Surgical Techniques for Vulvar Cancer

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Modern management of vulvar cancer requires an individualized approach, with each patient requiring an assessment of the most appropriate operation for (i) the primary lesion, and (ii) the regional lymph nodes (1). The old approach of radical vulvectomy and en bloc bilateral groin dissection for virtually every patient is no longer acceptable practice. We recently reported 121 cases of T1 and T2 vulvar cancer, with negative lymph nodes, from The Royal Hospital for Women in Sydney, Australia. Radical local excision was performed in 116 patients, (95.9%). With a median follow-up of 84 months, the overall 5-year survival was 96.4% (2).

This chapter will be divided into three sections: (i) management of the primary lesion, (ii) management of the regional lymph nodes and (iii) reconstruction of large defects. It will not discuss exenterative surgery. Such patients are better treated with preoperative radiation ± chemotherapy, usually with subsequent resection of the tumor bed.

Management of the Primary Lesion

Radical Local Excision ± Resection of Distal Urethra

Indications: Unifocal T1 or T2 vulvar cancer.

Technique

Radical local excision implies a wide and deep excision of the primary tumor. The surgical margins should be at least 1 cm, and should be drawn using a marking pen with the vulva in its natural state, i.e. without stretching the skin. An elliptical incision should be made and carried down to the inferior fascia of the urogenital diaphragm, which is coplanar with the fascia lata and the fascia over the pubic symphysis. The surgical defect is closed in two layers (Figures 1a and 1b).

For perineal lesions, proximity to the anus may preclude adequate surgical margins, and consideration should be given to preoperative or postoperative radiation in such cases.

For periurethral lesions, the distal 1 cm of urethra should be excised if the urethral margin would be less than 1 cm (Figure 2). This will cause no loss of continence and the area around the distal urethra should be left to granulate and epithelialize. A Foley's catheter should be left in situ for about 5 days.

If there is unifocal invasive cancer and associated VIN, the latter may be superficially excised and the defect either closed primarily or skin grafted.

Radical Vulvectomy ± Resection of the Distal Urethra or Vagina

Indications: (i) Multilocal invasive vulvar cancer
(ii) T3 lesions involving the distal urethra or vagina.

Technique

Figure 1a. T2 squamous cell carcinoma of the right labium majus with midline extension.

Figure 1b. Radical local excision with primary closure and bilateral groin dissection.

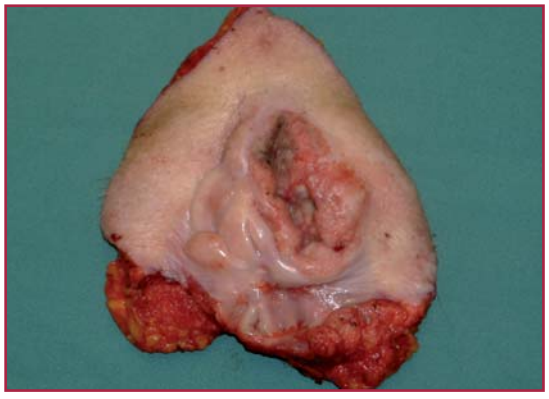

Figure 2. Periclitoral carcinoma treated by radical local excision with resection of distal 1 cm of urethra to ensure adequate surgical margins.

Figure 3. Skin marking for groin dissection. Incision is made about 1 cm above groin crease and does not need to extend as far as the anterior superior iliac spine. The lateral superficial circumflex iliac vessels are a suitable landmark for the lateral extent.

If the radical vulvectomy and groin dissection are performed through separate incisions, the lateral vulvar incision is basically elliptical. Each incision should commence on the mons pubis anteriorly and extend through the fat and superficial fascia to the fascia over the pubic symphysis. It is then easy to develop bluntly the plane immediately above the pubic symphysis and fascia lata. The skin incision is extended posteriorly along the labiocrural folds to the perianal area and carried down to the fascia lata. The medial incision is placed to clear the tumor with margins of at least 1 cm. If the tumor is involving the urethra or the vagina, dissection around the tumor is facilitated by transaction of the vulva, thereby improving exposure of the involved area.

The specimen includes the bulbocavernosus muscles and the vestibular bulb. Because of the vascularity, it is desirable to perform most of the dissection by diathermy after the initial skin incision. In addition, the vessels supplying the clitoris should be clamped and tied, as should the internal pudendal vessels posterolaterally.

Inguino-Femoral Lymphadenectomy

Indications: (i) T1 tumors with stromal invasion greater than 1 mm .

(ii) All T2 and T3 lesions.

Unilateral dissection is appropriate for lesions up to 4 cm diameter that are at least 1 cm from the midline, as long as the unilateral nodes are negative.

