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Management Modalities of Vesicovaginal Fistulae

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Abstract: ***Background*:** If surgical repair is not immediate, conservative measures that may be undertaken include continuous bladder drainage with an indwelling catheter, fulguration of the fistulous tract, or the use of fibrin or cyanoacrylate glue in the tract. VVF can be best managed following basic surgical principles, such as adequate exposure, identification of structures, wide mobilization, tension-free closure, good hemostasis and uninterrupted bladder drainage. The choice of surgical repair of VVF depends on the surgeon's experience, the location and size of the fistula, and the patient's preference. VVF is most commonly repaired transvaginally, as most gynecologists find this approach more convenient. The transabdominal route is mostly used by urologists. There is no consensus on the timing of repair for successful outcome; however, the timing of surgery should be balanced between attainment of optimal tissue conditions and liberation of urinary leak for the patient. The decision for an abdominal approach for VVF repair is largely driven by patient and surgeon preference as well as the need for concomitant abdominal surgeries like augmentation enterocystoplasty, ureteral reimplantation, or repair of an enteric fistula. A buccal mucosal graft (BMG) is an oral mucosal tissue harvested from the inner cheek or lower lip. It is frequently used for the repair of urethral defects, including rectourethral and vesicovaginal fistulae. This technique was popularized after 1992 and is the first-choice graft tissue for urethroplasty in the repair of male urethral strictures. The use of oral mucosa is favored by urologists because of its similarities and compatibility with the mucosa of the urethral tract. The buccal mucosa is a nonkeratinized tissue, and its thick epithelium with vascular lamina propria gives it strength and adaptability to withstand the shearing forces in the mouth as well as defend against the microbial environment of the oral cavity.

Keywords: *Vesicovaginal Fistulae.*

Introduction

A vesicovaginal fistula (VVF) is an abnormal communication between the bladder and vagina, resulting in continuous urine leakage through the vagina [2,3].

Management of Vesicovaginal Fistulae

(I) Conservative treatment

If surgical repair is not immediate, conservative measures that may be undertaken include continuous bladder drainage with an indwelling catheter, fulguration of the fistulous tract, or the use of fibrin or cyanoacrylate glue in the tract [4,5].

Table (1): Indications and contraindications of conservative management of VVF [5].

Indications	Contraindications
-Progressively decreasing urine leakage with bladder drainage. -Fistula onset <3 weeks. -Fistula tract is long and narrow. -< 0.5 cm size fistula.	-Radiation-associated VVF. -Scarring around the fistula site. -Fistula onset >6 weeks. ->3 cm size fistula.

Fulguration or application of glue can be performed transvaginally or endoscopically. There are limited case reports and case series on conservative measures with resolution ranging between 67–100% [4,6].

With catheter drainage alone, one meta-analysis only reported an 8% success rate over 4 weeks [4]. In another study, the authors used platelet-rich plasma injections transvaginally for a success rate of 91.7% [7].

(II) Surgical intervention

VVF can be best managed following basic surgical principles, such as adequate exposure, identification of structures, wide mobilization, tension-free closure, good hemostasis and uninterrupted bladder drainage [5,8,9].

The choice of surgical repair of VVF depends on the surgeon's experience, the location and size of the fistula, and the patient's preference. VVF is most commonly repaired transvaginally, as most gynecologists find this approach more convenient. The transabdominal route is mostly used by urologists [10].

Table (2): Abdominal versus transvaginal repair [11].

Variables	Transvaginal	Transabdominal
Indication	Simple	Complex
Vaginal access/exposure	Limited	No
Blood loss	Limited	More
Invasiveness	Minimal	Maximal
Postoperative pain	Mild	Moderate – severe
Vaginal shortening	Possible	No
Associated pelvic pathology	No	Yes
Ureteric involvement	No	Yes

Timing of surgery

There is no consensus on the timing of repair for successful outcome; however, the timing of surgery should be balanced between attainment of optimal tissue conditions and liberation of urinary leak for the patient [9].

For optimization of repair, any infections should be fully treated, inflammation should be given sufficient time to resolve, and all devitalized tissues debrided along with clearance of any foreign body [11].

The classic strategy is repair within 1 week of injury or a delay of 3 to 6 months to allow for healing of the traumatized tissue. Repeat cystoscopy may be undertaken to assess for healing within the bladder and scar formation before VVF repair, as regular pelvic examinations may be less reliable [3].

II.A. Abdominal repair

Indications

The decision for an abdominal approach for VVF repair is largely driven by patient and surgeon preference as well as the need for concomitant abdominal surgeries like augmentation enterocystoplasty, ureteral reimplantation, or repair of an enteric fistula [12,13].

Disadvantages

The open abdominal approach to VVF repair can be quite morbid with longer operative times and greater blood loss when compared to the transvaginal approach although data are mostly based on retrospective reviews and not derived from randomized controlled trials [14,15].

Operative steps

As in all open pelvic surgeries, one must first consider the risks and benefits of a lower vertical versus a transverse (Pfannensteil) abdominal incision. Benefits of a midline vertical infraumbilical incision include easier access to the upper abdomen, which facilitates later retrieval of the omentum for use as an interposition graft, and decreased blood loss. Risks include potentially worse postoperative pain and a less aesthetically appealing incision [16].

There are several techniques in VVF repair with an abdominal approach that can be categorized by how the fistula is initially identified and addressed—either transvesical or extravesical and either transperitoneal or extraperitoneal [3].

(1) The transvesical approach

The transvesical approach is based on the technique described by O'Conor and Sokol as early as the 1950s, which remains a gold standard in the treatment of supratrigonal VVF. After bladder mobilization, an intentional, 4 to 5 cm high cystotomy is performed along the sagittal plane in the extraperitoneal portion of the bladder near the dome using either cautery or a scalpel [15].

The bladder incision is then extended down to the level of the fistulous tract. Regardless of whether tract excision is desired, it is imperative to fully dissect and develop the vesicovaginal plane at least 1 to 2 cm beyond the fistulous tract. This will decrease tension on the repair and aid in layered closure for both the vaginal and bladder walls [3].

