

Postablative reconstruction of vulvar defects with local fasciocutaneous flaps and superficial fascial system repair

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Abstract

Introduction Postablative reconstruction of vulvar defects is a difficult challenge because of the functional, locational and cosmetic importance of this region. Local flaps carry a high incidence of delayed wound healing as local flaps may redistribute but not eliminate local wound tension. Repair of the superficial fascial system may avert local complications by minimising tension to the skin and increasing the initial biomechanical strength of wound. The aim of this study was to determine the clinical outcome of local fasciocutaneous flaps used for postablative reconstruction of vulvar defects in which the superficial fascial system was repaired.

Methods A retrospective analysis was conducted of patients with vulvar carcinoma in situ or vulvar carcinoma, who underwent ablation and immediate reconstruction with local fasciocutaneous flaps and superficial fascial system repair. Postoperative complications were recorded and clinical outcomes were evaluated.

Results Twelve of the 13 flaps healed primarily. Complications included 2 superficial wound infections, both of which were treated successfully with antibiotic therapy. One flap was complicated by minor wound dehiscence, which healed with conservative treatment.

Discussion Local fasciocutaneous flaps with superficial fascial system repair provide excellent design flexibility

and can be designed and tailored to reconstruct postablative vulvar defects with good outcomes and minimal morbidity.

Keywords Surgical flaps · Vulvar neoplasms · Vulvar reconstruction

Introduction

Postablative reconstruction of oncologic vulvar defects can be challenging because of the lack of sufficient local tissue [1–3]. Postablative vulvar reconstruction should not interfere with the important functions of micturition, reproduction and defaecation that occur in the region of the female perineum. Direct closure is carried out whenever possible, but in certain cases the tension transmitted by direct primary closure stretches the skin and can cause wound breakdown. This may lead to limited lower limb mobility and pain, and prolong patients' stay in hospital.

The goal of vulvar reconstruction is to provide thin, pliable, sensate, durable, reliable and stable coverage with minimal morbidity. The reconstruction must avoid bulkiness, orifice stenosis, reduced sensation and technical complexity. Efforts should be made to provide an aesthetically acceptable result. In addition, reconstruction should also be of low morbidity and not hinder future disease surveillance.

Skin grafting is not usually suitable because of the nature of the area and interference with function and cosmesis. Flaps, by importing vascularised tissue, may overcome these difficulties but are not free from problems [2, 3]. Postablative reconstruction of vulvar defects has generally used local flaps, such as pudendal thigh flaps, gluteal fold flaps or V-Y flaps [2, 3]. Although simple to perform with minimal donor-site morbidity, local flaps carry a high

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incidence of delayed wound healing as they may redistribute but not eliminate local wound tension [4].

Fasciocutaneous flaps are used for many soft-tissue reconstructive procedures. However, their use for postablative vulvar reconstruction has been limited in the literature [4]. Superficial fascial system (SFS) repair after flap transposition may avert local wound dehiscence by minimising tension to the skin through transfer of tension from the dermis to the deeper tissues [5]. The continuity of the dermis to the SFS ensures a direct energy transfer, and the oblique and vertical orientation of the SFS septae disperses the energy in a direction perpendicular to the wound tension [5]. Repair of the SFS increases the initial biomechanical strength of wound and has the potential to more effectively close dead space, reduce seroma formation and decrease early wound dehiscence [5]. The aim of this study was to determine the clinical outcome of local fasciocutaneous flaps used for postablative reconstruction of vulval defects in which the SFS was repaired.

Methods

A retrospective analysis was conducted of patients with vulvar carcinoma in situ or vulvar carcinoma, who underwent ablation and immediate reconstruction with local fasciocutaneous flaps. Postoperative complications were recorded and clinical outcomes evaluated (Fig. 1).

Surgical approach

Ablation was performed by gynaecologic surgeons. Once negative margins were obtained and the final defect was known, the size and extent of the defect and the laxity and quality of the vulvo-perineal skin were evaluated by plastic surgeons.

