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Review Article

Vesico vaginal fistula

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Introduction

Vesico vaginal fistula (VVF) is an abnormal fistulous tract communicating the bladder with the vagina resulting in continuous urinary leak in to the vagina. Majority of the fistulas are caused by gynaecologic and other pelvic surgical procedures. Birth trauma is still the commonest cause of VVF in underdeveloped countries with fewer facilities for obstetric care. Significant emotional and social distress accompanies the diagnosis of this condition and hence requires timely intervention.

Historical background

The oldest evidence of VVF can be found in remains of the Queen Henhenit, the wife of Egypt's ruler around 2050BC. An extensive anatomical review of the Queen's body performed in 1923 in Cairo has revealed a large communication between the bladder and the vagina (1). The Persian physician Avicenna made the connection between obstructed labour and VVF in 950 AD (1). In 1597, Luiz de Mercado introduced the word 'fistula' and replaced the word 'ruptura'. Dutch physician, Hendrik von Roonhuyse gave a clear description of VVF and proposed a method of repair which was published in the first book of operative gynaecology in 1663. Using the Roonhuyse's technique, Johann Fatio documented the first successful VVF repair in 1675 (1).

Dr John Peter Metauer of Virginia has successfully closed a VVF using wire sutures in 1838. Dr J Marion Sims who has been called the father of American Gynaecology is considered as the first American to close a VVF. Sims emphasized the importance of good exposure, adequate resection of the fistula and scarred vaginal edges, and the critical importance of continuous postoperative bladder drainage in his publication in 1852 (2).

During the past several decades, various surgical techniques have been introduced for the management of VVF by a number of surgeons. A layered closure technique was first described by Mauris Collis in 1861 (3). Trendelendburg (4) in 1881 described a technique which uses suprapubic approach. Martius and Garlock have pioneered the concept of interpositional tissues in fistula reconstruction in 1920s. In 1942, Latzko described a technique with resection of scarred tissue and horizontal layered closure of the defect (5).

O'Conor and Stovsky in 1950 popularized the trans-abdominal approach and also proposed the use of electrocoagulation as an initial treatment modality for small fistulas. Various tissue flaps have been described as interposition grafts to minimize the failure of VVF repair. Pedicled gracilis muscle flap (Garlock in 1928) (6), pedicled bulbocavernosus flap (Maritius in 1928) (7) and pedicled omental flaps (Kiricuta and Goldstien in 1972) (8) are important flaps among them.

Incidence

The incidence of VVF is much different in developed countries as compared to underdeveloped countries. The obstructed labour is the major aetiological factor in developing world whereas in developed countries pelvic surgery is the predominant cause. The true incidence of the VVF in developing countries is unknown as most of these patients suffer silently. Some studies have revealed a prevalence rate as high as 2 million women worldwide (9). Overall incidence of 0.8 per 1000 hysterectomies (open and laparoscopic) have been reported in a study in Finland (10). In some rural areas of Africa, the fistula rate may approach 5-10 per 1000 deliveries – which is close to the maternal mortality rate in Africa (9).

Aetiopathogenesis

In developing countries, majority of the VVF are caused by obstructed labour (97%). During normal labour, anterior vaginal wall, bladder base and urethra are compressed between foetal presenting parts and the

posterior pubis. Prolonged, obstructed labour will result in intervening tissue ischaemia and sloughing of necrosed tissue giving rise to a defect between the urinary bladder and the vagina. These fistulas are often larger than the fistulas following surgical complications. Numerous other factors contribute to the development of VVF in developing countries. In areas where culture encouraged marriages occurring at very younger age when even the bony pelvis is not well developed has a higher risk of obstructed labour and consequent development of VVF. Chronic malnutrition may further limit the pelvic growth resulting in higher risk of cephalo-pelvic disproportion. Lack of adequate health care personnel and obstetric facilities may lead to protracted obstructed labour for days or weeks.