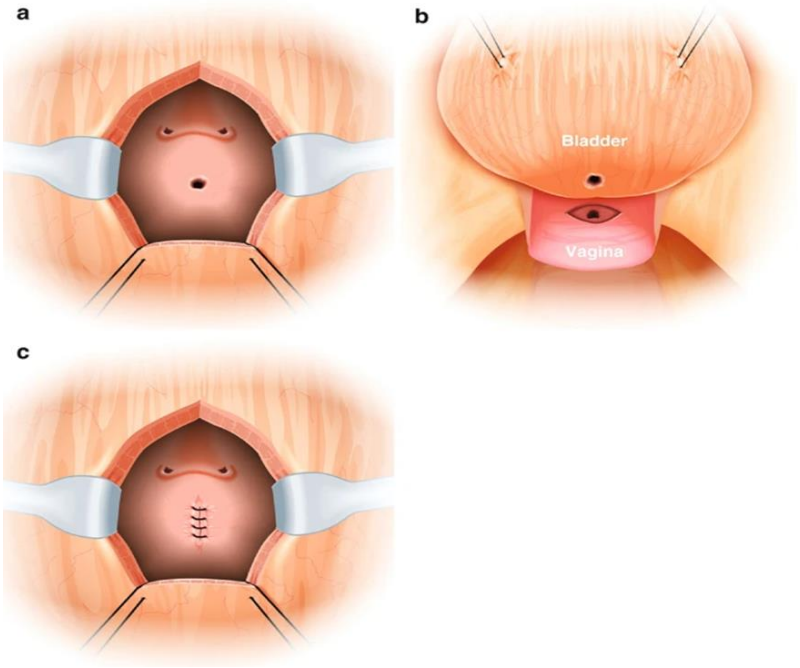

Figure (1): Transvesical approach to vesicovaginal fistula repair. (a) Cystotomy exposing the fistula. (b) Maximal mobilization vesicovaginal plane. (c) Final transvesical repair [3].

(2) The extravesical approach

The extravesical approach, first described by Von Dittel in 1803, focuses on targeted dissection, avoiding cystotomy, and preferentially dissecting to the fistulous tract via the vesicovaginal plane [17]. The superiority of either the transvesical or extravesical approach has not been established in the literature [18].

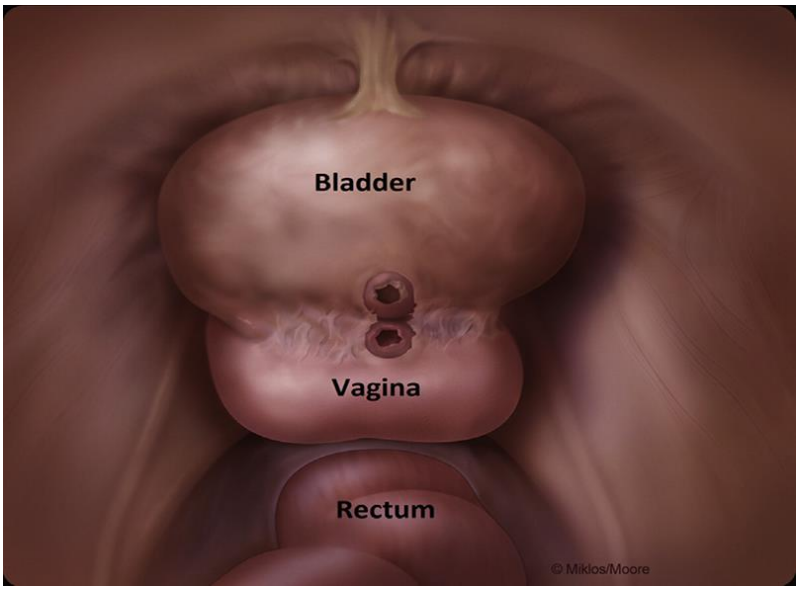

Figure (2): Extravesical dissection to fistulous tract [19].

(3) Fistulous tract excision

Classically, excision of the tract was described as an integral step for a good repair. However, this adage is now debatable. Resection of tissue to provide healthy margins was thought to improve success rates. However, excision with wide margins may result in a larger defect that ultimately can increase tension on the repair and risk of recurrence [20].

To perform a fistulectomy, the surgeon should extend the cystototomy down to the threaded fistulous tract and circumferentially resect the tract [12].

(4) Closure

A multilayered closure, with nonoverlapping suture lines, is generally preferred. The vaginal defect can be closed in a single or double layer using interrupted or running 2-0 absorbable sutures. The cystotomy should preferentially be repaired in 2 layers with either interrupted or continuous suturing using a 3-0 absorbable suture. A retrograde fill of the bladder is recommended between the first and second layer of closure to ensure a water-tight seal [19].

(5) Tissue interposition

Many surgeons performing repair of VVF support use of a tissue interposition graft. These grafts serve as barriers between the bladder and vaginal suture lines. Use of omental flaps, epiploic appendices of the sigmoid colon, or peritoneal flaps has been reported [21]. Tissue flaps are thought to provide another layer of well-vascularized tissue between the repair and surrounding tissue that could decrease failure rate [22].

Role of laparoscopy and robotic surgery

These techniques employ similar steps to the previously described open abdominal practices. Comparable success rates have been demonstrated with minimally invasive approaches compared with the open approach but are associated with decreased blood loss and a shorter hospital stay by an average of 2 days [23]. Cure rates for the laparoscopic approach range from 75% to 98%, with most studies reporting success greater than 90% for primary repair [19].

II.B. Transvaginal approach

Advantages

Table (3): Advantages of the vaginal approach in the management of VVF [24].

-Avoids the morbidity of abdominal and bladder incisions with less blood loss.
-Not affected by prior abdominal or pelvic surgeries.
-Local interpositonal flaps are easily accessible.
-Shorter operative time, less post-surgical pain, shorter hospital stay and quicker return to normal activities.

