

RECONSTRUCTION OPTIONS FOR CHALLENGING PERINEAL DEFECTS

ZORLAYICI PERİNE DEFEKTLERİNDE ONARIM SEÇENEKLERİ

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Cite this article as: Aksöyler D, Nergizoğulları MC, Yalçın Y, Kozanoğlu E, Akalın BE, Ercan LD, et al. Reconstruction options for challenging perineal defects. J Ist Faculty Med 2024;87(4):275-282. doi: 10.26650/IUITFD.1467973

ABSTRACT

Objective: Abdominoperineal resection and pelvic exenteration for the surgical treatment of advanced colorectal or gynaecological cancers can result in large perineal defects and severe surgical site morbidity. Several regional flaps can be used to treat radiation- and extirpative surgery-related wound breakdowns. This study aims to retrospectively evaluate the efficiency of different flaps used in the reconstruction of perineal defects.

Material and Method: A retrospective review of pelvic reconstructions performed between May 2021 and August 2023 was conducted, with a 6-month follow-up. Ten patients who underwent abdominoperineal resection with immediate abdominal-based flap (n=4) or thigh-based flap (n=6) reconstruction of the perineal/pelvic defect were evaluated. The two groups were compared in terms of patient characteristics, aetiology, preferred treatment, and postoperative complications.

Result: Five women and five men underwent comprehensive pelvic reconstruction. The mean age was 49.6 years (range 26–76) and mean BMI of 28.6 kg/m² (range 21.3–50). Five patients had previously undergone radiotherapy. In total, 11 flaps were created based on the type of perineal defect. One patient experienced a minor dehiscence (<5 cm). Two patients experienced major dehiscence (>5 cm), and required reoperation. A patient with Crohn's disease developed one intra-abdominal abscess

ÖZET

Amaç: İleri evre kolorektal veya jinekolojik kanserlerin cerrahi tedavisinde abdominoperineal rezeksiyon ve pelvik ekzenterasyon ameliyatları büyük perineal defektlere ve ciddi cerrahi alan morbiditesine neden olabilir. Radyasyon ve onkolojik cerrahiye bağlı yara iyileşme problemlerini engellemek için çeşitli bölgesel flepler yara kapatılmasında kullanılabilir. Bu çalışmanın amacı perine defektlerinin onarımında kullanılan fleplerin etkinliğinin retrospektif olarak incelenmesidir.

Gereç ve Yöntem: Mayıs 2021 ile Ağustos 2023 arasında gerçekleştirilen pelvik rekonstrüksiyon vakaları geriye dönük olarak altı aylık takip süresi ile incelendi. Toplamda 10 hasta çalışmaya dahil edildi. Bu hastalara karın temelli flepler (n=4) ve uyluk temelli flepler (n=6) kullanılarak perineal defekt rekonstrüksiyonu gerçekleştirildi. Bu iki hasta grubu hastaların demografik özellikleri, etiyojisi, tercih edilen tedavi yöntemi ve ameliyat sonrası gelişen komplikasyonlar açısından karşılaştırıldı.

Bulgular: Beş kadın ve beş erkeğe kapsamlı pelvik rekonstrüksiyon uygulandı; yaş ortalaması 49,6 (26-76 aralığı) ve ortalama vücut kitle indeksi (VKI) 28,6 kg/m² (21,3-50 aralığı) idi. Beş hastaya daha önce radyoterapi uygulanmıştı. Perine defektinin tipine göre toplam 11 flep uygulandı. Bir hastada yara yerinde küçük bir ayrılma (<5 cm) oldu. İki hastada yara yerinde büyük açılma oldu (>5 cm) ve yeniden ameliyat edilmeleri gerekti. Crohn has-

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Submitted/Başvuru: 14.04.2024 • **Revision Requested/Revizyon Talebi:** 17.05.2024 •

Last Revision Received/Son Revizyon: 23.05.2024 • **Accepted/Kabul:** 03.07.2024 • **Published Online/Online Yayın:** 25.09.2024



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because of spontaneous fistula formation. There was no vascular compromise in the flaps.

