

Paraumbilical perforator flap for one-stage reconstruction of a large oncologic vulvar defect: a single case report

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Background: Large vulvar defects often results in complex reconstructive problems. Deep inferior epigastric perforator (DIEP) flap was considered as a less invasive and reliable method for vulvar reconstruction. However, tedious dissection of the pedicle vessel requires a longer flap harvesting time. To overcome the disadvantage, paraumbilical perforator (PUP) flap was developed with the perforator only penetrating the retus abdominis muscle. However, no case has previously been reported of using PUP flap for vulvar reconstruction. In our report, we are first writing to share our own clinical experience of using PUP flap as an aid to cover a large vulvar defect. **Case:** We present a case of a 60-year-old female with a BMI of 30 and recurrent vulvar squamous cell carcinoma, without comorbidities involving hypertension and diabetes mellitus. By the aid of a Doppler probe, PUP was identified and labeled on the skin. A radical vulvectomy without additional treatment (chemotherapy and/or radiotherapy) was subsequently underwent, with a final defect consisting of a campaniform, full-thickness skin defect measuring $15 \times 8 \text{ cm}^2$ without involvement of the urethra and vagina. By the aid of a PUP flap, the large defect was successfully reconstructed in one stage. The duration of surgery is nearly 3 hours. Postoperative management consists of remained urinary catheterization and complete bed rest. Follow-up was respectively performed at 3, 6 months. No local recurrence or distant metastasis was found. **Conclusions:** Our results suggest that PUP flap has shown to be an alternative and new method for one-stage reconstruction of vulvar defects. Further investigations for this novel flap to treat such cases are needed.

Keywords

Paraumbilical perforator flap; Vulvar cancer; One-stage reconstruction

1. Introduction

Large vulvar defects often results in complex reconstructive problems. Despite of marked improvements in surgical techniques, vulvar reconstruction is still a great challenge for plastic surgeons [1]. The ideal single stage reconstructive procedure should provide a large enough area of well-vascularized tissue of similar thickness, reconstruct both sensitivity and function, regain the normal morphology, avoid an obvious donor site scar and minimize donor-site morbidity.

Abdominal perforator flaps are commonly utilized to reduce donor site complications [2]. The pedicled deep inferior epigastric perforator (DIEP) flap is considered as a technical innovation of the vertical rectus abdominis myocutaneous (VRAM) flap [3]. Secondary to its decreased lower donor site morbidity, excellent cosmetic outcomes, and higher success rates, DIEP flap has been considered as a less invasive and alternative choice for vulvar reconstruction [4]. Although DIEP has reduced donor-site morbidity, tedious dissection of the pedicle vessel requires a longer flap harvesting time. To overcome the disadvantage, a paraumbilical perforator (PUP) flap was developed with the perforator only penetrating the retus abdominis muscle [5]. Herein, we first present our own clinical experience of using paraumbilical perforator (PUP) flap as an aid to reconstruct a large vulvar oncologic defect.

2. Case report

A 60-year-old woman was admitted to our department with a BMI of 30 and recurrent vulvar squamous cell carcinoma, without comorbidities involving hypertension and diabetes mellitus. She had previously undergone bilateral inguinal lymphadenectomy followed by chemotherapy. Three years after surgery, she developed recurrent symptoms and physical findings of intense pruritus, persistent pain, diffuse vulval leukoplakia and a typical crateriform ulceration (Fig. 1A). By the aid of a Doppler probe, PUP was identified and labeled on the skin. A radical vulvectomy without additional treatment (chemotherapy and/or radiotherapy) was subsequently underwent, with the final defect consisting of a campaniform, full-thickness skin defect measuring $15 \times 8 \text{ cm}^2$ without involvement of the urethra or vagina (Fig. 1B). Following the assessment of the tumor resection margins, a $16 \times 9 \text{ cm}^2$ paraumbilical perforator flap was obtained to cover the vulvar defect (Fig. 2A). Final pathology report confirmed the diagnosis of vulvar squamous cell carcinoma. The duration of surgery is nearly 3 hours. Postoperative management consists of remained urinary catheterization and complete bed rest. Follow-up was respectively performed at 3, 6 months. At 6-month postoperative visit, the patient had achieved an acceptable reconstruction with no evidence for tumor recurrence (Fig. 3).