Disadvantages to the transvaginal approach include potential for vaginal shortening with apical fistula (especially the Latzko technique) and difficulty in exposing high fistulae near the vaginal cuff, especially in a narrow vagina, and the deep vagina in the absence of any degree of apical prolapse [25].

Contraindications

Contraindications to vaginal approach include: severely indurated vaginal epithelium around the fistula, small capacity or poorly compliant bladder, vaginal stenosis, repair requiring ureteral reimplantation, involvement of other pelvic structures [26].

The technique

The two most commonly techniques are the Latzko technique and the layered closure. These approaches can be performed with or without a fat pad or myocutaneous flap [26].

(1) The Latzko procedure

The Latzko procedure has long been championed for small noncomplicated fistulas and remains relevant in the current age, although its popularity has waned somewhat over the years. It is in effect a partial colpocleisis [27].

An elliptical portion of vaginal mucosa is mobilized and denuded around the fistula tract, at least 2 cm in all directions. The pubovesical fascia and vaginal mucosa are closed in layers, using interrupted sagittally oriented sutures imbricating one over the other. The vesical edges of the fistula are not disturbed with no tension across the suture lines [25].

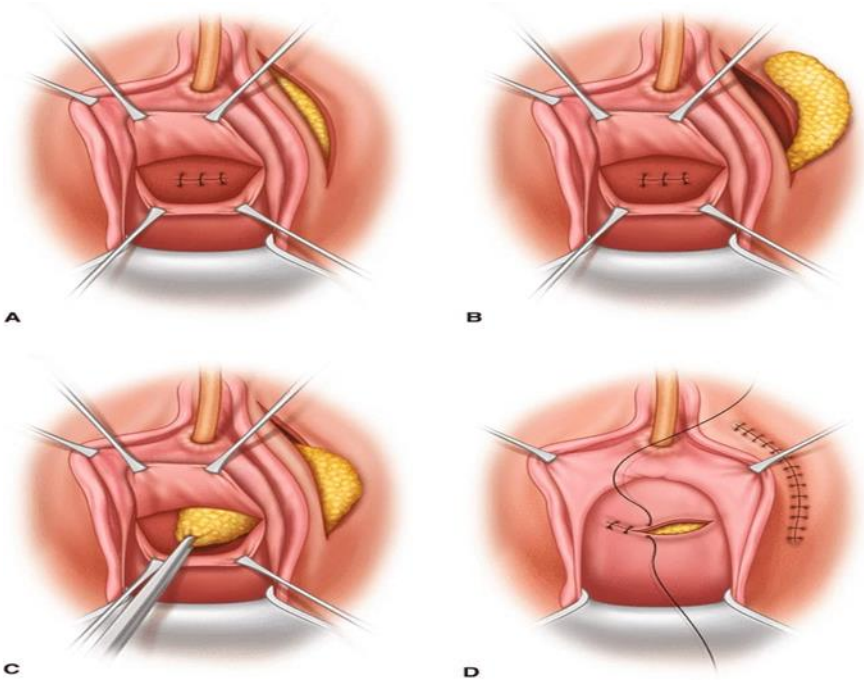

Figure (3): Latzko partial colpocleisis [25].

The major disadvantage is vaginal shortening with potential interference with sexual activity and risk of failure. The success rate ranges from 89% to 100% [11].

(2) Layered closure

Layered closure technique is used to correct simple, small fistulas. The excision of the fistula is performed after separating the bladder from the vaginal mucosa and the underlying fascia for approximately 1.5 cm [26].
The full thickness of the fistula is excised and the bladder closed in two layers. The first layer is extramucosal and the second imbricates the first one. The last layer is the closure of the vaginal wall. The main difference between the Latzko and the layered closure consists in the excision of the vesical mucosa during the layered closure [17].
(3) Martius flap
In general, the Martius flap is used as treatment for complex fistulas, including recurrent, radiation-induced or large fistulas. The procedure involves the use of a 5-6 cm long and 2-3 cm wide fat pad along the length of the labium majus which is elevated and tunneled subcutaneously into the vagina to act as an inter-positional vascular flap [26].
This flap is classically developed by making a vertical incision along the external surface or the medial border of the labia majora. It is supplied by the perineal branch of the internal pudendal and the external pudendal artery and collaterals [28].

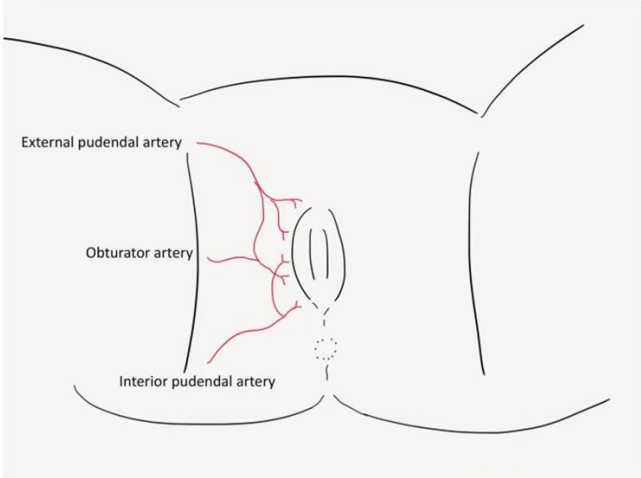

Figure (4): Schematic of the blood supply of the Martius flap [25].
When the fistula is complex and there is a significant deficit of blood supply, the bulbocavernosus muscle (modified Martius flap) can also be utilized, along with the subcutaneous and cutaneous tissue (myocutaneous flap). The flap can be uni- or bilateral according to the anatomical characteristics of the fistula [29].
(4) Gracilis flap
The gracilis flap was first described by Garlock in 1928 and is used for vaginal reconstruction after a pelvic exenteration or if a fistula is associated with radiation. The blood supply is derived from a branch of the profunda femoris entering the upper one-third of the muscle [11].
This is a long flap that can cover the medial portion of the groin, vulva, perineum and lower abdomen. Plastic surgery involvement may be needed for these complex situations. In these situations, a combination of a transvaginal and transabdominal approach may be necessary [25].\