Conclusion: Repair options vary depending on the nature of the defect and extent of resection. The primary goals of reconstruction are to eliminate pelvic dead space and separate the intra-abdominal content from the perineum to prevent herniation and strangulation of the small intestines and to ensure that the perineal wound heals without complications.

Keywords: Abdominoperineal resection, flap, pelvic exenteration, perineal reconstruction, radiotherapy

talığı olan hastada spontan fistül oluşumu sonucu karın içi abse gelişti. Fleplerde kısmi veya tam kayıp izlenmedi.

Sonuç: Onarım seçenekleri defektin boyutuna ve rezeksiyonun derecesine bağlı olarak değişmektedir. Rekonstrüksiyonda öncelikli amaç pelvik ölü boşluğu ortadan kaldırmak ile karın içi içeriğin perineden ayrılmasını sağlamak, ince bağırsakların fıtıklaşmasını önlemek ve komplikasyonsuz yara iyileşmesini sağlamaktır.

Anahtar Kelimeler: Abdominoperineal rezeksiyon, flep, pelvik ekzenterasyon, perineal rekonstrüksiyon, radyoterapi

INTRODUCTION

Abdominoperineal resection or pelvic exenteration is a surgical procedure used to treat advanced colorectal cancer, locally advanced genital cancer, or perineal skin cancer. Major functional and anatomical deficits can be observed in the perineal region according to the defect (1). Furthermore, the perineal area is at higher risk of infection than other wound sites. Additional undesired patient factors such as preoperative nutritional status (albumin <2 g/dL), previous radiotherapy, accompanying diabetes mellitus, smoking, and perineal bacterial counts also affect outcomes after resection (2).

Although simple abdominoperineal defects can be treated with primary closure, local flaps, or an omental flap to obliterate the dead pelvic space, wound breakdowns continue to occur due to the aforementioned factors. In addition to wound healing, quality of life, sexual function, bladder function, and fertility are important factors to consider in pelvic reconstruction (1).

A multidisciplinary approach is required, with the participation of a reconstructive surgeon, and a wide range of local, regional, or less frequently free fasciocutaneous, musculocutaneous, and muscle flaps should be used for reconstruction, depending on the need for volume and skin replacement based on the size and location of the defect (2-4).

In this study, we would like to share our brief experience with each type of defect, including the type of flap to consider, its potential benefits and drawbacks, and the precautions to take to avoid potential complications.

MATERIAL AND METHODS

This study was approved by İstanbul Faculty of Medicine Clinical Research Ethics Committee (Date: 09.02.2024, No: 3).

We conducted a retrospective analysis of medical records of pelvic reconstructions performed at the Plastic Reconstructive and Aesthetic Surgery Clinic between May 2021 and August 2023, with at least a 6-month follow-up.

Charts were reviewed for preoperative and postoperative information, and complications were noted. Minor wound dehiscence was accepted as less than 5 cm, and major wound dehiscence was defined as more than 5 cm.

Pelvic defects and preferred flaps were identified by examining anatomical subunits and associated flap characteristics. Kosutic's classification for perineal defects was used (Table 1) (5).

Complications were compared between flap types and patients who did and did not receive radiotherapy.

RESULTS

The results are summarised in Table 2. Five women and five men underwent comprehensive pelvic reconstruction, with a mean age of 49.6 years and mean BMI of 28.6 kg/m².

Five patients (50%) had previously received radiation therapy. One patient experienced minor dehiscence (<5 cm), which resolved with local dressing. Two patients had major dehiscence, one of whom required reoperation for dehiscence at the flap donor site, which was treated with split-thickness skin grafting (STSG); the other required an additional gluteal rotation flap for posterior raphe closure. There was one intra-abdominal abscess in a patient with Crohn's disease due to spontaneous fistula formation. There was no vascular compromise on the vertical rectus abdominis flap (VRAM). The patient underwent serial irrigation and negative pressure wound therapy (NPWT), and an artificial mesh was extracted at the donor site. There were no hernia cases in the late period.