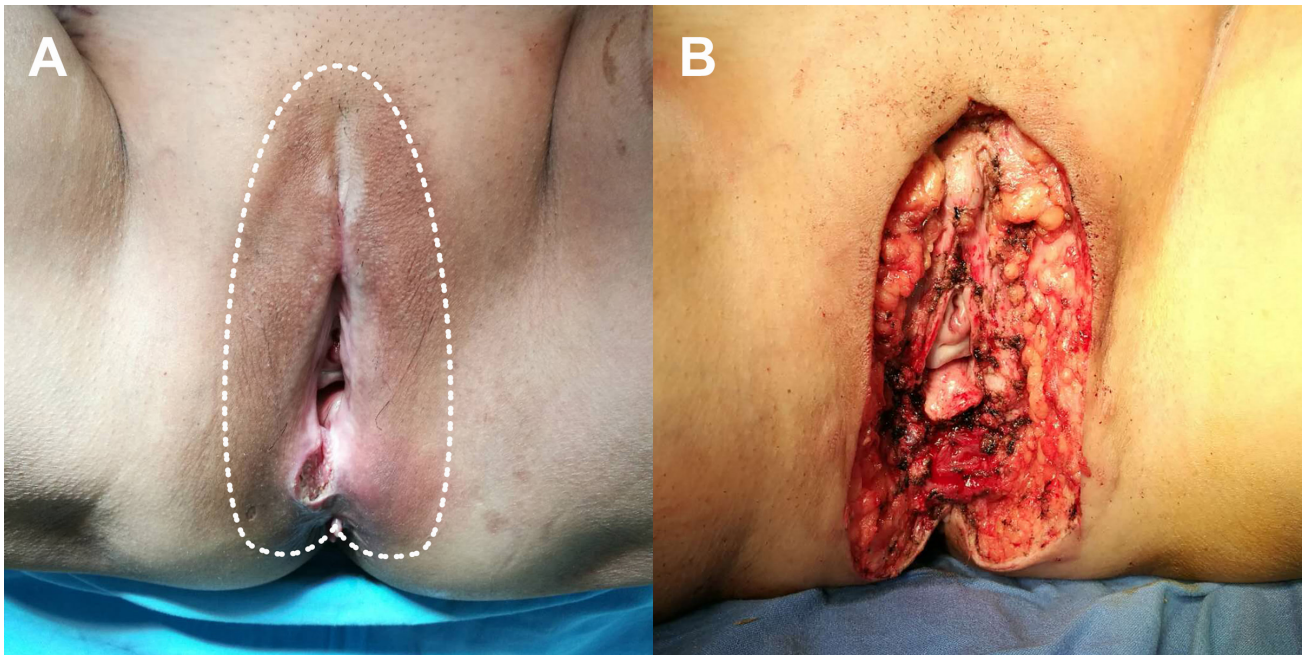


Fig. 1. Extended radical vulvectomy for carcinoma. (A) Recurrent vulvar squamous cell carcinoma in a 60-year-old woman. The white dotted lines is defined the tumor resection margins. (B) Lithotomy view of a $15 \times 8 \text{ cm}^2$ vulvectomy defect following excision of recurrent vulvar squamous cell carcinoma.

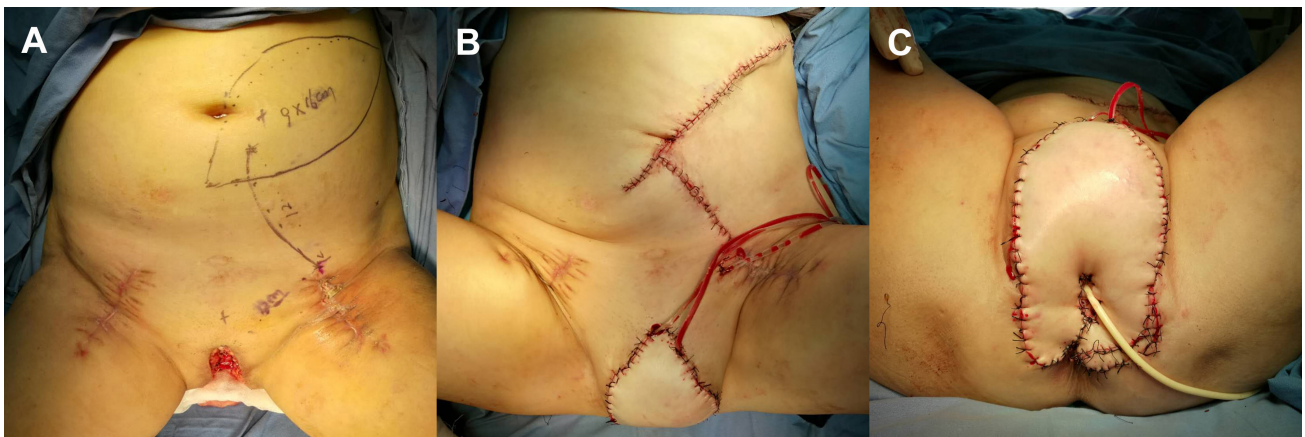


Fig. 2. PUP flap technique for vulvar reconstruction. (A) A $16 \times 9 \text{ cm}^2$ PUP flap was designed to cover the vulvar defect with the vessel pedicle being 12 cm in length. (B) Vertical view of the postoperative outcome. (C) Lithotomy view of the postoperative outcome.