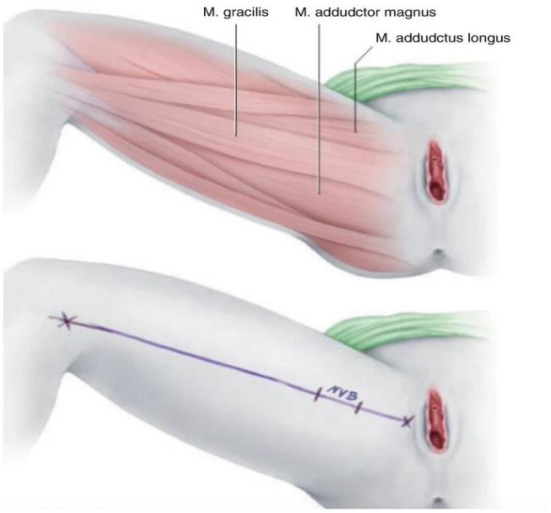

Figure (5): The gracilis flap harvest begins by delineating the anatomical landmarks. The pubic symphysis and the medial condyle of the tibia are marked, and a line is drawn between them. The approximate location of the dominant neurovascular bundle (NVB) of the gracilis flap can be identified ≈10 cm inferior to the pubic symphysis along the marked line [30].

(5) Peritoneal flap

First described in 1993 by Raz and colleagues, the posterior peritoneal flap lends itself for high-riding apical VVF. After closure of the first two layers, dissection is carried beyond the posterior wall of the bladder to expose an edge of the peritoneum in the anterior cul-de sac [11].

Care is taken to not enter the peritoneum. After mobilization of the peritoneal flap, it is advanced over the repair and secured in a tension-free manner using interrupted absorbable sutures [25].

(6) Omental flap

More commonly used for transabdominal VVF, omentum may be used if it has previously been brought down to the pelvis during a previous surgery. The advantages to the omentum as an interpositional flap are its well-vascularized pedicle and inherent lymphatic properties. During a transvaginal approach, a tongue of omentum may be accessed via peritoneal window and advanced over the fistula repair site and secured with absorbable interrupted sutures [25].

(7) Amniotic membrane

Used for decades for complex wound dressings, such as burns, researchers have proposed using an amniotic membrane as a patch over the repair for complex VVF [31,32].

Amniotic membranes act as a biological barrier and release peptide growth factors required for tissue growth, collagen deposition, and angiogenesis, while also functioning as a scaffold for tissue ingrowth [32].

Duration of bladder catheter after the operation

The benefit to the patient of having a few days less catheterization does not outweigh the increased risk of leakage from earlier removal and 14 days should remain the standard [24]:mFor simple fistulas this can be reduced to 12 days. For repeat or difficult repairs, 14-18 days is recommended. In post-radiation fistulas, 28 days is recommended.

If there is a positive dye test at the time of intended catheter removal or if the patient starts to leak urine anytime post-operatively, an extra 2-4 weeks of catheterization may allow the fistula to heal. In addition, although there are no studies to support it, getting the patient to lie prone in bed as much as possible improves the chance of closure. This is because it keeps the urine away from the fistula site posteriorly. If the leakage stops in this position, the fistula is likely to heal provided the patient can maintain this position for 10-14 days.

Other aspects of postoperative care

The post-operative care of the vesicovaginal fistula patient is just as important as the surgical repair. Beside bladder catheterization, other main principles of post-operative care include [33]:

Adequate hydration of the patient is necessary in order to maintain a good urine output and keep the urinary catheters Patent. Oral fluids can suffice. This may eliminate the need for antibiotics.

Perineal hygiene is vital. Sitz baths help to provide cleansing and ease discomfort but facilities are frequently inadequate for adequate care.

The avoidance of sexual activity or other vaginal manipulation should be strictly observed until satisfactory healing has taken place.

Repeat vaginal exams may be performed periodically for at least the first 3 months in order to detect and manage any tissue breakdown, infection, or recurrent vaginal stenosis. Gentile dilation may help to maintain some caliber to the vaginal opening. Some patients may require reconstruction of their vagina.

Recurrent fistulas should be given time to heal spontaneously with continuous bladder drainage if they are small. If drainage does not work, consider reoperation when inflammation has resolved.

Urge incontinence should be treated with anticholinergics if available. If the bladder capacity is inadequate because of scarring, an augmentation may be required.

Nutritional status post-operatively should continue to be optimized and anemia should be addressed with oral supplements or in severe cases, blood transfusion.

Education, training, and counseling is necessary to help to introduce these patients back into society. Most are divorced and without skills necessary to cope in society.

Outcomes after surgery

Of patients undergoing surgical closure, the median (range) overall closure rate in the literature in industrialized countries is 94.5 (75.8–98.6%). However, amongst patients undergoing surgical repair in underdeveloped countries, the median (range) overall closure rate was 87 (58.0–100%) [12].

Buccal Mucosal Grafts

A buccal mucosal graft (BMG) is an oral mucosal tissue harvested from the inner cheek or lower lip. It is frequently used for the repair of urethral defects, including rectourethral and vesicovaginal fistulae. This technique was popularized after 1992 and is the first-choice graft tissue for urethroplasty in the repair of male urethral strictures [34].

The use of oral mucosa is favored by urologists because of its similarities and compatibility with the mucosa of the urethral tract. The buccal mucosa is a nonkeratinized tissue, and its thick epithelium with vascular lamina propria gives it strength and adaptability to withstand the shearing forces in the mouth as well as defend against the microbial environment of the oral cavity [34].