The abdominal-based flaps (VRAM) had a 25% complication rate, whereas the thigh-based flaps (profunda artery perforator flap [PAP flap], transverse upper gracilis flap [TUG flap], anterolateral thigh flap [ALT], and gracilis muscle flap) had a 50% complication rate.

Patients who had previously received radiation therapy had a complication rate of 60%, whereas those who had never received radiation therapy had a complication rate of 20%. No complication rate comparisons were significant.

Three female patients required partial vaginal resection with reconstruction. Three patients reported sexual activity before surgery and two reported sexual activity six months after reconstruction. One patient died after a tumour recurrence and lung metastasis within six months.

Table 1: Definition of Kosutic classification, number of patients with each type of defect, and preferred reconstruction methods

Types of defects	Definition	Number of patients	Preferred reconstruction method
Type 1a	Defects affect areas/organs anterior to the anus and up to the pubis, with no effect on the anus. The urethra is preserved.	4	ALT-VL, ALT, PAP-TUG, VRAM
Type 1b	Defects affect areas/organs anterior to the anus and up to the pubis, with no effect on the anus. The urethra is resected.	1	Gracilis flap
Type 2a	The defect affects the anus and areas posterior to it, towards the natal cleft, whereas the perineum anterior to the anal defect is not affected. Pelvic clearance is not performed.	0	-
Type 2b	The defect affects the anus and areas posterior to it, towards the natal cleft, whereas the perineum anterior to the anal defect is not affected. Pelvic clearance is not performed. Pelvic clearance is performed.	3	VRAM, PAP-TUG
Type 3	Defect includes the majority of or the entire perineum, with total pelvic exenteration performed.	2	PAP-TUG, Glutaeal rotation, VRAM

ALT: anterolateral thigh, VL: Vastus lateralis, PAP: profunda artery perforator, TUG: transverse upper gracilis, VRAM: vertical rectus abdominis

Table 2: Summary of demographic characteristics, medical history, defect type, preferred reconstruction options, and postoperative complications

Patient	Age at surgery	Diagnosis	BMI (kg/m ²)	Prior RT	Defect location and type	Extirpative surgery	Reconstruction	Complications
1	39	Dermatofibrosarcoma	50	No	Mons pubis Type 1a	Mons pubis, right labia, vulva	Left-pedicled ALT-VL	Dehissence at the donor side of the STSG for defect closure
2	52	Rectum adenocarcinoma	25.9	Yes	Pelvis Type 3	APR with TPE	Left pedicled PAP-TUG flap Glutaeal rotation flap	8 cm wound separation at the anal region, right side glutaeal rotation flap
3	63	Uterine leiomyosarcoma	28.76	Yes	Pelvis Type 3	TPE	Fascia-sparing VRAM	None
4	44	Vulvar malignant mesenchymal tumour	31.18	No	Mons pubis, left vulva, left lower abdomen Type 1a	Mons pubis, left labia, vulva	Left-pedicled ALT	Tumour recurrency in 3 months- lung metastasis, ex due to tumour metastasis
5	57	Necrotising fasciitis (Fournier gangrene)	23.1	No	Scrotum posterior perineal raphe Type 1b	Penectomy, several debridement procedures	Right-pedicled gracilis flap	None
6	45	Rectal adenocancer	26.53	Yes	Pelvis and posterior raphe Type 2b	APR with TPE	Left-pedicled VRAM	Spontaneous fistula formation in the abdomen, intraabdominal NPWT, and donor site prosthetic mesh removal