Vesico vaginal fistula occurring in developed countries is predominantly caused by inadvertent injury to bladder during pelvic surgery (90%). These fistulas are small and has healthy surrounding tissues. Different types of bladder injuries which could occur during pelvic surgery include unrecognized bladder laceration, bladder wall injury from electrocautery and mechanical crushing and avascular necrosis following dissection in incorrect tissue planes. Resulting bladder defect allows the formation of a urinoma which will eventually drain through the least resistant path, the suture line in vaginal vault. This passage gets epithilialized later. In a study in Mayo clinic, the predominant cause of genitourinary fistula has been documented as gynaecological surgery (82%) followed by obstetric injury in 8% and irradiation in 6% (11). Anecdotal data suggests hysterectomy as the major cause of obstetric fistula in Sri Lanka. In a study done by Tancer et al in 1992, hysterectomy was the commonest cause of VVF (73%) (12). The incidence of fistula following hysterectomy is reported to be around 0.1% to 0.2% (13). Other less frequent causes of VVF include urological and other pelvic surgical procedures, pelvic malignancies, radiotherapy, tuberculosis and endometriosis.

Clinical features

The hallmark symptom of VVF is the continuous urine leakage through the vagina. These patients may complain of uncontrolled urine leakage or increased vaginal discharge following surgery, pelvic radiotherapy or without prior surgical interventions. Incontinence is usually continuous unless the defect is very small. Postoperative complications such as prolonged ileus, urinary ascites and pelvic abscess formation need further evaluation in patients following pelvic surgery. Approximately 90% of genito-urinary fistulas become symptomatic within 3 to 30 days post operatively and VVF associated with bladder lacerations will be evident immediately. Meta analysis of gynaecologic literature suggests that the rate of bladder injury during hysterectomy is around 10.4 per 1000 cases (14).

Classification of VVF

Waaldjik and Elkins (15) have introduced a system to classify vesico-vaginal fistula depending on the anatomical involvement, size of the defect and the site of the fistula.

Anatomic classification

Type 1 – not involving the closing mechanism

Type 2 – involving the closing mechanism

A. Not involving total urethra

B. Involving total urethra

Type 3 – miscellaneous eg: ureteric fistula

Classification according to the size

- small < 2 cm
- medium 2-3 cm
- large 4-5 cm
- extensive > 6 cm

Classification according the site

- vesico-cervical
- juxta-cervical
- midvaginal vesicovaginal
- suburetral vesicovaginal
- urethra vaginal

Diagnostic evaluation

A full vaginal examination is the most important physical examination in the evaluation of a woman with suspected VVF (16). In addition to the detection of a fistulous tract, this should include the assessment for tissue mobility, accessibility of the fistula and evidence of inflammation and oedema. Following intravenous indigo carmine dye, a fistula could be confirmed by intra-vaginally placed tampon.

This should be accompanied with cystoscopic examination to localize the vesical defect of VVF and intravenous urogram (IVU) if the bladder is normal to look for a uretero-vaginal fistula. A detailed cystourethroscopy will also be helpful to determine the status of bladder mucosa, size and the proximity of the fistula to the ureteric orifices, multiplicity of fistula tracts and the presence of serpinginous tracts. Cystoscopy will also allow to biopsy the unhealthy mucosa around

fistula in a previously known case of pelvic malignancy. A 10% risk of a simultaneous ureteral involvement with VVF (17) has been documented and this would necessitate to evaluate the ureters by IVU or retrograde pyelograms. Patients with severe bladder wall changes like bullous edema or diverticula where the cystoscopic evaluation is suboptimal, colour Doppler ultrasonography with intravesical contrst could be considered. Color Doppler study by Volkmer and colleagues using diluted contrast media and observing jet phenomenon through the bladder wall toward the vagina has demonstrated a VVF in 92% of the patients (18).

Therapeutic options

Management of VVF depends on the size of the defect, involvement of ureteric orifices, underlying causative factors and the time of detection after pelvic surgery or obstructed labour.

Conservative management

If the VVF is suspected in the immediate post operative period, a continuous catheter drainage of the bladder is advocated for 30 days. If the leakage becomes minimal, indwelling catheter should be continued for another two to 3 weeks. In 1985 Zimmern demonstrated that if the fistula is small and the urine leakage stops with Foley catheter drainage, there is a high chance of spontaneous complete healing of the tract (19). If there is no improvement by 30 days, surgical intervention is indicated for cure.