Anatomy and biological characteristics of buccal mucosa

The intrinsic properties of buccal mucosa enable it to be a favorable material for transplantation. Histologically, buccal mucosa has a thick, nonkeratinizing, stratified squamous cell epithelium similar to that of the penile and glanular urethra. The epithelial layer overlies a thin but highly vascular lamina propria. In contrast, other materials used in urethral reconstruction such as bladder mucosa and penile skin have a thin epithelium and thick lamina propria [35].

These properties of the lamina propria facilitate graft take as the thinness of the lamina propria enables imbibition and its dense plexus of blood vessels promotes inosculation [36].

Being accustomed to a wet environment, buccal mucosa is be fitting to the urinary tract. The tissue is highly resilient, having to naturally withstand harsh conditions in the mouth. Microorganisms that normally reside within the oral cavity would cause infection if they gained access to the tissues, however, the epithelium of buccal mucosa acts as the major barrier to these threats [37].

Once transferred to the urinary tract, the BMG is repeatedly exposed to urine. Despite this change of environment, the BMG is able to thrive. Soave et al. found that integrated BMG had complete preservation of oral mucosa histological properties that were not replaced by urothelium [38].

Prior studies utilizing materials such as tunica vaginalis and skin have found that the graft undergoes metaplasia or develops epithelial thinning. The authors presumed that the ability of buccal mucosa to retain its histopathological characteristics likely accounts for its superiority to other graft materials [38].

Harvesting buccal mucosa

Technique

BMGs are often harvested concurrently with the primary urologic procedure. In order to afford access to the buccal cheek during the harvest, the surgeon must discuss airway management with the anesthesiologist prior to induction. Oral intubation is performed with the endotracheal tube directed away from the surgical field. Nasal intubation has also been described and can be utilized based on surgeon preference [39].

Self-retaining mouth retractors are helpful for maintaining mouth opening during harvest. The opening of Stenson's duct is identified as a papilla adjacent to the second maxillary molar and is marked with a marking pen. An elliptical graft is drawn with the axis extending from the oral commissure anteriorly to the external oblique ridge of the mandible posteriorly. The graft should lie 1 cm inferior to the duct to avoid damage during graft harvest and closure. 1% lidocaine with 1:100,000 epinephrine is infiltrated into the submucosal plane and used to hydrodissect the planned excision. A #15 blade scalpel is used to incise the circumference of the graft [40].

The graft is elevated in the submucosal plane off of the adherent buccinators muscle using sharp dissection with a pair of tenotomy scissors. Hemostasis is achieved at the donor site with monopolar or bipolar electrocautery. If closure of the donor site is to be performed, a 3-0 chromic suture is placed in a running, locking fashion to approximate the donor site mucosa in a single layer [40].

The graft is then thinned by draping it taught over the non-dominant index finger and tangentially cutting away muscle fibers and excess fat and submucosa with a sharp curved iris scissor. Patients are encouraged to adhere to a soft diet and use mouth wash three times daily for the next 10 days post-operatively. Various harvesting techniques have been reported with the technique described here [40].

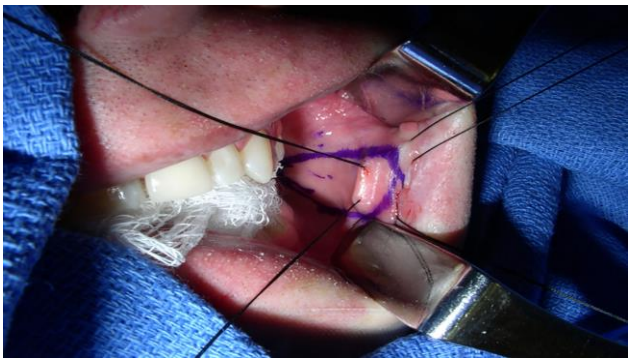

Figure (6): Typical setup for BMG harvest. The dry X-ray-detectable gauze sponge is packed to the contralateral oral space, and three retraction sutures are used with the middle incorporated into the distal apex of the graft. The Army–Navy retractors were used only for photographic exposure of the harvest site and are not typically needed during harvest [35].

Figure (7): The BMG donor harvest site closed with an absorbable running suture. The blue dot indicates the Stensen's duct. The image was obtained intraoperatively at Duke University Medical Center, with the operation completed under routine care. BMG, buccal mucosal graft [35].

Complications

Harvesting BMGs is a safe procedure. Although infrequent, early and late postoperative morbidities exist and should be discussed with the patient. Risk of clinically significant bleeding is <5% and risk of donor site infection is 1.7%. Other postoperative morbidities include prolonged pain, difficulty with mouth opening, and perioral numbness [39].

Oral pain following buccal graft harvest is well tolerated with up to 50% of patients reporting no pain in the early postoperative setting. Not surprisingly, harvesting from bilateral buccal cheeks has worse immediate postoperative pain and patient satisfaction. BMG length also corresponds with worse pain scores [41,42].

Tobacco consumption and poor oral hygiene have also been linked to worse postoperative pain control [43]. A few adjuncts have been proposed to reduce early postoperative pain, such as liposomal bupivacaine infiltrations and infraorbital nerve blocks [44,45]. Although these adjuncts have demonstrated efficacy, they have not been widely adopted, likely due to the uncertainty of cost-benefit analysis. Objective assessment of mouth opening has demonstrated a significant difference between preoperative mouth open and mouth opening during the first week post-surgery. This difference was no longer seen after 1 month and there was a return to baseline by 6 months [46].

Subjective assessment of mouth opening has yielded mixed results. Barbagli et al. reported that <2% of patients had difficulty with mouth opening on a survey administered four months post-surgery whereas Soave et al. reported that >30% of patients had some impairment with mouth opening at 6 months post-surgery. A majority of patients experience oral numbness in the early postoperative period [41,42].

Although oral numbness could easily be attributed to local analgesia, it typically persists outside the analgesic's duration of action. There is mixed data regarding the persistence of oral numbness outside of the early postoperative period. Some have reported that the vast majority of patients regain normal oral sensation by 3 months [46]. Others have reported that more than a quarter of patients continue to have oral numbness at 6 months post-surgery [46].

