

## Review Article

# A Critical Review on Reconstructive Options for Vulvo-Vaginal Defects

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## Background

Surgery is the most common therapy for vulvar cancer. Vulvar cancers have a significant recurrence rate. Distant metastasis is less common than local recurrence in individuals with bigger tumors, and it can be effectively treated with excision or irradiation of the tumor. The nutritional assessment, fitness for anesthesia, considering patient's comorbidities, and organ function tests can reduce the risk of complications of surgery to a significantly greater extent.

Multiple operations and extreme excision often leave a huge defect without enough tissue to fill it, delaying wound healing and increasing postoperative morbidity. The patient's life quality is severely affected by the complications associated with the excisional procedures. To decrease morbidity and enhance the patient's quality of life, vulvar reconstruction should be considered following radical surgical therapy. Also,

Oncologic resection is the most common cause of vulvar deformities. The prevalence of vulvar cancer is high in women accounting for 1% of all cancers in women and 5% of all female genital cancers. Vulvar cancer is more common in those aged 65 to 70 years old and is on the rise in industrialized nations. Ablation surgeries for vulvar cancer results in huge soft tissue defects. These surgeries are associated with poor wound healing and require adjuvant therapies for fast and complete recovery. The surgical options for reconstruction using the flaps are common procedures to fill the defects and allow secondary healing. Surgical excision without reconstruction would result in perineum injury and poor wound healing, delaying the administration of any required adjuvant radiation. The main aim after reconstruction surgery includes skin closure with better quality tissues, the non-deviated position of urethral and vaginal introitus, preservation of shrinkage of introitus, restoration of the anovaginal partition, tension-free closure, and

simultaneous closure of associated defects. Pelvic support may be compromised in the case of pelvic exenteration or abdominoperineal resection, and a variable amount of dead space may need to be filled to lessen the risk of problems. Sensitive reconstruction, sexual function, attractive external form restoration, and minimum flap donor site morbidity are secondary aims. Certain algorithms have been developed to assist surgeons in deciding amongst the many flaps accessible, but they have some limitations. Beyond the vulvar and perineal boundary, they have traditionally been more concerned with the defect's size, with little regard for the surrounding faults. In gynecologic procedures for vulvar cancer and abnormalities of the groin, mons pubis, urethra, and vagina the defects are common. These defects have unique geometries that must be evaluated tridimensional as one single form to determine the flap for reconstruction appropriately. Few articles in the literature explore perforator flaps for vulvoperineal repair, and no real algorithmic strategy has been published that includes the whole armamentarium of conventional and perforator flaps. Because of the longer pedicle, improved mobility, and lower donor site morbidity, these flaps may be technically challenging, yet they are preferred in many circumstances. In this article, we've chosen to perform a medical review of the many reconstructive options available with flaps that may be employed in therapy.

## **2. Materials and Methods**

The study population included patients with advanced vulvovaginal abnormalities undergoing vulvovaginal reconstruction with flaps. We analyzed English-language literature published on PUBMED and MEDLINE issued from 1996-2015 using keywords valvular cancer, vulvovaginal reconstruction flaps, plastic surgery for vulvar abnormalities, etc. The types of vaginal defects and clinical application, advantages,

disadvantages, types of procedures, and adverse effects of different flaps were assessed. Common complications that can occur in patients after reconstruction was also described. Researchers independently screened literature, assessed the quality of literature, and extracted useful data.

### **2.1 Literature Review**

The main aim of reconstructive surgeons is to maximize wound healing after surgery and reduce complications. The wound complications are directly associated with smoking, so cessation of smoking before surgery can reduce the risk of wound complications [1].

The young sexually active woman has different requirements after vaginectomy as compared to an old woman who has undergone vaginectomy. In young females, the approach of reconstructive surgery is directed towards maximal functional sexual capacity after surgery. However, in older women, the main focus is wound healing after surgery and decreasing the risk of prolapse. In case of complete vaginal and perineal defects in old women, the flap closure of the perineum can result in good recovery, and reconstruction of complete neovagina can be avoided. It will reduce the risk of wound complications, delayed healing, and prolapse. Before reconstructive surgery, a complete discussion should be carried out by the surgeon to know the expectations of the patient after surgery and address them accordingly [4].