Table 2: Continued

Patient	Age at surgery	Diagnosis	BMI (kg/m ²)	Prior RT	Defect location and type	Extirpative surgery	Reconstruction	Complications
7	26	Rectum solid-er malignant fibrous sarcoma	21.3	No	Pelvis and posterior raphe Type 2b	APR with TPE	Right-pedicled fascia-sparing VRAM	None
8	76	Vulvar SCC	30.80	Yes	Pelvis and posterior raphe Type 2b	APR with TPE	Right side PAP-TUG flap	Minor wound separation and dressing application
9	48	Vulvar adenocancer	21.70	No	Mons pubis, left vulva Type 1a	Radical vulvectomy, mons pubis, labia	Right side PAP-TUG flap	None
10	56	Right groin SCC	27.2	Yes	Right groin, fistulized lymph node Type 1a	Right ilioinguinal LND, orchiectomy, partial femoral artery excision, and reconstruction using artificial vascular graft	Right-side VRAM flap	None

BMI: Body Mass Index, RT: Radiotherapy, SCC: Squamous cell carcinoma, APR: Abdominoperineal resection, TPE: Total pelvic exenteration, ALT: Anterolateral thigh, VL: Vastus lateralis, STSG: Split Thickness Skin Graft, PAP: Profunda artery perforator, TUG: Transverse Upper Gracilis, LND: Lymphnode dissection, VRAM: Vertical Rectus Abdominis Muscle, NPWT: Negative pressure wound therapy

DISCUSSION

Radical surgical resection is the primary treatment for locally advanced rectal, gynaecologic, and urological malignancies (6-8). The most important aspect of tumour excision is to ensure microscopically complete resection (R0) with clear margins of at least 1 mm and no microscopic residual disease (4, 9). Studies have shown that the rate of local recurrence increases with resection margins. The 5-year survival rate in patients with excision of 10 mm was 80%, whereas the 5-year survival rate in patients with excision of 1 mm was 34% (10, 11). Therefore, if R0 margin resection cannot be executed by surgical excision, then neoadjuvant radiotherapy and/or chemotherapy must be considered to make the tumour resectable with R0 margins (4, 9). However, perineal wound complications were reported in 66% of patients who underwent abdominoperineal resection and primary wound closure in addition to external beam radiation therapy (12). The use of locoregional flaps decreases wound complication rates to 20%–30% (1, 13).

For Type 1 defects, several reconstruction options are available. Small or superficial defects can be closed using local

cutaneous flaps or STSG. However, larger defects or previous radiation exposure necessitate the use of regional fasciocutaneous or musculocutaneous flaps (1, 14). The ALT flap has been delineated for mons and vulvar reconstruction and provides sufficient surface area and soft-tissue thickness with its long pedicle length (Figure 1) (15). The pedicle length varies between 16 and 19 cm, and the flap quickly moves under the rectus femoris and sartorius muscles (1). If necessary, a stair-step incision can be made in the rectus muscle to move the flap forward. The volume requirement determines whether a thinner fasciocutaneous flap or a bulkier musculocutaneous flap is harvested. If the defect extends to the inferior abdomen, an ALT-Tensor Fascia Lata, ALT-VL, or hemi-thigh flaps can be used as part of abdominal reconstruction (1, 16). In our opinion, the lateral thigh is a reliable source of mons pubis, inferior abdomen, and penoscrotal soft tissue reconstruction.

To achieve satisfactory surgical outcomes with vaginal reconstruction, several obstacles must be overcome. The creation of a cylindrical structure of adequate size to allow sexual intercourse and a flap of sufficient volume must obliterate the pelvic dead space to prevent perineal small-bowel herniation (1). Patient expectations and age are also important considerations.

The pedicled VRAM is typically the first choice for creating a thin cylindrical neovagina to reconstruct posterior or circumferential vaginal defects in sexually active women (1).