Electrocoagulation or fulguration of the fistula lining have been tried as conservative therapies with acceptable results. This technique should not be used for large fistulous tracts and inflammatory, immature and malignant fistulas. Stovsky et al demonstrated complete resolution of small fistula <3cm in over 70% of the subjects in their study group with electrocoagulation followed by 2 weeks catheter drainage (20). An alternative is to destruct the fistulous lining mechanically using the cystoscope.

Surgical management

Timing of repair

Although the occurrence of a VVF is an anguishing experience for both the patient and the surgeon, one should allow optimal tissue conditions before attempting at repair. Controversy surrounds the length of delay between index surgery and the repair. Generally, everybody agrees that the surrounding tissue should be free of infections and inflammation prior to repair for successful results. The factors that affect the success of VVF repair include the duration of the fistula, the causative factors, the tissue quality surrounding the fistula, surgical technique, and the experience of the surgeon and the overall medical condition of the patient. Longer durations are advocated for the patients with infections and irradiation of the surrounding tissues. Many authors have recommended a minimum of 3 to 6 months waiting time before repair (21,22). Fistulas detected within 24 to 48 hours following surgery could be repaired safely immediately.

Pre-operative care

In post-menopausal women, oestrogen replacement therapy with local vaginal creams with or without oral hormone replacement may assist tissue vascularization and healing. 4 to 6 weeks of therapy is generally recommended.

Antibiotic prophylaxis with broad spectrum peri-operative parenteral antibiotics is of great concern in preventing infections at operation site thereby reducing the dehiscence of suture lines. Vaginal packs soaked in antiseptic solutions are used prior to fistula repair as a part of antibiotic prophylaxis.

Patient positioning

The site of the fistula and the type of surgical approach will determine the positioning of the patient. Lawson position and Jackknife position are ideal for proximal urethral and bladder neck fistulas while dorsal lithotomy position would allow excellent access for repair of high vesico-vaginal fistulas.

Surgical techniques of repair

Different surgical techniques depend on the site of the fistula, size of the fistula and the experience of the surgeon. The techniques include vaginal approach, combined abdominal and vaginal approach, abdominal approach, laparoscopic approach and endoscopic approach. In any method of repair, following surgical principles should be observed for maximal results.

- Timing of repair to avoid tissue inflammation and infection
- Adequate exposure
- Complete haemostasis
- Adequate tissue mobilization
- Excision of the fistula tract
- Suturing without tension
- Watertight closure of the bladder
- Good blood supply at the repair site
- Continuous bladder drainage post operatively

Vaginal approach

This technique includes creation of an anterior vaginal wall flap, excision of the fistulous tract and closure of the tract with full thickness bladder wall and advancement of the vaginal flap over the closed fistulous defect. Many procedures have been used to facilitate the exposure of the fistula through the vagina, namely extended episiotomy incision or deep vaginoperineal incision and parasacral incision as an extension of vaginoperineal incision. Bleeding is an expected complication of these procedures. Catheterization of the fistulous tract with a small balloon catheter will help to bring down the defect to the field.

The following steps are involved

- Vaginal retraction using self retaining retractor
- Creation of the anterior vaginal wall flap including the fistulous opening
- Careful excision of the tract and the vaginal wall opposite the defect
- Complete mobilization of the vaginal wall away from the edges of the fistula
- Closure of the fistula incorporating bladder wall using absorbable suture material
- Advancement of the vaginal flap over to cover the site of fistula closure

This procedure is followed by vaginal packing and continuous bladder drainage with urethral catheter. In addition to urethral catheter, some surgeons use suprapubic catheters to make sure complete drainage of the bladder.

Various interposition grafts or flaps could be used in any doubtful situations of poor healing to bring about good blood supply to the area. Popular among them are Martius flap; bulbocavernosus muscle with its overlying fibro-fatty tissue as a pedicled flap described by Martius in 1928, Gracilis muscle flap and peritoneal flap.

Abdominal approach

All vesico vaginal fistulas could be easily approached through the transperitoneal or transvesical routes. Absolute indications for this approach include, the need for augmentation cystoplasty and ureteric reimplantation, difficult vaginal approach, involvement of VVF with ureteric orifices and complex presentation involving other abdominal structures.