Several factors are addressed before planning for the surgery which include the type of flap availability, condition of surrounding tissues, previous surgical history, etc [5]. Rectus abdominis flap reconstruction is not likely possible if the patient has previously undergone abdominal surgeries, requiring abdominal

incisions. Tissues that have undergone radiation therapy are also not a good choice for flap reconstruction because they carry an increased risk of wound complications. Discussion with the oncologic surgeon before surgery helps to assess the location and size of the defect and determine the surgical plan [6].

To understand the vulvovaginal flap reconstruction, it is important to know about the defects that can be addressed with the help of this technique. According to Cordeiro's classification, there are two main types of defects that include Type I (partial) and Type II (complete) defects. These defects are further classified and include Type IA, Type IB, Type IIA, and Type IIB.

- Type IA involves a partial defect of the lateral and/or anterior vaginal wall.
- Type IB involves partial defects of the posterior vaginal wall.
- Type IIA defects are circumferential and involve the upper two-thirds of the vagina.
- Type IIB involves circumferential total vaginal resection [7].

Vaginal defects that usually require flaps from restoration usually result from oncologic resection. The main goal after vulvovaginal resection is the restoration of sexual function and body image. There are two main types of vaginal resection that require flap reconstruction and include partial and circumferential defects [8]. All these major types of defects can be restored by three types of flaps including vertical rectus abdominis myocutaneous (VRAM), gracilis flaps, and Singapore (pudendal thigh) flaps. Another type of flap known as bowel has also been well defined in recent times and has found clinical usage in some settings [9].

Vulvo-Vaginal reconstruction results in better psychological and emotional health in the woman, in addition to closed wounds. The quality of life after restorative surgery depends upon sexual function and enhanced body image. The flaps that are placed during a restorative surgery have other functions as well [10]. It must provide a wide and deep space to penetrate completely during intercourse. Enough soft tissue should be present in order to permit wound healing, separate the perineum from intraperitoneal contents, and eliminate the dead space in the pelvic cavity [11]. After surgery, there are usually two types of defects that include partial and complete thickness defects. Extensive reconstructive surgeries are reserved for complete-thickness defects while primary closure or a split-thickness skin graft can help in effective repair and reconstruction of partial-thickness defects [12].

There are several options for full-thickness defects and the most commonly used reconstruction techniques include fasciocutaneous and myocutaneous flaps. These flaps have profound usage in the reconstruction of circumferential and partial vaginal defects [13]. These flaps contain a large amount of flexible tissue that can be used for vaginal soft tissue reconstruction and fill the dead space in the pelvis as well as separate the perineum from intraperitoneal contents [14]. These flaps do not change their thickness and do not harden so there is no risk of vaginal stenosis. However, there is a disadvantage associated with these flaps as they do not have lubrication and artificial or supplemental lubrication is required during intercourse [15]. Other rare disadvantages include necrosis of the partial or complete flap. If you take into account the specific complications associated with the flaps, the VRAM flaps carry the least complications as compared with Singapore and gracilis flaps. Other complications associated with flaps surgery include donor site

complications [16].

In the case of circumferential vaginal flaps, reconstruction with small and large bowel is well described. These flap surgeries are associated with a complication related to bowel resection and excessive discharge from the bowel tissue placed in the vagina. In some clinical settings, satisfactory results have been obtained by bowel flaps. The benefits of bowel vaginal flaps include the following:

- Natural lubrication through mucus production from bowel tissues
- No vaginal stent is required for maintaining vaginal caliber and depth
- The texture will be similar compared with the natural vagina
- Can also be used for congenital genitourinary conditions [17].