If VRAM is not applicable owing to previous abdominal surgery or the need for multiple ostomy placement, bilateral gracilis musculocutaneous flaps with or without omentum are a second option (13). Because gracilis flaps have limited access to reach deep into the pelvis and provide little volume to close the pelvic outlet, bilateral harvesting is frequently required. In myocutaneous gracilis flap reconstruction (TUG flap), the distal part of the skin is the least perfused and extends deep into the defect because of its unreliable vascularity. Thus, the PAP flap or combined TUG-PAP flap provides a longer distal skin island to fill the inner dead space with its dual robust blood supply (17, 18).

In nonsexually active women with combined vaginal and perineal defects, simple flap closure of the perineum without creating the neovagina may be associated with the quickest recovery and lowest incidence of complications (13). This recommendation also applies to men with perineal raphe defects, including pelvic dead space or not.

The inferior gluteal artery perforator flap, PAP flap, and combined TUG-PAP flap are viable options for Type 2a defects. The pedicled VRAM flap is typically the first option for Type 2b defects (1).

The pedicled VRAM flap has become the workhorse flap for reconstructing extended abdominoperineal defects, such as total pelvic exenteration or Type 3 defects (19). Previously, prior abdominal surgery was considered a contraindication for harvesting VRAM flaps for abdominoperineal reconstruction (20). However, a recent series showed that previous abdominal surgery does not increase the risk of flap failure (19). Thus, our primary choice was a VRAM flap, if applicable (Figure 2). To avoid the use of artificial mesh at the donor site, the anterior rectus fascia was preserved below the rectus sheath's arcuate line, and the component separation technique was used to repair the abdominal wall fascia above the arcuate line. The inferior muscle insertion at the pubic ramus was dissected to free the pelvic outlet from tension (6).

Thigh-based flap reconstruction should be considered in patients with a violated rectus abdominis flap either from previous operations or previous ostomy placement, extensive abdominal scarring, risk of abdominal hernia, or already having an abdominal hernia in Type 3 perineal defects (Figure 3) (21). Wide abdominoperineal defects can be reconstructed using the flaps discussed in this article, either separately or combined based on their different and distinct pedicles in a single patient, depending on the defect's width, depth, and related violated anatomical subunits (1).

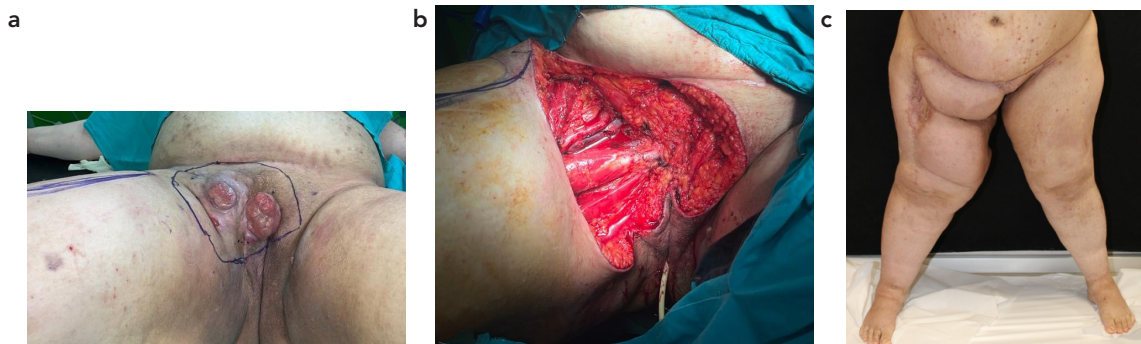


Figure 1: Patient 1: (a) 22×12 cm dermatofibrosarcoma on the mons pubis and right vulva. (b) The right femoral bundle was exposed after resection. (c) Final closure of the defect, result of the postoperative 8th month.

