The current methods used in the management of vesicovaginal fistula (VVF) and future available options

Mahesh Chandra

Associate Professor, Dept. of Urology, Government Medical College and Hospital, Chandigarh, Punjab, India

Corresponding Author: Mahesh Chandra
Email: docmaheshchandra@yahoo.com

Abstract
Vesicovaginal fistula (VVF) is abnormal communication between bladder and vagina, presenting with urine leakage through vagina between 7-10 days. The quick and accurate diagnosis of VVF and timely repair by experienced surgeon improves outcome and help in limiting clinical insults and patient distress. The current management options include conservative, open laparoscopic and robotic methods. Most large or complex VVF still require well planned surgical approach with intervening tissue. Currently, its management is employing other methods such fibrin glue to plug-seal VVF and successful uses of auto to logous satellite cell/smooth muscle cells injections as well as alginate gel is also in pipeline, which might further make the management of VVF minimal invasive and highly successful.

Keywords: Vesicovaginal, Fistula, Conservative, Repair, Uutologous, Tissue, Injection.

Introduction
Vesicovaginal fistula (VVF) may be defined as abnormal communication between bladder and vagina lined by epithelium, a uncommon condition.[1] Even today, this remains most socially devastating condition for female affecting their physical and psychological well being, irrespective its etiology.[2] First report VVF repair appeared in the middle of 19th Century, when James Marion Sims described their technique of transvaginal repair using silver-wire sutures and bladder drainage in the perioperative period.[3] Advancement in technology led to development of transabdominal repair of VVF using various graft or tissue in its treatment. However, despite many techniques, the VVF repair is still poses a technical challenge to surgeon.

Etiology and Incidence
In developing nations, a prolonged obstructed labour is leading cause for the formation of VVF. The incidence of VVF is 3 cases per 100,000 of deliveries in the country like West Africa. Major factor leading its formation includes young maternal age (physical immaturity produce to cephalopelvic disproportion), lack of advanced obstetrical skills and traditional practice of female circumcision in underdeveloped nations. The occurrence is very uncommon in developed nations due to availability of advanced medical care. In the developed nations, almost 90% of VVF occurs due to accidental or iatrogenic injury to bladder during pelvic-gynaecological surgeries.

Various high risk procedures include abdominal hysterectomy (75%) and urological or lower abdominal pelvic surgery (2%).[3,4] General risk factors include previous uterine surgery, irradiation, endometriosis and anatomical distortion (e.g. large uterine fibroid). Compounding factors that jeopardising healing includes anaemia, malnutrition and steroid uses. Less common causes are pelvic malignancy, obstetrical infections, foreign-body erosion and vaginal trauma.

Pathogenesis
Non-iatrogenic (Obstetric)
Prolonged, obstructed labour may leads to pressure necrosis of anterior vaginal wall and bladder neck or urethra as the intervening tissues gets compressed between fetus head and symphysis pubis of mother. Later, if mother survives, the necrotic tissue gets sloughed & expelled out within 10 days and incontinence may ensues. For assessment of outcome of different surgical techniques of its repair, the VVF may be classified as Type I- which does not involve urethral closing mechanism, Type II- involves urethral closing mechanism, Type III- involve ureter and other exceptional tissue.[5]

Iatrogenic (Post-Surgical)
Following abdominal hysterectomy, VVF may arise from an unrecognised bladder injury during surgical procedure which leads to urinoma formation. Urinoma follows path of least resistance and may drain through the vaginal cuff suture lines with development of fistulous tract between bladder and vagina. Other, possible mechanism includes pressure necrosis from inappropriately placed sutures between vaginal cuff and posterior bladder wall which is complicated by factors e.g. hematoma or infection.

Presentation and Clinical Assessment
Majority of VVF patient presents with urine leakage through vagina between 7-10 days. But, in some cases leakage may be immediately apparent in postoperative period. VVF may also develop following pelvic irradiation or secondary to malignancy. After pelvic irradiation, VVF has taken up to 20 year for its development in literature.

Unrecognized injury to urinary tract and impending urinary fistula must be considered in all female who develop prolonged ileus, excessive pain, haematuria or fever after pelvic surgery.

Differential diagnosis includes ureterovaginal fistula (UVF), urethrovaginal fistula, peritoneal fluid leak, vaginal discharge due to infection, pelvic abscess or collection.

Biochemical analysis differentiates urine from other body fluids.