Lesions involving the anterior labia minora should have bilateral dissection because of the more frequent contralateral lymphatic drainage from this region (3).

Technique

Groin dissection is most commonly performed through a separate groin incision (4).

A linear incision is made along the medial four-fifths of a line drawn between the anterior superior iliac spine and the pubic tubercle, about 1 cm above and parallel to the groin crease (Figure 3). On the basis of embryological and anatomical studies, Micheletti et al. have proposed that the superficial circumflex iliac vessels could represent the lateral surgical landmark (5). The incision is carried through the subcutaneous tissues to the superficial fascia. The latter is incised and grasped with artery forceps to place it on traction, and the fatty tissue between it and the fascia lata is removed over the femoral triangle (Figure 4). The dissection is carried 2 cm above the inguinal ligament to include all the inguinal nodes. The saphenous vein is usually tied off at the apex of the femoral triangle and at its point of entry into the femoral vein, although some surgeons preserve the vein. To avoid skin necrosis, all subcutaneous tissue above the superficial fascia must be preserved.

The fatty tissue containing the femoral lymph nodes is removed from within the fossa ovalis (Figure 5). There are only one to three femoral lymph nodes, and they are always situated medial to the femoral vein in the opening of the fos-

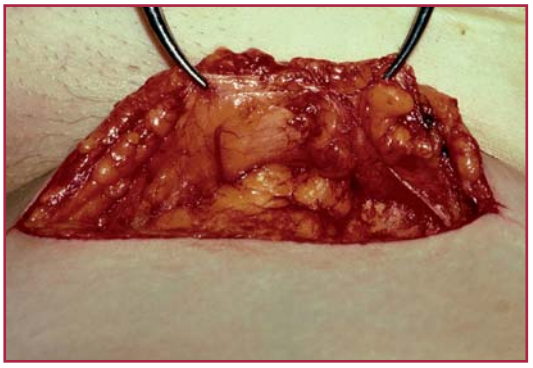

Figure 4. Campers fascia grasped with forceps. All subcutaneous fat above this fascia must be preserved to obtain primary wound healing. The inguinal nodes are in the fat beneath this fascia overlying the femoral triangle.

Figure 5. Groin dissection completed showing fascia lata in situ laterally, and all fatty tissue removed from fossa ovalis lateral to the femoral vein medially.

sa ovalis. Cloquet's node is not consistently present but should be checked for by retraction of the inguinal ligament cephalad over the femoral canal.

At the conclusion of the dissection, a suction drain is placed in the groin and the wound is closed in two layers (Figure 6).

Resection of Bulky Positive Nodes

Patients with bulky nodes will require adjuvant radiation. If the latter is combined with a complete groin dissection, severe lymphedema is very likely to follow. Because properly planned radiation is capable of sterilizing micrometastases in lymph nodes, there is no need to do a complete groin dissection if frozen section confirms metastatic disease (6). In patients who have palpably enlarged groin nodes, a preoperative CT scan of the pelvis should be obtained to determine the presence or absence of enlarged pelvic nodes. If the latter are present, they should also be resected.

Technique For Resection of Bulky Groin Nodes

A linear incision, above and parallel to the inguinal ligament, is made over the enlarged nodes, and carried down through the subcutaneous fat to Camper's fascia. The latter is incised, and the nodes will be immediately apparent. They can be resected, and sent for frozen section diagnosis. If positive, the wound is closed in 2 layers. If negative, full groin dissection is undertaken.

Technique For Resection of Bulky Pelvic Nodes

The pelvic sidewall is approached retroperitoneally through the same linear groin incision. The abdominal wall muscles and their aponeuroses are incised in a linear fashion above and parallel to the inguinal ligament. The peritoneum is reached and retracted medially. The round ligament is identified and transected, which will allow good access to the retroperitoneum of the pelvic sidewall. With progressive retraction and blunt dissection, the peritoneum is stripped off the pelvic sidewall. The ureter is identified attached to the peritoneum, and the paravesicle space is developed between the external iliac vessels laterally and the bladder and superior vesicle artery medially. Any enlarged lymph nodes can be readily identified and resected, usually from the external iliac or obturator group. If the nodes are adherent to the vessels, sharp dissection with metsambaum scissors, staying right on the vessel, is required.

Post-Operative Management

In spite of the age and general medical condition of most patients with vulvar cancer, the surgery is usually remarkably well tolerated. However, a postoperative mortality rate of 1% to 2% can be expected, usually as a result of pulmonary embolism or myocardial infarction. Patients should

Figure 6a. T1 lesion involving the perineum.