It has been suggested that the incidence of postoperative complications is influenced by the closure or nonclosure of the donor site. Multiple randomized control trials have been conducted to address this issue, however, superiority of one technique still cannot be claimed. The largest trial to date included 135 patients and concluded that nonclosure was noninferior to closure in regards to pain and postoperative morbidities [46].

Application in the lower urinary tract

Over the past three decades, BMGs have become the graft material of choice in complex urethral reconstruction. BMGs are suitable for long (>2 cm) bulbar strictures as well as for penile urethra and fossa navicularis reconstruction. The versatility of BMGs has facilitated the development of a variety of urethroplasty techniques [40].

Application in the upper urinary tract

Recently, BMG onlay for the treatment of ureteral strictures has gained significant popularity. Initially reported in 1999, Naude described his experience with BMG onlay (five patients) and tubularized interposition (one patient) in patients with complex ureteric strictures. All six patients performed well, without lesions on excretory urography, with follow-up durations ranging from 8 months to 6 years. Ten years later, Kroepfl described the use of BMG onlay in seven ureteral strictures in six patients. The grafts had good take in all patients, however, there was impaired drainage caused by persistent strictures below the reconstructed ureteric segments in two ureters [47].

The use of a tubularized BMG interposition was subsequently demonstrated to be successful by Badawy et al. In this series of five patients, a tubularized BMG was applied for the management of long ureteral strictures (average 4.4cm). There was no evidence of obstruction on retrograde pyelogram or sonography at a mean followup of 2 years [48]. Despite these results, caution should be applied when using tubularized grafts as poor outcomes have been demonstrated with tubularized BMG urethroplasties [49].

A necessity for the BMG ureteroplasty to take is the presence of a good vascular bed. This has been nearly uniformly reported to be in the form of an omental wrap. However, other options include perinephric fat within Gerota's fascia as well as the psoas muscle [50].

Application in the Repair of Rectovaginal Fistulas (RVFs)

All studies reporting on the use of BMGs for RVFs were considered eligible, and no restrictions were applied. Two case reports were identified:

In 2014, Grimsby et al. published the use of an autologous BMG in the repair of a recurrent iatrogenic RVF in a 4-year-old female. This patient's RVF was a complication of a Soave procedure for Hirschsprung disease and failed 1 repair attempt prior to the use of the BMG [51]

In 2019, Elmer-DeWitt et al. described the use of an autologous BMG to repair an iatrogenic RVF in a 64-year-old transgender woman. This patient had previously undergone a penile skin inversion neovaginoplasty, which was complicated by intraoperative rectal injury. These 2 reports demonstrated the successful use of buccal mucosa as a graft repair for an RVF [52].

A systematic review found a 4% complication rate occurring at the buccal donor site—most commonly scarring and contracture. Bleeding and hematoma formation occurred in <1% of cases. Patients can expect to have mild pain and discomfort for up to 4 weeks postoperatively. Patients may have limited range of jaw opening, but most return to preoperative range within 4 weeks [53].

Application in vesicovaginal fistula

In 2011, two women, aged 45 years and 56 years, were admitted due to recurrent VVF. Both women had previously undergone abdominal hysterectomies for benign conditions and, subsequently, abdominal VVF repair due to vaginal urine leakage. On admission, the younger woman had a round fistula, with a diameter of 1.5 cm, located on the left side, supratrigonally; the other woman had an ellipsoidal fistula measuring 2.5 cm × 1.5 cm, located medially and supratrigonally. Both women underwent suturing of the VVF (abdominal approach) with the interposition of BMG. After the last treatment, both women were cured [54].

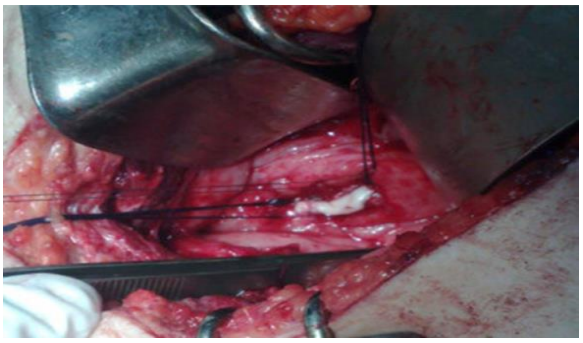

Figure (8): Buccal mucosal graft placed on the anterior vaginal wall above the vaginal sutures [54].

In a case study, the patient is a 15-year-old postmenarchal female with uterus didelphys, bilateral hematocolpos, distal partial vaginal agenesis, and a vesico-vaginal fistula diagnosed on both clinical examination and MRI. She initially presented with urinary retention and a history of cyclical, recurrent menouria. The procedure began with cystoscopy, vaginoscopy, and bilateral ureteral catheterization. The fistula was clearly identified endoscopically. The patient then underwent laparoscopic vesico-vaginal fistula repair and repair of the distal partial vaginal agenesis with buccal mucosal vaginal reconstruction. The patient tolerated the procedure well. There were no complications. The patient was discharged on postoperative day 2 in stable condition. In follow-up, the patient was voiding well with a well-healed buccal mucosal graft and excellent cosmetic outcome [55].

