Cutaneous caudal extension modification of vertical rectus abdominis Myocutaneous flap in reconstruction of the groin: a case report

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Abstract

Groin reconstruction following large area tumor resection, radiotherapy or previous surgery has been considered a major surgical challenge. This may result from direct or indirect damage of the soft tissues, in addition to the pedicles of both local and regional flaps. This damage may occur due to a combination of trauma, scarring, angiopathy/vasconstriction and/or the effects of radiation.

Many local, distant and free flaps were described in literature for groin reconstruction. This Work presents a case of a challenging groin reconstruction using Vertical rectus abdominis myocutaneous (VRAM) flap post resection of a metastatic right groin mass with the introduction of simple useful Cutaneous caudal extension modification in design of the skin paddle.

The modification of the VRAM flap described in this paper allows the donor-defect skin bridge to be divided allowing for the vascular pedicle to be inset into this space, with Cutaneous caudal extension acting as the roof of the open tunnel. This allows for significantly less compression on the pedicle by not having to pass through a subcutaneous tunnel, hence, less risk of vascular compromise.

This work reaffirms the versatility and reliability of the VRAM flap in groin reconstruction and propose simple further modifications in the skin paddle to further enhance its usage as a workhorse flap in this area.

Keywords: VRAM; Groin Reconstruction; Rectus abdominis myocutaneous flap.

Introduction

Reconstruction of the groin area poses a significant surgical challenge, particularly following large area tumour resections, radiotherapy, previous surgery or in patients who smoke. In such cases, the surrounding soft tissues as well as the pedicles of both local and regional flaps may be damaged directly or indirectly through a combination of trauma, scarring, angiopathy/vasconstriction and/or the effects of ionising radiation.

Tumour resection may be curative or palliative (in cases of fungating, ulcerating or bleeding masses) and often results in exposure of the femoral vessels and nerve. Well vascularised flaps are therefore needed to resurface the defect in order to protect the neuro-vascular structures, attain good wound closure, obliterate dead space and minimise morbidity. Good soft tissue coverage is also necessary for effective antibiotic therapy and early administration of adjuvant radiotherapy. To this end, a variety of local, regional, and distant/free flaps have been described for the reconstruction of the groin. Each of these flaps possess a range of attributes with respect to flap size, reach, tissue biomechanics, ease of harvesting, donor site morbidity and cosmesis, that may either make them preferable for reconstruction of a particular resultant defect or may limit their use. The common ‘workhorse’ flaps for this area include the anterolateral thigh flap (ALT) [1], and a number of muscle and myofasciocutaneous flaps such as the sartorius, gracilis muscle [1], rectus femoris [2], tensor fascia lata [4] and vertical rectus abdominis flaps (VRAM) [3-7]. Muscle flaps have the advantage of providing well vascularised donor tissue and resistance to infection as well as good conformability/malleability and therefore ability to obliterate dead space. However, the use of these flaps requires, of course, the sacrifice of a muscle with potential resultant functional deficit and donor morbidity, as well as occasionally being somewhat excessively bulky.

Free flaps are sometimes used in this area although these require an experienced microsurgical team and are more challenging to harvest with increased operating time, which may overburden potentially critically ill patients such as those with progressive malignancies. Furthermore they do not have the same level of robustness in the context of radiotherapy as with pedicled muscle flaps, and hence the latter remain the preferred reconstructive option for many surgeons.
VRAM flaps have a Type III (two dominant pedicles) axial blood supply and can be based on either the deep superior or deep inferior epigastric vessels, with a good arc or rotation. They have been successfully used in the reconstruction of various regions of the trunk and proximal thigh with good functional outcomes [8]. They provide ample donor soft tissue and skin coverage, with relative ease of execution, low complication rates and high success rates, particularly benefiting high risk patients where a safe and quick reconstruction is desired. Furthermore, the presence of valves in veins of the inferior epigastric system and intramuscular lymphatic bundles within the rectus muscle reduces the incidence of venous stasis, oedema, and lymphoedema in the dependent portion of these large flaps [9].

Here we present a case of a challenging groin reconstruction with VRAM flap post resection of a metastatic right groin mass using a simple but nevertheless useful modification in design of the skin paddle. We also describe our planning algorithm and our reason for selecting this form of reconstruction.

Case Report

The patient is a 72 year old male with a background history of a Grade 3, transitional cell carcinoma of the bladder. He had undergone a radical cystoprostatectomy, urethrectomy, and pelvic lymphadenectomy with cutaneous urinary diversion by ileal conduit. His main co-morbidities were bullous pemphigus and peripheral vascular disease, which were being treated with steroid therapy and clopidogrel respectively. He was referred to our tertiary centre with a right groin mass that was biopsied under ultrasound guidance and confirmed to be a malignant tumour in keeping with metastatic urothelial carcinoma. A computerised tomography (CT) staging scan was performed confirming a solitary rapidly enlarging groin mass measuring 13.5 x 11.5 in maximum cross-section. The mass abutted the right femoral vessels but did not encase or invade them. The right femoral vein however appeared to be compressed by the mass with a possible distal thrombus. There was no evidence of any other nodal or metastatic disease. He was treated with 5 cycles of radiotherapy (20 Gy in 5 fractions) but, unfortunately, with no evidence of regression in the size of the tumour [Figure 1].