Figure 6b. Radical local excision and bilateral groin dissection through separate groin incisions.

be able to start eating on the first postoperative day and a stool softener such as coloxyl should be commenced. Bed rest is advisable for 2 to 3 days to allow immobilization of the wounds to foster healing. Pneumatic calf compressors and subcutaneous heparin should be used to help prevent deep venous thrombosis. Perineal swabs are given until the patient is fully mobilized, at which stage sitz baths or whirlpool therapy are helpful, followed by drying of the perineum with a hair dryer. Suction drainage of each groin is continued for 5-7 days to help decrease the incidence of groin seromas. A Foley catheter is left in the bladder until the patient is ambulatory.

Reconstruction of Large Defects

In the majority of cases of vulvar carcinoma, primary closure is possible following resection of the primary tumor because of the laxity of the skin and subcutaneous tissues in the area. The ease of primary closure is dependant on factors such as age, obesity, parity and prior surgery. Problems with primary closure arise in the presence of large cancers, lesions situated over the perineal body or the mons pubis, and prior surgery or radiation. Alternatives include skin grafting, use of flaps, or occasionally allowing healing by secondary intention.

Skin grafting is challenging in this area. It is difficult to avoid shearing forces and infection. Delayed healing or graft loss is common. Contractures have also been reported as problematic in the long term, interfering with basic functions such as urination and intercourse. Skin grafts are best restricted to patients undergoing superficial resections for VIN or noninvasive Paget's disease.

Flaps may be myocutanous, fasciocutaneous, based upon subcutaneous islands, or free flaps.

Advancement, Rotation and Transposition Flaps

Local flaps are best considered when primary closure carries a high risk of breakdown or when the cosmetic result is likely to be poor. Gynaecologic oncologists commonly perform these. When designing flaps, the following factors are important:

1. There must be meticulous haemostasis in the primary site.
2. There must be adequate blood supply to the flap. All flaps rely on microvasculaure, which may be compromised by factors such as smoking, diabetes, prior surgery, vascular disease, and by prior radiotherapy. Irradiated skin should be avoided in flap design.
3. The patient's position in the post-operative period.This is an important consideration in the intraoperative positioning of the patient and fashioning of the flap, to avoid tension lines across the flap.
4. The donor site should be able to be closed without tension. This is best achieved by taking the flap from an area of tissue and skin laxity. For local flaps this can be assessed by a "pinch test".
5. The flap should reach and fill the defect without tension and excessive arcs of rotation should be avoided. Flap design should allow for skin contours and arcs of rotation. The length of the flap may need to be adjusted accordingly.

Some flaps rely on specific local arteries, although many rely on musculocutaneous perforators.

Advancement Flaps

These are simple to perform, reliable, but uncommonly used in gynaecologic oncology. For defects in the perineum and perianal area in women with adequate skin laxity, the V-Y flap can be particularly useful. A triangular shaped area is drawn with the defect forming the base of the triangle. The length of the triangle is approximately 1.5-2x the diameter of the defect. The success of the flap is dependant upon the mobility of the subcutaneous tissues and undermining of the advancing edge and the 'tail' of the flap is necessary. When completed, the donor site and defect is closed creating a Y or kite-shaped pattern.

Transposition and Rotation Flaps

These flaps have been extensively used for perineal, lateral and anterior defects.

Rhomboid Flap

The simplest of these types of flap is the rhomboid flap. This is based around a parallelogram composed of two equilateral triangles with two 60° angles and two 120° angels (Figure 7a). The flap needs to be designed around an area of maximum tissue laxity adjacent to the defect to allow closure of the donor site (Figure 7b).

Lotus Flap

Recently, several groups have developed and modified lotus flaps based on the rich arterial blood supply in the peri-

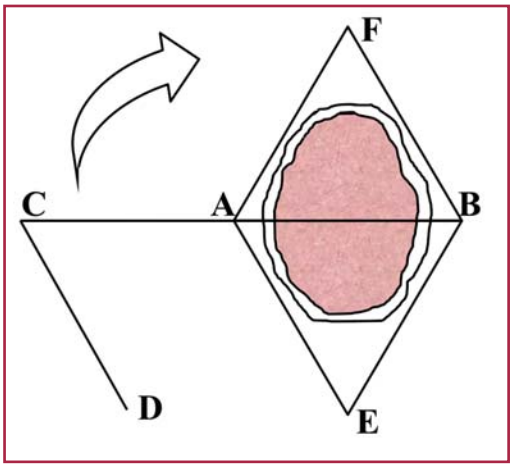

Figure 7a. Schematic representation of a rhomboid flap (AB=AC).