References

1. Michel F, Gaillet S, Boissier R, Delaporte V, Lechevallier E, Bensadoun H, et al. Epidemiology and care pathway of vesicovaginal fistulas managed in France between 2010 and 2018. World J Urol. 2022;40(4):1027-1033.
2. Agil A, Kurniawana AD. Vesicovaginal fistula with bladder and vaginal stone. Int J Surg Case Rep. 2022;96:107311.
3. Jen RP, Rangel E, Sugano DE, Rodriguez LV. Vesicovaginal Fistula: Open Approach. In: Sotelo R, Polotti CF, Arriaga J, editors. Urinary Fistula. Cham: Springer International Publishing; 2022. p. 105-124.
4. Bodner-Adler B, Hanzal E, Pablik E, Koelbl H, Bodner K. Management of vesicovaginal fistulas (VVFs) in women following benign gynaecologic surgery: a systematic review and meta-analysis. PLoS One. 2017;12(2):e0171554.
5. Rajaian S, Pragatheeswarane M, Panda A. Vesicovaginal fistula: review and recent trends. Indian J Urol. 2019;35(4):250.
6. Zhang W, Xu K, Zhang X, Hu H, Wang Q. Repair of a small and crooked vesicovaginal fistula using electrocauterization. Asian J Urol. 2018;5(3):182.
7. Shirvan MK, Alamdari DH, Ghoreifi A. A novel method for iatrogenic vesicovaginal fistula treatment: autologous platelet rich plasma injection and platelet rich fibrin glue interposition. J Urol. 2013;189(6):2125-2129.
8. Shrestha DB, Budhathoki P, Karki P, Jha P, Mainali G, Dangal G, et al. Vesico-vaginal fistula in females in 2010–2020: a systemic review and meta-analysis. Reprod Sci. 2022;29(12):3346-3364.
9. Jefferson FA, Hanson KT, Robinson MO, Habermann EB, Madsen AM, Gebhart JB, et al. Perioperative Outcomes of Vesicovaginal Fistula Repair by Surgical Approach. Urogynecol. 2023;10:1097.
10. Malik MA, Sohail M, Malik MTB, Khalid N, Akram A. Changing trends in the etiology and management of vesicovaginal fistula. Int J Urol. 2018;25(1):25-29.
11. Lee D, Zimmern PE. Vaginal approach to vesicovaginal fistula. Urol Clin. 2019;46(1):123-133.
12. El-Azab AS, Abolella HA, Farouk M. Update on vesicovaginal fistula: a systematic review. Arab J Urol. 2019;17(1):61-68.
13. Tenggardjaja CF, Goldman HB. Transabdominal Vesicovaginal and Vesicouterine Fistula Repair. Textbook of Female Urology and Urogynecology: Surgical Perspectives. 2023.
14. Sharma AP, Mavuduru RM, Bora GS, Devana SK, Singh SK, Mandal AK. Robot-assisted vesico-vaginal fistula repair: a compilation. Urology. 2018;119:1-4.
15. Kızılay F, Özdemir T, Aliyev B, Şimşir A, Kalemci S, Özyurt C. Comparison of the abdominal and transvaginal techniques in the surgical treatment of vesicovaginal fistula and analyzing the factors affecting its recurrence. J Urol Surg. 2020;7(3):238.
16. Rady HA, Mohammed NE, Ragab MH. Lower Midline Versus Pfannensteil Incision in Pelvic Lymphadenectomy in Endometrial Cancer. Indian J Gynecol Oncol. 2019;17:1-6.
17. Vaz I, Starforth L, Pizzol D, Di Gennaro F, Adile B, De Luca GM, et al. Gynecological Fistula: Epidemiology and Therapeutic Options in Mozambique.