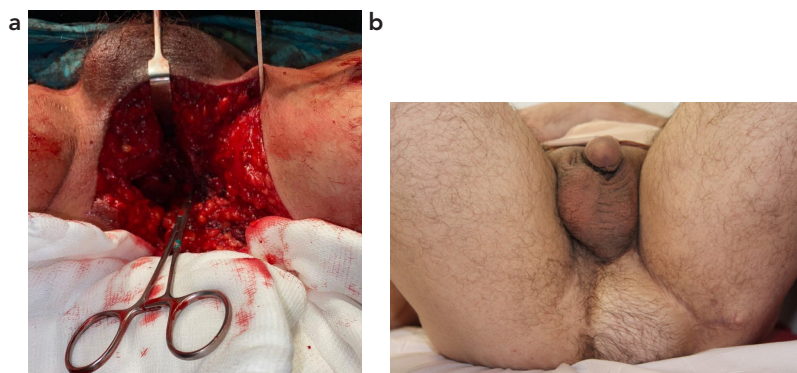


Figure 2: Patient 7: (a) Type 2b defect after the tumour excision. (b) Repair of the defect using a VRAM flap, the result of the postoperative 10th month.

Thigh flaps are associated with a higher incidence of donor-site cellulitis, recipient-site complications, pelvic abscess, and major wound dehiscence complications than VRAM flaps (42% versus 15%) (22). Most complications are caused by the relatively short arch of the thigh-based flaps. Several changes can be made to reduce the incidence of complications. First, a vertically designed PAP flap can be elevated on the first or second proximal perforator to include the distal thigh skin. The perforator can be dissected to the profunda femoris artery to increase the pedicle length (23). As a result, a longer flap can

reach the pelvic outlet owing to its longer pedicle. Second, performing additional omentoplasty can eliminate pelvic dead space, thereby preventing perineal hernia in patients undergoing thigh-based flap reconstruction.

The main factor separating intra-abdominal contents from the perineal wound is the preferred flaps inset. During inset 2.0, a polydioxanone absorbable suture (Ethicon, Somerville, New Jersey) was tightly knotted from the edge of the flap to the remnant pelvic muscles or ligaments. Thus, undesirable perineal hernias and small intestinal obstructions were avoided (Figure 4).

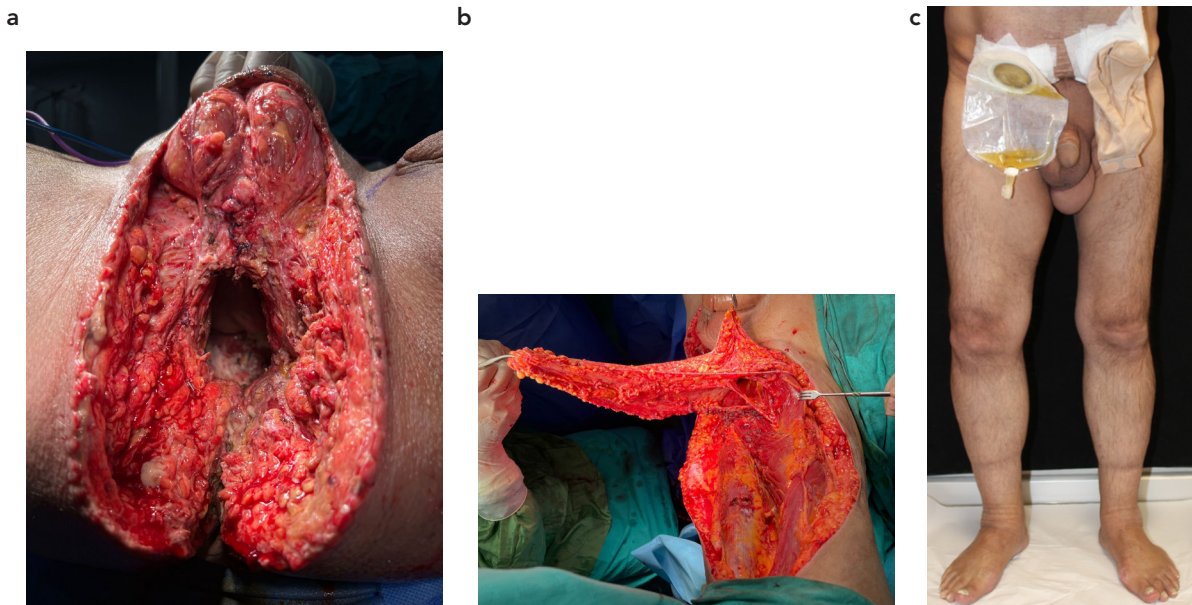


Figure 3: Patient 2: (a) Type 3 defect. (b) A combined PAP-TUG flap based on the pedicles and saphenous vein was also included in the flap to prevent venous insufficiency. (c) Final closure of the defect, result of the postoperative 14th month.