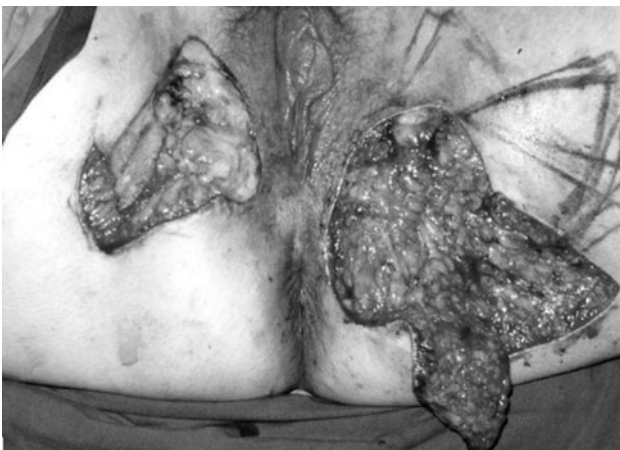


Fig. 1 Clinical case demonstrating postablative vulval defects and local fasciocutaneous flaps

Surgical technique

This fasciocutaneous flap derives its blood supply from the suprafascial plexus via perforators. The flap has a basic V-shaped design that is immediately adjacent to the postablative defect that approximates a quadrangle. The flap size is 0.5 cm smaller than the measured postablative defect. Larger flaps need more extensive local tissue dissection to transpose them into the desired position. Subfascial dissection is performed to identify the perforators. Once the perforators are located, the flaps were designed around the perforators and include skin, subcutaneous fat including the SFS and the deep fascia. The skin incision is marked with ink. The skin is incised through the subcutaneous tissue to the deep fascia. The incision origin is placed slightly posterior to the midpoint of the defect border. The axis of the flap is planned after consideration of certain factors. If the vulvar defect is oblong, the short diagonal of the flap should fall along its width. If the vulvar defect is round, the short diagonal can be chosen to lie along the maximum extensibility of the skin. After considering the shape and the axis of the defect to be created, the ablation margins are marked. In planning the flap, the short diagonal of the flap is extended towards lax skin (e.g. posterior-medial thigh, gluteal fold) and, if possible, away from the anterior thigh where the skin is less extensible. Another line, drawn parallel taking into account the laxity of the skin, completes the planning of the flap. The V is maintained as wide as possible to maximise the arterial inflow and venous drainage to the tip of the flaps. Both limbs of the V are of equal length. In bilateral cases, the flaps are mirror images of one another to maintain symmetry. Flap elevation is in the subfascial plane, deep into the epimysium. After flap harvest, the adjacent vulvar tissue is undermined below the level of the SFS for several centimetres to allow flap transposition over the postablative defect and primary closure of the donor site V incision on itself (Figs. 2, 4). Before proceeding to transposition of the flap, careful haemostasis must be obtained in the large lobules of fat that form part of the flap [6]. This is achieved using electrocautery. Mobilisation of the flap must be adequate to allow the sutures to be placed without tension. It is preferable to leave a portion of the flap unsutured than to close under tension. Wound closure is in two layers: first the SFS and then the skin. Suction drains, prophylactic antibiotics and thromboembolic deterrent stockings were used in all cases. A light protective dressing was applied. The sutures were removed 2 weeks after the operation (Figs. 3, 5).

Postoperative care

Postoperative care has two important components: physical and psychological. There are no absolute rules, but most patients benefit from at least 1–3 days of bed rest in the



Fig. 2 The local fasciocutaneous flaps are transposed into the vulvectomy defects and the donor sites are closed



Fig. 3 The same patient on discharge



Fig. 4 Second clinical case demonstrating postablative “mirror” vulval defects and local “mirror” fasciocutaneous flaps



Fig. 5 The same patient on discharge

supine position with the thighs positioned in such a way as not to compress the flap and not to apply tension on it; this is essential because direct pressure on the flap or donor site compromises the blood supply and flap viability. Regular vulvar cleaning three to four times a day and after each urination must start, with the use of an antimicrobial ointment after each wash. Suction drains were removed after a minimum of 2 days when drainage was less than 50 ml/day per drain. The Foley catheter usually remained in place for 3 days until ambulation. Patients were encouraged to sit, stand, and ambulate (mobilise) progressively once the oedema settles. Immobility leaves patients prone to constipation and thromboembolism: prophylaxis is crucial for both. Sexual intercourse can be attempted after about 6 weeks, depending on patient comfort. All the patients were followed-up for at least 12 months.

Results

A total of eight female patients underwent perineal ablation and had soft-tissue reconstruction using local fasciocutaneous flaps. The mean age of the patients was 56 ± 6 years (mean \pm SE). Perineal defects were due to vulvar intraepithelial neoplasia in four cases, vulvar carcinoma in three cases and vulvar Paget disease in one case. All the diseases were histologically reported as completely excised. The defects were unilateral in two cases of vulvar intraepithelial neoplasia and one patient with vulvar carcinoma. The defects were bilateral in two patients of vulvar

intraepithelial neoplasia, two patients with vulvar carcinoma and the patient with vulvar Paget disease. Therefore, the results of 13 flaps are reported, with a mean follow-up of 3 ± 1 years (mean \pm SE).