The surgical technique consists of the following steps. Once the defect is outlined, PUP is identified by means of a Doppler probe and labeled on the skin. The full thickness of skin is incised around the inverted pattern of the defect outlining the skin portion of the island flap. A paraumbilical perforator flap is harvested from the left paraumbilical site. The skin on the left side of the abdomen is then undermined downward over the left hypogastric and inguinal area to the level of the vulvar defect. Utilizing this tunneled design, PUP flap and subcutaneous pedicle obtained greater mobility and a longer turning radius to cover the complete vulvar defects. The skin edges are then sutured to the margins of the defect with fine interrupted sutures (Fig. 2B,C).

3. Discussion

A single stage reconstructive procedure utilizing well-vascularized tissue is the key point to success of the operation. Perforator flaps facilitate the transfer of the autologous skin and fat in a reliable method with minimal donor site morbidity. As one of the most widely used abdominal perforator flaps, DIEP flap remains the primary choice for breast reconstruction [6]. Based on the perforators derived from the deep inferior epigastric artery, the paraumbilical perforator flap was first described by Koshima and coworkers in 1991 [7]. To distinguish from the traditional DIEP with the transverse skin paddle for breast reconstruction, this novel flap design was officially named paraumbilical perforator flap (PUP) [8]. However, no case has previously been reported of using PUP flap for vulvar reconstruction. Herein, we first present



Fig. 3. At 6-month follow-up, the patient had achieved an acceptable restoration without tumor recurrence.

a case of recurrent vulvar carcinoma requiring total vulvectomy followed by a paraumbilical perforator flap for a one-stage vulvar reconstruction.

Numerous perforator flaps are available for the reconstruction of vulvar defects, but the ideal flap remains controversial [9, 10]. DIEP has been considered as a less invasive and simple procedure for vulvar reconstruction. However, the paraumbilical perforator flap is completely different from the deep inferior epigastric perforator flap because the former has only a short perforator, whereas the later has both a perforator and deep inferior epigastric vessels. Therefore, compared with DIEP, PUP may be a superior choice without invasion or sacrifice of any rectus abdominis muscle. Due to its reliability and versatility for reconstructions of complex defects resulting from vulvar cancer surgery, the anterolateral thigh (ALT) flap serves as another alternative option [11]. However, ALT flap often results in visible scarring of the donor site, and gluteal flaps require restrictions on postoperative sitting. According to the study by Zhang *et al.* [12], DIEP flap is a better choice than ALT for mons pubis defects. The vertical rectus abdominis myocutaneous (VRAM) flap is commonly used with larger defects following vulvectomy, but it has increased donor-site morbidity secondary to bulges or hernias. Furthermore, given a bulky appearance, follow-up surgical procedure is usually required [13].

PUP flap offers several advantages: (1) The procedure time is very short for flap elevation; (2) as there is no need for vascular dissection to the deep muscle layer, it minimizes the damage to the rectus abdominis muscles or fascia and reduces the occurrence of abdominal incisional hernia; (3) PUP flap provides a large and long enough donor site to cover the postoperative defects produced by the radical vulvectomy; (4) the thickness of the muscle-free flap is easily adjusted to the

complex prominence of the vulva, thereby achieving morphologic and functional vulvar reconstruction; (5) the reproducibility of PUP flap is high when underwent by a trained plastic surgeon, with a low rate of abortion.

Our flap also has several disadvantages that require consideration. Although PUP flap can be used to minimize the donor site morbidity, it is naturally bulky for vulvar reconstruction and frequently a secondary vulvar cosmetic surgery is frequently required. Furthermore, a further disadvantage encountered with this flap is the visible scar produced at the donor site.

4. Conclusions

Our report suggests that a paraumbilical perforator flap enables reconstruction of a large vulvar oncologic defect, with an acceptable restoration. We believe that PUP is a reasonable alternative to allow for one-stage reconstruction of vulvar defects. Further investigations for this novel flap to treat such cases should be considered.

Author contributions

XJL were the initial doctor who involved in the intervention of the patient during his hospitalization. CL wrote the manuscript. XLL and XJL were involved in literature review and revising the manuscript. XJL handled the submission process.

Ethics approval and consent to participate

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Changzhi People's Hospital (approval number: 2021K021).

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Conflict of interest

The authors declare no conflict of interest.

Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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