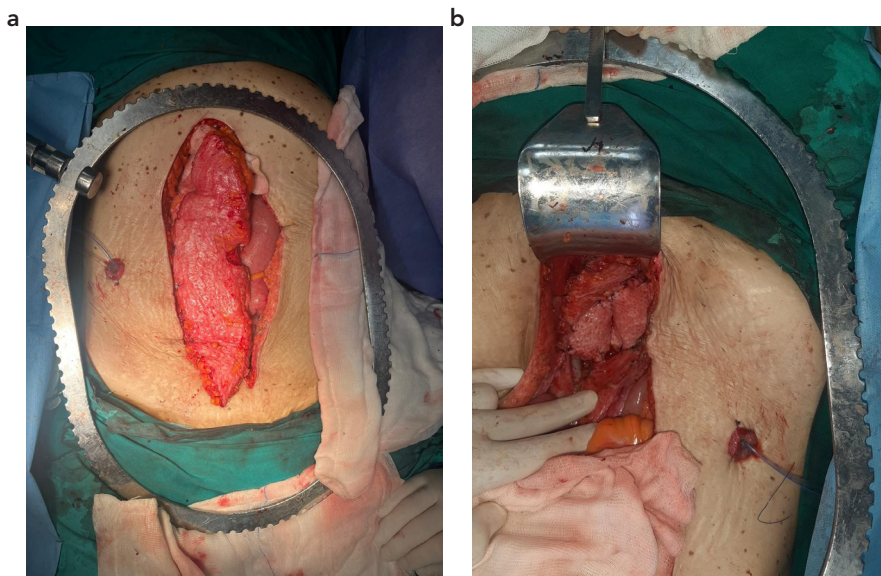


Figure 4: Patient 3: (a) De-epithelized VRAM flap. (b) The flap was sutured over the pelvic outlet.

CONCLUSION

Flap selection is based on previous surgeries, stoma requirements and placement, and the need for radiation therapy following resection. Major pelvic complications, such as abscesses, urinoma, perineal herniation, and fistulas, can be prevented by well-vascularised flap tissue, whether abdominal or thigh-based, or even omentum flap.

Therefore, an adjacent association between the oncologist and reconstructive surgeon is beneficial when planning for vaginal and perineal defect reconstruction.

Ethics Committee Approval: Ethics committee approval was received for this study from the İstanbul Faculty of Medicine Clinical Research Ethics Committee (Date: 09.02.2024, No: 3).

Informed Consent: Informed consent was obtained from every subject.

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study- D.A., M. C.N., Y.Y., B.E.A., L.D.E., R.A.A.; Data Acquisition- D.A., M.C.N., M.B.D., Y.M.; Data Analysis/Interpretation- D.A., E.K., C.B.K., Ö.P., C.E.; Drafting Manuscript- D.A., Y.Y., B.E.A., L.D.E., C.B.K., Ö.P., M.B.D., Y.M.; Critical Revision of Manuscript – D.A., M.C.N., E.K., C.E., R.A.A.; Final Approval and Accountability- D.A., M. C.N., Y.Y., E.K., B.E.A., L.D.E., C.B.K., Ö.P., M.B.D., Y.M., C.E., R.A.A.; Technical or Material Support- D.A., M.C.N., Y.Y.; Supervision- D.A., E.K., C.E., R.A.A.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: The authors declared that this study received no financial support.

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