Twelve of the 13 flaps healed primarily, though two patients in the series suffered a superficial wound infection, which responded to antibiotic therapy. One patient undergoing reconstruction of a unilateral vulvar intraepithelial neoplasia defect suffered necrosis of the tip of the flap leading to a minor wound dehiscence, which healed secondarily without further surgical intervention and did not lead to any long-term sequelae. No donor-site morbidity was reported. Patients were discharged from hospital 16 ± 1 days (mean \pm SE) post-reconstruction. The women with partners were all able to resume sexual activity postoperatively.

Discussion

Surgery for malignant or pre-malignant vulval disease frequently requires that a considerable area of skin be resected [7]. Patients may suffer significant morbidity if this skin is not replaced. Local fasciocutaneous flaps are preferred for vulvar reconstruction because of their characteristics in terms of thickness, reliability and low morbidity. Tension may cause wound breakdown and also contribute to a restricted range of movement with associated discomfort [5]. Local fasciocutaneous flaps with SFS repair provide excellent design flexibility and can be designed and tailored to reconstruct postablative vulvar defects with good outcomes and minimal morbidity. The relatively short hospital stay in this series of patients, despite their age, suggests that the morbidity of postablative surgery is controlled by this method of reconstruction.

A combined surgical approach for the treatment malignant or pre-malignant vulval disease best serves the patient. The ablational gynaecological surgeon, free from anxieties of achieving wound closure, does not compromise the excision, and the reconstructive plastic surgeon is able to tailor-make the reconstruction to the shape of the defect [8]. This study highlights this complementary approach.

Reconstruction of the vulva is important for functional, cosmetic and psychological reasons. The vulva in a non-irradiated field has a good blood supply, mostly from branches of the internal pudendal artery (a terminal branch of the internal iliac artery). It is frequently possible to primarily close the defect, but the sutures are often under tension and there will be a high rate of wound breakdown. The functional and cosmetic result may also be compromised. The wide range of reconstructive options for vulval reconstruction includes skin grafts, skin flaps, fasciocutaneous flaps and myocutaneous flaps. Split skin grafts were

used in the past but graft-take was not satisfactory due to the location of the wound; it was easy to get contaminated, and when it does, it commonly undergoes secondary contraction. Local flaps involve mobilising tissue adjacent to the defect. Rotational flaps and transposition (e.g. rhomboid) flaps are often sufficient for moderate defects. Larger defects require regional flaps created by mobilising a nearby island of tissue (e.g. the gluteal fold flap, an extremely useful and versatile flap) or distant pedicled flaps which may be taken from the thigh (e.g. gracilis) or the abdomen (e.g. TRAM based on the deep inferior epigastric artery). Vulval defects reconstructed using a flap have lower rates of infection and breakdown than defects using direct primary closure [2, 3]. In an irradiated field, undamaged vascularised tissue must be imported to the defect for regional or distant flaps.

Vulvar reconstruction with an immediate single-staged sensate flap that provides reliable and durable coverage is the ideal choice. Flaps, by importing vascularised tissue, may overcome these difficulties but are not free from problems. Vulvar reconstruction with myocutaneous flaps may involve the sacrifice of important functional muscles and are frequently bulky. The gracilis flap is probably the best known and most commonly used of the myocutaneous flaps [9]. Unfortunately, the viability of the cutaneous component of this flap is unreliable [9]. Other techniques require time-consuming dissections and sacrifice of important functioning muscles, such as the rectus abdominus and gluteus maximus to preserve their blood supply [10, 11]. The tensor fascia lata flap has to be transferred from a distant site with obvious potential hazards, leaving extensive scarring [12]. Skin flaps, such as the superomedial thigh flaps and pudendal thigh flaps take tissue from the same linear plane as the defect and are therefore vulnerable to tension across the flaps [13, 14]. Regional flaps can provide healthy and reliable soft-tissue coverage when local flaps are unavailable, and minimise wound tension but sacrifice important functioning muscles, such as the rectus abdominus and gluteus maximus to preserve their blood supply [15, 16].

Vulvar reconstruction with myocutaneous flaps has numerous disadvantages when compared with the fasciocutaneous flaps: more difficult preoperative management, more difficult operation, greater extension of scars into the donor site, more changes of position during operation, necessity of a greater ability by the surgeon and more difficult application in older patients. Less and less use of myocutaneous flaps (rectus abdominis muscle flap [11, 15]; medial thigh flap [13, 14], superomedial thigh flap [13] and other musculo-cutaneous flaps: tensor fascia lata flap, deep inferior epigastric perforator flap, Epiplon flap, etc.) [17–19] is being made at the reconstructive stage while favouring the use of fasciocutaneous flaps [20].