18. Miklos JR, Moore RD, Chinthakanan O. Laparoscopic and robotic-assisted vesicovaginal fistula repair: a systematic review of the literature. J Minim Invasive Gynecol. 2015;22(5):727-736.
19. McKay E, Watts K, Abraham N. Abdominal approach to vesicovaginal fistula. Urol Clin. 2019;46(1):135-146.
20. Lo TS, Chua S, Wijaya T, Kao CC, Uy-Patrimonio MC. Clinical relevance and treatment outcomes of vesicovaginal fistula (VVF) after obstetric and gynecologic surgery. Taiwan J Obstet Gynecol. 2019;58(1):111-116.
21. Randazzo M, Lengauer L, Rochat CH, Ploumidis A, Kröpfl D, Rassweiler J, et al. Best practices in robotic-assisted repair of vesicovaginal fistula: a consensus report from the European Association of Urology Robotic Urology Section Scientific Working Group for Reconstructive Urology. Eur Urol. 2020;78(3):432-442.
22. Serinçay H, Güler HU, Ulubayram K, Mangır N. A scoping review of tissue interposition flaps used in vesicovaginal fistulae repair. Ther Adv Urol. 2023;15:17562872231182217.
23. Sayegh AS, Medina LG, Sotelo R. Vesicovaginal Fistula: Minimally Invasive Surgery (MIS) Approaches. In: Sotelo R, Polotti CF, Arriaga J, editors. Urinary Fistula. Cham: Springer International Publishing; 2022. p. 125-138.
24. Breen M, Ingber M. Controversies in the management of vesicovaginal fistula. Best Pract Res Clin Obstet Gynaecol. 2019;54:61-72
25. Vollstedt A, Hoang L, Sirls L. Vesicovaginal Fistula Repair: Vaginal Approach. In: Martins FE, Holm HV, Sandhu J, McCammon KA, editors. Female Genitourinary and Pelvic Floor Reconstruction. Cham: Springer International Publishing; 2022. p. 1-24.
26. Bacalbaşa N, Lintoiu B, Bălescu I, Dimitriu M. Diagnostic and management in vesicovaginal fistulas. J Transl Med Res. 2016;21(2):95-101.
27. Jones L, Rosenblum N. Transvaginal Repair of VVF. Textbook of Female Urology and Urogynecology: Surgical Perspectives. 2023.
28. Hamid H, Farooq K, Ullah R, Ayub U, Jan MA, Ghafoor A. The Martius Flap's Effectiveness in the Repair of Vesicovaginal Fistulae. BMC J Med Sci. 2022;3(1):38-41.
29. Ghoniem GM, Warda HA. The management of genitourinary fistula in the third millennium. Arab J Urol. 2014;12(2):97-105.
30. Tran VQ, Ezzat M, Aboseif SR. Repair of giant vesico-vaginal fistulae using a rotational bladder flap with or without a gracilis flap. BJU Int. 2010;105(5):730-739.
31. Barski D, Gerullis H, Ecke T, Varga G, Boros M, Pintelon I, et al. Repair of a vesico-vaginal fistula with amniotic membrane–step 1 of the IDEAL recommendations of surgical innovation. Cent Eur J Urol. 2015;68(4):459.
32. Price DT, Price TC. Robotic repair of a vesicovaginal fistula in an irradiated field using a dehydrated amniotic allograft as an interposition patch. J Robot Surg. 2016;10(1):77-80.
33. Ibeanu OA, Gordon DA. Genito-Urinary Fistulae: Vesicovaginal, Ureterovaginal, and Other Urinary Fistula. In: Gordon DA, Katlic MR, editors. Pelvic Floor Dysfunction and Pelvic Surgery in the Elderly: An Integrated Approach. New York: Springer New York; 2017. p. 295-310.
34. Cahill C, Kruger N, Heine J. Buccal Mucosal Grafts as a Novel Treatment for the Repair of Rectovaginal Fistulas: Protocol for an Upcoming Prospective Single-Surgeon Case Series. JMIR Res Protoc. 2022;11(4):e31003.
35. Foreman J, Peterson A, Krughoff K. Buccal mucosa for use in urethral reconstruction: evolution of use over the last 30 years. Front Urol. 2023;3:1138707.
36. Favre GA, Villa SG, Scherñuk J, Tobia IP, Giudice CR. Glans preservation in surgical treatment of distal urethral strictures with dorsal buccal mucosa graft onlay by subcoronal approach. Urology. 2021;152:148-152.
37. Nanci A. Ten Cate's Oral Histology-e-book: development, structure, and function. Elsevier Health Sciences; 2017.
38. Soave A, Steurer S, Dahlem R, Rink M, Reiss P, Fisch M, et al. Histopathological characteristics of buccal mucosa transplants in humans after engraftment to the urethra: a prospective study. J Urol. 2014;192(6):1725-1729.
39. Barbagli G, Vallasciani S, Romano G, Fabbri F, Guazzoni G, Lazzeri M. Morbidity of oral mucosa graft harvesting from a single cheek. Eur Urol. 2010;58(1):33-41.
40. Gn M, Sterling J, Sinkin J, Cancian M, Elsamra S. The expanding use of buccal mucosal grafts in urologic surgery. Urology. 2021;156:e58-e65.
41. Barbagli G, Fossati N, Sansalone S, Larcher A, Romano G, Dell'Acqua V, et al. Prediction of early and late complications after oral mucosal graft harvesting: multivariable analysis from a cohort of 553 consecutive patients. J Urol. 2014;191(3):688-693.
42. Barbagli G, Kulkarni SB, Fossati N, Larcher A, Sansalone S, Guazzoni G, et al. Long-term follow up and deterioration rate of anterior substitution urethroplasty. J Urol. 2014;192(3):808-813.
43. Markiewicz MR, DeSantis JL, Margarone JE, Pogrel MA, Chuang SK. Morbidity associated with oral mucosa harvest for urological reconstruction: an overview. J Oral Maxillofac Surg. 2008 Apr;66(4):739-744.
44. Jonnavithula N, Bachu D, Sriramoju V, Devraj R, Gunta R, Pisapati MV. Effect of infraorbital nerve block on postoperative pain and 30-day morbidity at the donor site in buccal mucosal graft urethroplasty. J Anaesthesiol Clin Pharmacol. 2019;35(1):114.
45. Chua ME, Zuckerman JM, Vi RS, Virasoro R, DeLong JM, Tonkin J, et al. Liposomal bupivacaine local infiltration for buccal mucosal graft harvest site pain control: a single-blinded randomized controlled trial. Urology. 2020;145:269-274.
46. Patel K, Kalathia J, Krishnamoorthy V. Objective assessment of mouth opening after buccal mucosal graft urethroplasty: a prospective study. Urol Ann. 2020;12(3):259.
47. Kroepfl D, Loewen H, Klevecka V, Musch M. Treatment of long ureteric strictures with buccal mucosal grafts. BJU Int. 2010;105(10):1452-1455.

48. Badawy AA, Abolyosr A, Saleem MD, Abuzeid AM. Buccal mucosa graft for ureteral stricture substitution: initial experience. Urology. 2010;76(4):971-975.
49. Horiguchi A. Substitution urethroplasty using oral mucosa graft for male anterior urethral stricture disease: Current topics and reviews. Int J Urol. 2017;24(7):493-503.
50. Zhao LC, Yamaguchi Y, Bryk DJ, Adelstein SA, Stifelman MD. Robot-assisted ureteral reconstruction using buccal mucosa. Urology. 2015;86(3):634-638.
51. Grimsby GM, Fischer AC, Baker LA. Autologous buccal mucosa graft for repair of recurrent rectovaginal fistula. Pediatr Surg Int. 2014 May;30(5):533-535.
52. Elmer-DeWitt MA, Wood HM, Hull T, Unger CA. Rectoneovaginal Fistula in a Transgender Woman Successfully Repaired Using a Buccal Mucosa Graft. Female Pelvic Medicine & Reconstructive Surgery. 2019;25(2): e43-e44.
53. Markiewicz MR, DeSantis JL, Margarone JE, Pogrel MA, Chuang SK. Morbidity associated with oral mucosa harvest for urological reconstruction: an overview. J Oral Maxillofac Surg. 2008 Apr;66(4):739-744.
54. Hadzi-Djokic J, Pejcic T, Stamenkovic V, Petrovic M, Acimovic M. Buccal mucosal graft interposition in the treatment of recurrent vesicovaginal fistula: A report on two cases. Taiwan J Obstet Gynecol. 2015;54(6):773-775.
55. Penna FJ, Bowlin PR, Odeh RI, Allen LM, Farhat WA. Pediatric Laparoscopic Congenital Vesico-vaginal Fistula Repair for Vaginal Agenesis. J Pediatr Adolesc Gynecol. 2016;29(2):164-165.