Following discussion at the regional multidisciplinary meeting, the decision was made for palliative resection of the right groin mass and reconstruction. En-bloc resection of the mass was performed incorporating the overlying irradiated skin creating a surgical defect measuring 17 cm X 15 cm with consequent exposure of the femoral neurovascular bundles in the floor of the wound [Figure 2]. Resurfacing of the resultant defect was performed using a contralateral, laterally oriented inferiorly based myofasciocutaneous VRAM flap. The contralateral muscle was selected due to the sacrifice of the ipsilateral inferior epigastric pedicle that was necessary to ensure adequate oncological resection of the tumour. The skin paddle of the flap was designed with an inferiorly based Cutaneous caudal triangular extension. This extension tapered towards the pivot point of the flap located at the entry of the inferior epigastric vessels and remained contiguous with the lower abdominal wall skin through a skin bridge. The flap was harvested using a standard technique with elevation of the laterally oriented part of the flap in the fascial plane preserving the medial and lateral perforator rows. The origin and insertion of rectus muscle were divided whilst preserving the Cutaneous caudal extension of the skin paddle inferiorly, followed by skeletonisation of the left deep inferior epigastric vessels. Thus the sole remaining tether points of the flap were the vascular pedicle and overlying skin bridge, significantly enhancing its arc of rotation (120 degrees) and therefore permitting more muscle to be transferred to the wound defect. The skin between the defect and the flap was incised creating a space for the skin and vascular pedicle of the flap to be inset into during transposition of the flap onto the tumour excision defect. Thus, the Cutaneous caudal extension effectively formed the roof of an open tunnel between the flap and the defect through which the vascular pedicle passed [Figure 3]. The donor site was closed primarily after reinforcing the abdominal wall with a polypropylene mesh. Suction drains were used at both the recipient and donor sites [Figure 4].

The patient’s post-operative period was uneventful and all suction drains were removed after 10 days. The patient remained in hospital for 14 days in order to manage his bullous pemphigus with a tapering dose of steroids. He continued to be followed up in the outpatient clinic for 14 months before being discharged [Figure 5].

**Figure 1:** Preoperative photo showing the large solitary right groin lymph node and the urinary bag on the right abdomen.

**Figure 2:** Intra-operative photo after en bloc excision of the right groin lymph node with a 17X15 cm exposing the femoral vessels.

Discussion

There were a number of surgical challenges that this patient presented with, specifically the size of the defect that needed to be reconstructed following en bloc resection of the tumour, damage of the regional soft tissue due to previous surgical trauma and radiotherapy, as well as the age of the patient and his co-morbidities of malignancy and peripheral vascular disease. Recent radiotherapy to the right groin rendered the use of local or regional flaps, such as an ALT, unreliable as their pedicles may have been damaged by radiation induced vasculopathy. Thus the preferred option was to use a flap with a blood supply that was based out of the field of resection and radiation. A free flap would also have been potentially compromised by poor quality recipient vessels due to recent radiotherapy, poor quality donor vessels due to peripheral vascular disease, and increased risk of complications due to the complexity and hence duration of the procedure (particularly in the context of the patient’s age and co-morbidities). Another issue of concern was the increased risk of infection secondary to potential systemic immunocompromise from long-term steroid therapy and malignancy.

The decision to reconstruct using a contralateral VRAM was therefore made given that it was a pedicled flap with a large reliable vascular territory outside the zone of injury (the presence of an ipsilateral ileal conduit also, of course, meant that an ipsilateral flap was not an option). It provided ample skin and good soft tissue bulk, being straight forward to harvest and inset, particularly benefiting this higher risk patient. Furthermore, as a muscle flap, it confers some degree of protection against local infection and aids delivery of systemic antibiotics by providing well vascularised soft tissue coverage.

Various modifications of the VRAM flap have been described in the literature, mainly with the aim of altering the skin paddle in order to increase the amount of skin and subcutaneous fat included with the flap or to extend the reach of the flap. For example, the extended deep inferior epigastric flap, as first reported by Taylor et al [10], is based on an extended rectus abdominus muscle flap with an oblique skin paddle supplied by paraumbilical perforators that could be extended to the mid-axillary line. This confers both an increase in flap reach and distal flap volume [10].

In this paper, we utilise another modification of the VRAM skin paddle that has previously been described by the senior author in the context of reconstruction of the proximal lower limb [5]. We have further modified this by preserving a skin bridge contiguous with the lower abdomen skin (as opposed to islanding the flap completely). This has a number of advantages, the first being that it creates a second tether point for the flap supporting the fibrovascular pedicle. Preservation of the origin of the rectus muscle to the pubis has been proposed by Buchel et al. to protect the vascular pedicle from twisting [11]. However, by reducing the risk of traction injury to the vascular pedicle, the Cutaneous caudal extension modification allows the origin of the rectus muscle at the pubis to be divided with more confidence and hence increasing the potential arc of rotation as well as reach of the flap.

Various methods of tunnelling the VRAM flap have also been described in the literature. In addition to the classic technique where the flap is passed under a subcutaneous tunnel formed by an intact skin bridge between the defect and donor site, Parett et al suggested tunnelling the flap deep to the inguinal ligament [12]. However, the modification of the VRAM flap described in this paper allows for the donor-defect skin bridge to be divided to allow the vascular pedicle
to be inset into this space, with the Cutaneous caudal extension serving as the roof of the open tunnel. Thus by not having to pass through a subcutaneous tunnel, there is significantly less compression of the pedicle and, hence, less risk of vascular compromise.

In summary, we reaffirm the versatility and reliability of the VRAM flap in groin reconstruction and propose simple further modifications in the skin paddle to further enhance its usage as a workhorse flap in this area.

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