Direct visualization to assess sites, size and numbers of fistula using vaginoscopy or cystoscopy provides advantage in planning VVF repair. Methylene blue dye instilled through the Foley's catheter into bladder and subsequent Valsalva manoeuvre by the patient may help in locating sites of small fistula. About 25% VVF patients have associated hydronephrosis and 10-15% concomitant ureter injury (UVF).[4] Therefore, the assessment of upper urinary tract using intravenous urography (IVU) or retrograde pyelography (RGP) is mandatory. CT urography provides excellent anatomical view of the fistulous tract.[5]

Management

Conservative Treatment

Management of 2-3mm, small size VVF relies on the spontaneous closure of defect. In this, urinary bladder is drained using Foley's catheter and anticholinergic drugs are used liberally to relax detrusor muscles and to prevent bladder spasm. A success rate between 92.86-97.98% has been reported for small size VVF which has developed following hysterectomy and catheterization period varies from 19-54 days.[6]

Use of several minimally invasive approaches for small VVF has been reported in the literature. Use of fibrin was first reported by Peterson et al in year 1979, they used fibrin-based glue injections into the fistulous tract.[7] Fibrin promotes healing of fistula though its effects on fibroblasts and by promoting neo-collagen synthesis. It also has advantage of being biodegradable, thus no long term complications. Although, several authors have reports it successful but number of patients treated by this technique remains small and VVF size tiny.[8-10]

Electro coagulation of fistulous tract through transvaginal or transurethral route is another minimally invasive technique. This technique has been found to be successful in small numbers with small size fistulas measuring less than 3mm.[11] This technique involves use of tiny electrode and bare minimal coagulation current to avoid risk of increasing fistula size.

Till date, there has been no consensus on the timing that should be allowed for spontaneous healing of VVF and also when to abandon this conservative approach before proceeding to definite surgical repair. Several authors suggest that 3-5 weeks is more than sufficient time for trial of conservative treatment. Urinary catheterization prior to surgical repair is a common practice, which offers some degree of symptomatic relief to VVF patients. Generally, VVF repair is deferred for about 3-6 months to allow for resolution inflammation and oedema of tissues. But, this approach is more useful for complex and large VVF defects. Early repair in patients of simple, iatrogenic fistula is highly successful without causing added physical and psychological trauma.

Surgical Treatments

Two approach used for VVF repair are transvaginal and transabdominal or their combination. Out of above two, the transvaginal approach has low rate of complications and shorter recovery time compared to transabdominal but later is preferable, when fistula size is large or it cannot be easily visualized or accessed through vagina e.g. complex VVF.

Regardless of surgical techniques and its timings, the basic principles that underline VVF repair remain almost same. Initial, VVF repair has best chance of success, thus it is imperative that repair should be well planned and performed by surgeon, who is experienced enough in repair. A good surgical repair must be watertight, tensionless, and free of infection and must uses healthy tissues for repair, if required even a well-vascularised interposition flap may be used.

Transvaginal Repair

This approach has advantage of avoiding laparotomy & opening of bladder with minimal blood loss, early postoperative recovery and shorter hospital stay.[12] Its success rates is reported to be equivalent or better than transabdominal repair.[13]

Vaginal-flap technique is most commonly employed technique for VVF repair.[14] This utilizes a 'U'-shaped flap with fistula at the base. The fistula is circumscribed, vaginal wall mobilized away and fistula margins excised to allow advancements of vaginal flaps, so that fistulous closure-line is seated away from the underlying defect. Debate continued as whether the fistula tract should be excised or not with main concern being that excision might increase size of defects with potential decreased strength of repair.[15] Fistula is closed transversely with care to invert bladder mucosa while avoiding ureter injury. Second layer of sutures may be used to further strengthens repairs. Use of Martius-flap which is composed of labial fat pad may provide a layer of healthy, vascularised tissue between fistula repair and vaginal wall. This may further reinforce VVF repair and increase success rate, when tissue viability is questionable. However, the use of interposition flap is not mandatory for small size and uncomplicated VVF.[16]

Transabdominal Repair

Usually, this approach is indicated, if vaginal exposure of fistula tract is inadequate (high vaginal defect, retracted or narrow vagina) and, or fistula is closer to distal ureter and where there is need of bladder augmentation. Main advantage of this approach is that greater omentum can be used as an interposition flap which is preferable for repair of complex, multiple or recurrent fistulas especially when there is past history of pelvic irradiation or coexisting pelvic pathology. Further, it also allows creation of an ileal conduit for urinary diversion, if fistula proved to be beyond repair in all counselled patients.