Fasciocutaneous flaps represent an excellent tool for vulvar reconstruction. The fasciocutaneous flaps most commonly used are the mobilised ones from the perineal region due to their high vascularisation and wide mobility: lotus petal flap [21, 22], V-Y flap from the pubic region [23], V-Y advancement flap from the gluteal fold [24] and from the medial thigh [25] and pudendal-thigh flap [26].

In this study, fasciocutaneous flaps proved to be robust and reliable. The design and surgical technique are relatively straightforward and thus do not add a great deal of time to the operation. These local fasciocutaneous flaps are indicated for postablative reconstruction of small- to medium-sized tissue vulvar defects, including those defects involving the anterior commissure, perianal region, internal vaginal pavement, and labia majora and minora. These flaps are limited only by the ability to achieve primary wound closure. Skin laxity in the donor area determines the preferred flap. Local fasciocutaneous flaps can be tailored to the shape of the defect without difficulty, provide excellent design flexibility and allow the flap donor site to be closed directly, reducing scarring to a minimum. This compares with other skin flaps, where the design frequently limits their mobility and their reach [2–4, 7, 9–14]. No functioning muscle is killed, so the transferred tissue is not bulky and fits well to the defect, giving a natural appearance. Flap survival was excellent and the donor site scar area healed nicely. They offer excellent cosmetic results while being technically simple to perform with minimal disruption of the donor site.

The SFS is the connective tissue network that resides below the dermis and provides the major structural support for the skin and fat of the body [4]. The SFS is a viscoelastic layer in possession of functional biomechanical properties [4]. The SFS provides the major structural support for the skin and fat of the body, and repair of the SFS would be expected to diffuse the tension on the skin flap, lift areas of soft-tissue ptosis and provide long-lasting support [4]. Its description and surgical application have made a significant contribution to body-contouring surgery [4].

This single-staged sensate flap is raised with both the deep fascia with its suprafascial and subfascial plexus to optimise the circulation. Repair of the SFS transfers tension from the dermis to the deeper tissues, minimising tension to the skin flap [4]. This biomechanical energy transfer is enhanced by the dermis–SFS junctional architecture [4]. The continuity of the dermis to the SFS ensures a direct energy transfer, and the oblique and vertical orientation of the SFS septae disperses the energy in a direction perpendicular to the wound tension [4]. Therefore, closure of the SFS layer averts local complications by minimising tension to the skin and increasing biomechanical strength of wound which decreases early wound dehiscence [4].

Local fasciocutaneous flaps are preferred for vulvar reconstruction because of their characteristics in terms of thickness and reliability, but carry a high incidence of delayed wound healing as local flaps may redistribute but not eliminate local wound tension. Repair of the SFS layer averts local complications by minimising tension to the skin and increasing biomechanical strength of wound which decreases early wound dehiscence [4]. Fasciocutaneous flaps in which the SFS is used to minimise tension for the vulvar reconstruction provide excellent design flexibility and can be designed and tailored to reconstruct postablative vulvar defects with good outcomes and minimal morbidity.

Conflict of interest None.