The Singapore flaps are supplied by perineal arteries through posterior labial arteries. The patient is put in a lithotomy position and the flaps are raised in the subfascial plane over the thigh from anterior to the posterior aspect of the adductor muscles of the thigh just lateral to labia majora. About 6×15 cm of skin area can be elevated using Singapore flaps [18]. Two types of defects can be restored using Singapore flaps. One is a partial vaginal defect that can be restored by a single flap while the other is a total vaginectomy defect that can be restored with the help of bilateral flaps. In total vaginectomy defects, bilateral flaps are sutured with each other to form neovagina with the opening at the introitus and swapped toward the midline [19]. These flaps are being extensively used in the reconstruction of anterior and lateral defects of the vagina (type IA) and the donor sites are closed primarily to allow healing. These flaps have several advantages and disadvantages. The advantages include

decreased operative time, concealed donor site, and thin well-counteracted vagina [20]. On the other hand, the disadvantages include necrosis of flaps leading to complete flap loss in less than 15% of patients. Hair growth and painful intercourse are other documented effects of the Singapore flaps [21].

The VRAM flaps are effective reconstructive options for the reconstruction of posterior partial vaginal defects (type IB). This flap provides well-vascularized neovagina with muscle mass allowing the separation of intrabdominal contents and perineum and obliterating the dead space in the pelvis. The flap is designed to help the superior portion of the muscle and is covered by a vertical skin paddle to allow maximum flap rotation [22]. During restoration with the VRAM flaps, care should be taken to keep the cutaneous perforator in the flaps to decrease the risk of compromised blood supply [23]. The rectus abdominis muscle is detached from its coastal insertion and rotated downward. The attachment on symphysis pubis can be maintained or released depending on the wound and desired results. The donor site is closed primarily up to the width of 8cm or a large skin paddle can be designed on the length of the muscle and the flap is rotated to the pelvis [24].

Another type of defect that can be reconstructed with a rectus abdominal flap is a circumferential vaginal defect (type II). In circumferential defects, the rectus abdominis muscle can be rotated to form a double layer, and the middle of the skin paddle is inserted into the apex of the vaginal vault [25]. Another technique that can be used is rolling the flap to make a tube-shaped structure and insert it into the vagina [26]. The vertical skin paddle is used to form the vaginal pouch in this technique. The cap is formed which can be sutured to the remaining cylindrical remnant of the

vagina and fill the pelvis. In the patients that have undergone abdominoplasty, supply from the deep inferior epigastric artery is not reliable, VRAM flap is contraindicated because of compromised supply to abdominal structure and viscera [27].

Gracilis flaps are another reconstructive option in cases where Singapore flaps and VRAM flaps are not available. In patients with previous abdominal scars due to surgeries, these flaps are very useful. In patients with two recti due to any illness for fecal and urinary diversion, these flaps can be a useful alternative to other rectus abdominis flaps [28]. They have significant clinical application in the repair of total circumferential vaginal defects (type IIB). Bilateral gracilis myocutaneous flaps provide a larger mass of skin for the reconstruction of the vaginal vault. Gracilis flaps have soft tissues and muscle mass that are adequate to fill dead space in the pelvis and separate the intrabdominal contents from the perineum [29]. The success rate of gracilis flaps is not yet completely understood because according to some authors, the gracilis flap loss rate is up to 15% while others reported no flap loss after reconstruction with gracilis flaps. The success rate and reliability of gracilis flaps depend upon the site of the proximal skin island and the preservation of cutaneous perforators because these factors provide maximal viability.

The gracilis flap is supplied by the medial circumflex femoral artery, which is a branch of the profunda femoris. The flap is designed over the medial side of the thigh in such a way that the axis between the semitendinous tendon and pubic tubercle is in the center of the flap. During the elevation of the flap, care is taken to preserve the cutaneous perforators. The pedicle is identified at the gracilis muscle between the adductor Magnus and adductor longus muscle at the

proximal 1/3<sup>rd</sup> point. The myocutaneous flap is inserted into the vaginal defect after tunneling and separation of the gracilis. The gracilis reconstruction results in prominent scars, which is a major factor in its slightly decreased clinical application. The donor site is closed primarily to allow healing [31].