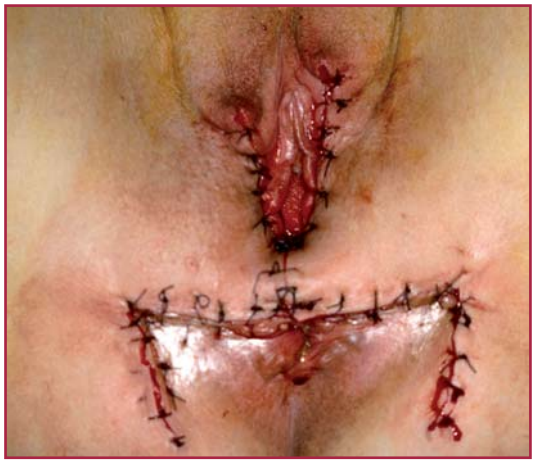

Figure 7b. Completed bilateral rhomboid flaps to close a large perineal defect.

neal area arising from the terminal branches of the internal pudendal vessels. Yii and Niranjan described the lotus petal fasciocutaneous flap in 1996 (7). This flap requires isolation and preservation of deep perforators in the region and includes the deep fascial layer. In 2005, Warrier and Kimble modified this flap to increase it's versatility by omitting the fascial layers, and leaving a subcutaneous islanded flap thinned to cutaneous at its periphery (8). The flap is designed adjacent to the defect to be filled, without defining or isolating the vasculature. The width of the flap should be at least equal to the width of the defect and should pivot around a point at the base furthest away from the defect (Figure 8: Length AB= Length AC). Flap length should be adjusted to allow length for skin contour and also for rotation if necessary. These flaps have proven robust, simple to perform, and cosmetically extremely acceptable (Figures 9a and b).

Other fasciocutainous flaps have been designed around individual arterial territories. Groin axial flaps are described based on the SEPA (superficial external pudendal artery)

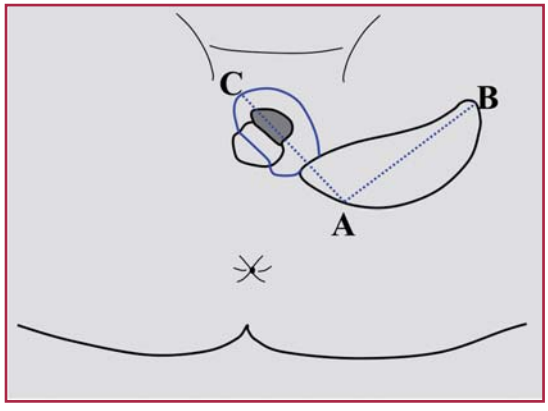

Figure 8. Schematic representation of lotus petal flap (AB=AC).

Figure 9a. Recurrent vulvar cancer following previous radical vulvectomy

Figure 9b. Modified lotus petal flap necessary to close the defect because of skin tightness following prior surgery.

(9) and the SCIA (superficial circumflex iliac artery). Blood supply for these flaps is compromised if a groin node dissection is required, limiting their usefulness.

Myocutaneous Flaps

Very large primary or recurrent vulvar cancers may require a myocutainous flap to fill the defect. The three most commonly utilised include the gracilis, tensor fasciae lata and the rectus abdominis myocutaneous (RAM) flaps.

The gracilis myocutaneous flap is based upon the medical femoral circumflex artery, a branch of the deep femoral artery. This emerges between the adductor longus and brevis muscles. A skin island can be included over the proximal gracilis muscle since the blood supply here is reliable. This flap can rotate through 90 to 180° and can be tunnelled to position if necessary. It has been commonly used to fill groin and vulval defects (Figures 10a and b). To reach the peri-anal area or vagina, it is rotated 180° about it vascular pedicle.

RAM flaps have been successfully used to fill defects in the groin and vulva and also are commonly used for vaginal reconstruction at pelvic exenterative surgery (10). RAM flaps may be based on either the superior or inferior epigastric vessels. The most commonly used is the distally based

Figure 10a. Large left lateral vulvar cancer extending to involve the distal vagina.

Figure 10b. Gracilis myocutaneous graft used to close the defect.

RAM flap which has considerable mobility. This flap does require an abdominal incision, which can be seen as disadvantageous.

The tensor fasciae lata flap is less commonly utilised nowadays because there are improved alternatives in most situations (11). The donor site can be difficult to close and unsightly and the knee joint can become unstable. It is useful in the patient who has a defect following resection of nodes in an irradiated groin (Figure 11).

Figure 11. Tensor fasciae lata graft used to close the defect following resection of a groin recurrence following prior groin and vulvar radiation.

Myocutaneous grafts are usually performed in conjunction with a plastic surgeon, because the need for such procedures is very uncommon. One of the major disadvantages of myocutaneous flaps is the tissue bulk included in the flap. This is useful for vaginal reconstruction but for vulval defects, it is often excessive and may lead to a less aesthetically acceptable result.

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