References

- Al-Benna S, Steintraesser L (2009) Postablative reconstruction is better terminology than oncoplastic surgery. *Plast Reconstr Surg* 124:463e–464e
- Lazzaro L, Guarneri GF, Rampino Cordaro E, Bassini D, Revesz S, Borgna G, Parodi PC (2010) Vulvar reconstruction using a “V-Y” fascio-cutaneous gluteal flap: a valid reconstructive alternative in post-oncological loss of substance. *Arch Gynecol Obstet* 282:521–527
- Knapstein PG, Mahlke M, Poleska W, Zeuner W (1989) Surgical treatment of vulvar cancer and plastic reconstruction of vulvar defects. *Arch Gynecol Obstet* 245(1–4):504–512
- Salgarello M, Farallo E, Barone-Adesi L, Cervelli D, Scambia G, Salerno G, Margariti PA (2005) Flap algorithm in vulvar reconstruction after radical, extensive vulvectomy. *Ann Plast Surg* 54:184–190
- Al-Benna S, Al-Ajam Y, Tzakas E (2009) Superficial fascial system repair: an abdominoplasty technique to reduce local complications after caesarean delivery. *Arch Obstet Gynaecol* 279:673–675
- Al-Benna S (2011) Perioperative management of morbid obesity. *J Perioper Pract* 21:225–233
- Weikel W, Schmidt M, Steiner E, Knapstein PG, Koelbl H (2008) Reconstructive plastic surgery in the treatment of vulvar carcinomas. *Eur J Obstet Gynecol Reprod Biol* 136:102–109
- Al-Benna S (2011) Female plastic and reconstructive surgeons’ personal decision making for breast cancer treatment and reconstruction. *Arch Gynecol Obstet* 284:737–741
- McCraw JB, Massey FM, Shanklin KD, Horton DE (1976) Vaginal reconstruction with gracilis myocutaneous flaps. *Plast Reconstr Surg* 58:176–183
- Ogino M, Sakamoto T, Hove J, Dobashi K, Okinaga S, Arai K (1992) Reconstruction of surgical defects using the gluteus maximus myocutaneous flap following radical vulvectomy. *Asia Oceania J Obstet Gynaecol* 18:23–29
- Shepherd JH, Van Dam PA, Jobling TW, Breach NM (1990) The use of rectus abdominus myocutaneous flap following excision of vulval cancer. *Br J Obstet Gynaecol* 97:1020–1025
- Chafe W, Fowler WC, Walton LA, Currie JL (1983) Radical vulvectomy with use of tensor fascia lata myocutaneous flap. *Am J Obstet Gynecol* 145:207–213
- Hirshowitz N, Peretz BA (1982) Bilateral superomedial thigh flaps for primary reconstruction of scrotum and vulva. *Ann Plast Surg* 8:390–395

14. Wee JTK, Joseph VT (1989) A new technique of vaginal reconstruction using neurovascular pudendal thigh flaps: a preliminary report. *Plast Reconstr Surg* 83:701–709
15. Höckel M (1996) The transversus and rectus abdominis musculoperitoneal (TRAMP) composite flap for vulvovaginal reconstruction. *Plast Reconstr Surg* 97:455–459
16. Ogino M, Sakamoto T, Inoue J, Dobashi K, Okinaga S, Arai K (1992) Reconstruction of surgical defects using the gluteus maximus myocutaneous flap following radical vulvectomy. *Asia Oceania J Obstet Gynaecol* 18:23–29
17. Gorchev G, Tomov S, Baichev G, Popovska S, Velkova A (2006) Clinical and surgical aspects of vulvar reconstruction with tensor fasciae latae flaps after en bloc radical vulvectomy. *J Buon* 11:55–60
18. Muneuchi G, Ohno M, Shiota A, Hata T, Igawa HH (2005) Deep inferior epigastric perforator (DIEP) flap for vulvar reconstruction after radical vulvectomy: a less invasive and simple procedure utilizing an abdominal incision wound. *Ann Plast Surg* 55:427–429
19. Luo S, Raffoul W, Piaget F, Egloff DV (2000) Anterolateral thigh fasciocutaneous flap in the difficult perineogenital reconstruction. *Plast Reconstr Surg* 105:171–173
20. Arvas M, Köse F, Gezer A, Demirkiran F, Tulunay G, Kösebay D (2005) Radical versus conservative surgery for vulvar carcinoma. *Int J Gynaecol Obstet* 88:127–133
21. Yii NW, Niranjana NS (1996) Lotus petal flaps in vulvovaginal reconstruction. *Br J Plast Surg* 49:547–554
22. Franchelli S, Leone MS, Bruzzone M, Muggianu M, Puppo A, Gustavino C, Di Capua E, Centurioni MG (2009) The gluteal fold fascio-cutaneous flap for reconstruction after radical excision of primary vulvar cancers. *Gynecol Oncol* 113:245–248
23. Moschella F, Cordova A (2000) Innervated island flaps in morphofunctional vulvar reconstruction. *Plast Reconstr Surg* 105(5):1649–1657
24. Lazzaro L, Guarneri GF, Cordaro ER, Bassini D, Revesz S, Borgna G, Parodi PC (2010) Vulvar reconstruction using a “V-Y” fasciocutaneous gluteal flap: a valid reconstructive alternative in post-oncological loss of substance. *Arch Gynecol Obstet* 282:521–527
25. Persichetti P, Simone P, Berloco M, Casadei RM, Marangi GF, Cagli B, Di Lella F (2003) Vulvo-perineal reconstruction: medial thigh septo-fascio-cutaneous island flap. *Ann Plast Surg* 50:85–89
26. Wee JT, Joseph VT (1989) A new technique of vaginal reconstruction using neurovascular pudendal-thigh flaps: a preliminary report. *Plast Reconstr Surg* 83:701–709