Another option for flap reconstruction is the posterior thigh flap, which can be used in partial and total vaginal reconstruction but is rarely used as compared to other flaps. In partial reconstruction single flap is taken, while in the total vaginal reconstruction, flaps from both thighs are taken. The patient is put in a lithotomy position and the flap is elevated off the inferior gluteal artery. A skin island of 34 × 15 cm can be elevated from the center of the posterior thigh and the center point of the line between the greater trochanter and ischial tuberosity is marked as a reference point [32].

Bowel flaps are a useful technique in the restoration of circumferential vaginal defects. Donor sites options include small bowel, rectosigmoid colon, and ascending colon. The bowel should be prepared before the reconstruction surgery because it lowers the risk of infection and healing problems. The bowel segment can be taken from the body via laparoscopic techniques or regular laparotomy [33,34]. Reconstruction with the colonic segment provides the benefit of a decreased amount of secretions and increase mass for filling the pelvic cavity as compared to the small bowel segment. However serious complications have occurred following vaginal reconstruction with bowel flaps including ulcerative colitis in the sigmoid colon flap, after 14 years of surgery [35]. Neovaginal prolapse after 33 years of sigmoid colon vaginoplasty that has also been treated successfully with retroperitoneal sacropexy. Some

other techniques can be adopted prophylactically or as a treatment for neovaginal prolapse that includes fixing the flaps to the sacrospinous ligament and anterior rectus sheath [36].

In recent research, the authors concluded that after 5 years of follow-up of rectosigmoid vaginoplasty, there was a loss incidence of excessive discharge and stink and the caliber of neovagina was well-maintained [37]. The patients were able to perform intercourse with comparable satisfaction to the normal vagina. The rectosigmoid flap is taken off the superior rectal artery and length is estimated to be 8-12 cm and shifted locally to the pelvic cavity to form a neovagina. In patients with any type of bowel vaginoplasty, the incidence of malodor can be reduced by regular douches [38,39].

### **3. Discussion**

Vulvovaginal defects usually result from neoplastic diseases in which apart from the vulva and vagina other perineal structures are resected. Other disorders include perineal wound and pelvic exenteration. Reconstruction requires filling of dead space of pelvis and placement of skin island. In patients with external beam radiation and abdominoperineal resection, perineal wound complications can occur in more than 50% of patients. Perineal wound complications can be effectively resolved using two types of flaps known as rectus abdominis flaps and gracilis flaps. In some patients, perineal hernias occur in patients after reconstruction with rectus abdominis flaps.

Till now the most effective clinically approved reconstructive technique includes rectus and gracilis

flaps. It is due to the fact that these provide an extensive mass of vascularized tissue for separating the intraabdominal contents and filling the dead space of the pelvis. The skin paddle can be inserted in an oblique direction in the pelvis to fill up the dead space of the pelvis. Thigh flaps are useful and effective in the reconstruction of vulvovaginal defects where other types of flaps are not available. However, there is a different perspective about the effectiveness of thigh flaps and gracilis flaps. Some authors recommend gracilis flaps and place the thigh flaps as alternative options, while others have an opposite perspective. However, the complications associated with gracilis flaps and thigh flaps are significantly higher as compared to rectus abdominis flaps. These complications include wound dehiscence, delayed healing, pelvic abscess formation, and infection. The posterior thigh flap elevated from a posterior gluteal artery provides extensive soft tissue mass for filling pelvic dead space and can be conducted in a short time.

### **4. Conclusion**

The planning for reconstruction and type of flap used for reconstruction depends upon different factors including the type of vaginal defect, choice of reconstructive surgeon, a collaboration between extirpative and reconstructive surgeons, previous surgical and medical history of the patients, and availability of restorative techniques. All types of flaps carry both positive and negative effects, but the large variety of flaps ensures that all the patients requiring reconstructive surgeries can be effectively managed and better results can be achieved.

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