Repair of involves complete bisection of bladder from dome to posterior bladder wall encircling entire fistula site.[17] In preoperative period, bilateral ureteric catheters are placed to identify and protect both ureters from any

iatrogenic injury during VVF repair. The bladder is mobilized away from the vagina, fistula is excised and then, bladder and vagina are closed separately. The greater omentum may be mobilized, brought down as interposition flap between them and secured in position with one or two sutures, if required. Alternative to interposition flaps may includes pelvic peritoneum, appendices epiploicae or bladder wall flaps.[18,19]

Extraperitoneal approach has been also reported for repair of small simple VVF, in which an anterior cystotomy is made to allow access to bladder and free bladder mucosal graft used for defect closure.[20] Since, the exposure with this approach is limited and use of omentum as an interpositional flap is excluded. Thus, most surgeons favour an intraperitoneal approach as previously described.

Laparoscopic Repair

Use of laparoscopic methods for VVF repair was first reported by Nezhat et al in year 1994.[21] The method continues to be developed with aim to achieve equivalent success rate to that of transabdominal open repair, while avoiding morbidity of open repair and for early postoperative recovery. This involves cystoscopic placement of bilateral ureteric catheters and another catheter through VVF fistula to facilitate identification of these structures during laparoscopic dissection. Several studies confirms, the feasibility of this method but total number of patients reported so far are very small and success depend on proper patient selection and previous laparoscopic experience of surgeon.[22-24] A review by Kumar et al. concluded that it could be alternative method to traditional open repair. However, laparoscopic VVF repair requires a good laparoscopic experience in pelvic surgery and intracorporeal suturing.[25] Therefore, laparoscopic repair of VVF has not gained a widespread acceptance due to different technical challenges posed to skilled laparoscopic surgeon.

Robotic Repair

Use of this technology in the repair of VVF is most recent. There are few reports of Robotic-assisted VVF repair with advantage of easy manipulation and intracorporeal suturing during reconstructive phase of operation.[26] Early reports on Robotic repair have reported a successful outcome with minimal postoperative morbidity but number of patients in each series are very small.[27,28]

Postoperative Management

Continuous bladder drainage is imperative to ensure tension-free healing and tissue integrity establishment. The placement of a suprapubic catheter is advisable in transabdominal repairs where bladder has been opened as part of the procedure. In postoperative period, catheters must be checked regularly to ensure a free drainage of urine. When both suprapubic and urethral catheter are placed, the drainage is maintained even if one catheter gets blocked. Insufficient bladder drainage is a common cause of failed VVF repair. Further, the liberal use of anticholinergic drugs in postoperative period to prevent bladder spasms may compromise healing process.[17]

Complications

First attempt at VVF repair is best time with about 85% success rate for both transabdominal and transvaginal repair.[15] Various complications of repair include recurrent fistula, ureteric injury or obstruction, vaginal stenosis, decreased bladder capacity and irritative LUTS (lower urinary tract symptoms). Recurrent small size fistula can be managed conservatively using prolonged catheterization and if required a second attempt at surgical repair may be made only when all tissues have fully healed and recovered. The vaginal stenosis is rare complication of VVF repair and may require further surgery in the form of relaxing incisions or use of skin graft.[15]

Conclusions

Undoubtedly, VVF is a condition with devastating physical and social consequences for patient, irrespective of its etiopathogenesis. A successful management poses significant challenges to surgeon. The quick and accurate diagnosis of VVF and timely repair by experienced surgeon, while adhering to basic surgical principles improves outcome and help in limiting clinical insults and patient distress.

Future Directions

In view of associated advantages, there is increasing trend for transvaginal repair of large and complex VVF. Small VVF can also be managed using minimal invasive and continuous bladder drainage with or without oral anticholinergic drugs. Use of fibrin glue to plug-seal VVF is latest with successful outcomes. Progressively, the successful uses of autotologous satellite cell/smooth muscle cells injections and alginate gel in VVF closure is also in pipeline, which may further change the management of VVF.[29]

Conflict of Interest: None.

References

1. Rovner ES. Urinary Tract Fistulae. Campbell- Walsh Urology, 10th Edition, 3rd Volume, Chapter 77, International Edition 2012; Page 2222-61.
2. Sims JM. On the treatment of vesico-vaginal fistula. *Am J Med Sci* 1852;23:59-82.
3. Tancer ML. Observation on prevention an management of vesicovaginal fistula after total hysterectomy. *Surg Gynecol Obstet* 1992;175: 501-6.
4. Goowin WE, Scardino PT. Vesicovaginal and uterovaginal fistulas: A summary of 25 years of experience. *J Urol* 1980;123: 370-74.
5. Gamel MG, Hussein AW. The management of genitourinary fistula in third millennium. *Arab J Urol* 2014;12:97-105
6. Davits RJ, Miranda SI. Conservative treatment of vesicovaginal fistulas by bladder drainage alone. *Br J Urol* 1991; 68:155-6.
7. Pettersson S, Hedelin H, Jansson I, Teger-Nilsson AC. Fibrin occlusion of a vesicovaginal fistula. *Lancet* 1997;1: 933.

