico-uterine fistulae. BJU Int. 2005;96(1):183–6.

16. Nezhat CH, et al. Laparoscopic repair of a vesicovaginal fistula: a case report. Obstet Gynecol. 1994;83(5 Pt 2):899–901.

17. Wong C, Lam PN, Lucente VR. Laparoscopic transabdominal transvesical vesicovaginal fistula repair. J Endourol. 2006;20(4):240–3; discussion 243.

18. Sotelo R, et al. Laparoscopic repair of vesicovaginal fistula. J Urol. 2005;173(5):1615–8.

19. Tiong HY, et al. Laparoscopic repair of vesicovaginal fistula. Int Urol Nephrol. 2007;39(4):1085–90.

20. Otsuka RA, et al. Laparoscopic repair of vesicovaginal fistula. J Endourol. 2008;22(3):525–7.

21. Porpiglia F, et al. Laparoscopic vesico-vaginal fistula repair: our experience and review of the literature. Surg Laparosc Endosc Percutan Tech. 2009;19(5):410–4.

22. Ou CS, et al. Laparoscopic repair of vesicovaginal fistula. J Laparoendosc Adv Surg Tech A. 2004;14(1):17–21.

23. Abdel-Karim AM, et al. Laparoscopic transperitoneal extravesical repair of vesicovaginal fistula. Int Urogynecol J Pelvic Floor Dysfunct. 2011;22(6):693–7.

24. Gozen AS, et al. Transperitoneal laparoscopic repair of iatrogenic vesicovaginal fistulas: Heilbronn experience and review of the literature. J Endourol. 2009;23(3):475–9.

25. Erdogru T, et al. Laparoscopic transvesical repair of recurrent vesicovaginal fistula using with fleece-bound sealing system. Arch Gynecol Obstet. 2008;277(5):461–4.

26. Miklos JR, Sobolewski C, Lucente V. Laparoscopic management of recurrent vesicovaginal fistula. Int Urogynecol J Pelvic Floor Dysfunct. 1999;10(2):116–7.

27. Hemal AK, Kumar R, Nabi G. Post-cesarean cervicovesical fistula: technique of laparoscopic repair. J Urol. 2001;165(4):1167–8.

28. Melamud O, et al. Laparoscopic vesicovaginal fistula repair with robotic reconstruction. Urology. 2005;65(1):163–6.

29. Sundaram BM, Kalidasan G, Hemal AK. Robotic repair of vesicovaginal fistula: case series of five patients. Urology. 2006;67(5):970–3.

30. Hemal AK, Kolla SB, Wadhwa P. Robotic reconstruction for recurrent supratrigonal vesicovaginal fistulas. J Urol. 2008;180(3):981–5.

31. Schimpf MO, et al. Vesicovaginal fistula repair without intentional cystotomy using the laparoscopic robotic approach: a case report. JSLS. 2007;11(3):378–80.

32. Engel N, John H. Laparoscopic robot assisted vesicovaginal fistula repair with peritoneal flap inlay. J Urol. 2008;179(suppl 4):666.