Modified lithotomy position with slight flexion at hip joints and abduction of legs would facilitate simultaneous access and examination of vaginal vault. Lower midline incision or Pfannenstiel incision will allow adequate exposure. Three commonly practiced approaches are transvesical extraperitoneal approach, extravesical transperitoneal approach and transvesical transperitoneal approach.

Transvesical extraperitoneal approach:

- First described by Trendelenburg in 1885 (23)
- Bladder is opened and fistula visualized
- Mucosa around the fistula circumcised and tract excised
- Bladder wall and vaginal wall separated and sutured separately

Extravesical transperitoneal approach:

- First described by von Dittel in 1803 (24)
- Laparotomy
- Bladder dissected free from vaginal wall
- Vaginal and bladder defects are closed separately

Transvesical transperitoneal approach:

- Described by Legueu in 1913 (25)
- A combination of Trendelenburg and Dittel procedures
- Laparotomy and midline cystotomy
- Extension of cystotomy incision to the fistula
- Bladder dissected off the vagina
- Vaginal wall and the bladder closed separately.

Transperitoneal route allows to harvest the interpositional omentum pedicle graft for repair. Omentum graft is secured between the bladder and the vagina using absorbable sutures (8). Other types of grafts which have been used include peritoneal flaps, rectus abdominis muscle flap and autologous bladder mucosa interposition graft.

Laparoscopic approach

Laparoscopic VVF repair has been reported recently by several surgeons. Abdel Karim et al reported laparoscopic repair of VVF through transperitoneal extravesical route in 15 patients using omentum graft with 100% cure rates (26). Retrospective analysis of 5 patients who underwent immediate laparoscopic repair of VVF through extravesical technique without omental graft by Lee JH et al has shown promising results (27). Extravesical repair includes cystoscopy and ureteral catheterization and catheterization of the fistula, laparoscopic dissection of bladder from the vaginal wall

and closure of bladder and vagina with an omentum interposition graft. Melamud and co-workers have reported their successful attempt at repairing VVF using Robotic assisted laparoscopic technique (28).

Complicated VVF

Complicated VVF could be defined as

1. fistulas > 3cm in diameter
2. fistulas following failed previous repair
3. fistulas associated with prior radiation therapy
4. fistulas associated with malignancy
5. fistulas that occur in trigone, bladder neck and urethra (29).

Prior radiation therapy increases the risk of repair failure due to microvascular injury secondary to radiation. Different kinds of interposition grafts and flaps are used as tissue adjunct for successful repair which include fibrofatty labial tissue, bladder autografts, myocutaneous flaps including rectus, sartorius, gluteus and gracilis muscle flap. In the presence of prior irradiation, an interposition graft should always be considered.

Postoperative care

Continuous bladder drainage is an essential part in VVF repair. Large calibre urethral catheter with or without a suprapubic catheter will help uninterrupted drainage. The use of urethral catheter in fistulas close to bladder neck and in urethra is discouraged to reduce tension over the suture line (30). An average of two weeks catheter drainage is advocated except for fistulas secondary to radiation therapy where longer periods are required.

Bladder spasms cause significant discomfort to the patient and anticholinergics are prescribed to keep the bladder paralysed.

Acidification of urine is advised to reduce cystitis, mucus production and stone formation and vitamin C 500 mg TDS is recommended. Adequate fluid intake of 2500 to 3000 ml is suggested to produce good urine output. Stool softeners and high fibre diet will help reduce constipation.

Oestrogen replacement therapy in postmenopausal women would help tissue healing. Post operative prophylactic antibiotics are prescribed by most surgeons until the indwelling catheters are removed.

No pelvic examination or coitus should be carried out until 6 weeks and many clinicians advice complete pelvic rest for 3 months.

A voiding cysto-urethrogram is performed 2 weeks later and if no urine leak is demonstrated, catheters could be removed. Persistent minor urine leak could be managed with continuous catheter for another 2 weeks.

Complications

Specific complications which could follow VVF repair include recurrence of fistula, injury to ureter and new fistula formation. Non-specific complications include haemorrhage, infection and thromboembolism. Sexually active women may experience dyspareunia due to vaginal stenosis or fibrous scarring.

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