8. Hedelin H, Nilson AE, Teger-Nilssion AC, Thorsen G. Fibrin occlusion of fistulas postoperatively. *Surg Gynaecol Obstet* 1982;154:366-8.
9. Schneider JA, Patel VJ, Hertel V, Closure of vesicovaginal fistulas from the urological viewpoint with reference to endoscopic fibrin glue technique (German). *Zentralbl Gynakol* 1992;114:70-3.
10. Welp T, Bauer O, Diedrich K. Use of fibrin glue in vesico-vaginal fistulas after gynaecologic treatment (German). *Zentralbl Gynakol* 1996;118: 430-2.
11. Stovsky MD,Ignatoff JM, Blum MD, Nanninga JB, O' Conor VJ, kursch ED. Use of electrocoagulation in the treatment of vesicovaginal fistulas. *J Urol* 1994;152:1443-4.
12. Dupont MC, Raz S. Vaginal approach to vesicovaginal fistula repair. *Urol* 1996;48:79.
13. Blaivas JG, Heritz DM, Romanzi LI. Early versus late repair of vesicovaginal fistulas: vaginal and abdominal approaches. *J Urol* 1995;153:110-3.
14. Leach GE, Raz S. Vaginal flap technique: A method of transvaginal fistula repair. Female urology. In: Raz S, editor. Philadelphia: WB Saunders Co; 1983;327-7.
15. Woo HH, Rosario DJ, Chapple CR. The treatment of versicovaginal fistulae. *Eur Urol* 1996;29:1-9.
16. Smith GL, Williams G, Vesicovaginal fistula. *BJU Int* 1999;83:564-70.
17. Carr LK,Webster G. Abdominal repair of vesicovaginal fistula. *Urol* 1996;48:10-1.
18. Eisen M, Juekovic K, Altwein JE, Altwein JE, Schreiter F, Hohenfeller R et al. Management of vesicovaginal fistula with peritoneal flap interposition. *J Urol* 1974;112:195-8.
19. Gil-Vernet JM, Gil-Vernet A, Campos JA. New surgical approach for treatment of complex vesicovaginal fistula. *J Urol* 1989;141:513-6.
20. Ostad M, Uzzo RG, Coleman J, Young JP. Use of free bladder mucosal graft for simple repair of vesicovaginal fistulae. *Urol* 1998;52:123-6.
21. Nezhat CH, Nezhat F, Nezhat C, Rottenberg H. Laparoscopic repair of a vesicovaginal fistula: A case report. *Obstet Gynecol* 1994;83:899-901.
22. Chibber PJ. Shah HN. Jain P. Laparoscopic O' Conor's repair for vesicovaginal and vesico-uterine fistulae. *BJU Int* 2005;96:183-6.
23. Sotelo R, Mariano MB, Garcia-Segui A, Dubois R, Spaliviero M, Keklikian W, et al. Laparoscopic repair of vesicovaginal fistula. *J Urol* 2005;173:1615-8.
24. Modi P, Goel R, Dodia S. Laparoscopic repair of vesicovaginal fistula. *Urol Int* 2006;76:374-6.
25. Kumar S, Kekre NS, Gopalakrishnan G. Vesicovaginal fistula; An update. *Indian J Urol* 2007;23:187-91.
26. Melamud o, Eichel I, Turbow B, Shanberg A. Laparoscopic vesicovaginal fistula repair with robotic reconstruction. *Urol* 2005;65:163-6.
27. Sundaram BM, Kalidasan G, Hemel AK. Robotic repair of vesicovaginal fistula: case series of five patients. *Urol* 2006;67:970-3.
28. Hemal AK, Kolla SB, Wadhwa P. Robotic reconstruction for recurrent supratrigonal vesicovaginal fistulas. *J Urol* 2008;180:981-5.
29. Marianne SJ, Jeeva S, Alessandro C, Henrik D. Treatment of Vesicovaginal Fistulas with Autologous Cell Injection – A Randomized Study in Animal Model. *Technol Cancer Res Treat* 2017;1-8

How to cite this article: Chandra M. The current methods used in the management of vesicovaginal fistula (VVF) and future available options. *J Urol, Nephrol Hepatol Sci* 2019;2(2):13-6.