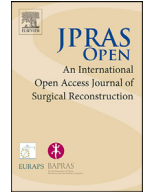




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## Case Report

# Three-dimensional reconstruction of hip and groin region by division and rotation of skin paddle using oblique rectus abdominis musculocutaneous flap after squamous cell carcinoma resection

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## ABSTRACT

Reconstructing extensive defects in the hip and groin region is challenging. Although the technique of wrapping the flaps is often chosen, achieving effective coverage of defects is difficult because of the tissue bulge in the center, and a skin graft is frequently required. We herein report a case of successful hip “corner” reconstruction using a pedicled oblique rectus abdominis musculocutaneous flap with division and rotation of the skin paddles after squamous cell carcinoma resection. The patient had a history of immunosuppressive treatment, radiation therapy, and surgeries on the ipsilateral thigh. Our technique minimized the sacrifice of the flap donor site, achieved primary closure, and resulted in a favorably shaped reconstruction with respect to three-dimensional mor-

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phology. The patient's postoperative quality of life was ultimately improved.

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## Introduction

The hip and groin area contains important structures, including the abdominal wall, inguinal ligament, iliac crest, and femoral vessels and nerves. The contours of the hip and groin are also important. They help to hold the belt in place and are crucial from a cosmetic standpoint. During reconstruction, exposed vital organs must be protected while remodeling the intricate three-dimensional structure of the hip and groin area. These steps are key to improving the patient's quality of life. Successful reconstruction ensures the ability to smoothly dress and walk in daily life after surgery.

In this report, we present a case involving a patient with an extensive defect in the hip and groin region. Choosing a suitable reconstruction method was challenging because of the patient's history of immunosuppressive treatment (IST), radiation therapy (RT), and limitation of the skin flap harvest site due to previous surgery on the ipsilateral thigh. Nonetheless, we successfully reconstructed a well-defined hip and groin through strategic division and rotation of the skin paddle of a pedicled oblique rectus abdominis musculocutaneous (ORAM) flap.

## Case presentation

A 71-year-old man presented with metastatic recurrence of squamous cell carcinoma in his left inguinal region. He had a history of kidney transplantation. The primary site of the squamous cell carcinoma was the left fifth toe, for which we performed excision, lymph node dissection in the left inguinal area, curative chemotherapy, and RT for whole left lower limb. This time, metastatic recurrence was identified in the left inguinal region in addition to the split-thickness skin graft (STSG) site related to the patient's history of necrotizing fasciitis. Neoadjuvant chemotherapy was administered, and resection of the metastatic recurrence and simultaneous reconstruction were performed.

During surgery, the defect was measured at  $15 \times 16$  cm. We excised the external oblique abdominis, internal oblique abdominis, sartorius, tensor fascia femoris, and a portion of the gluteus medius. A portion of the iliac crest was also removed, but the femoral vessels and nerve were not exposed (Figure 1). A pedicled ORAM flap measuring  $8 \times 25$  cm was raised based on the left deep inferior epigastric vessels. The defect on the donor side was meticulously closed by umbilicoplasty. The skin paddle was divided, each part containing its perforator vessels, after confirming blood perfusion by indocyanine green fluorescence angiography. The cephalic skin island was rotated clockwise to close the defect (Figure 2). The patient's progress was uneventful, and he was discharged on the 12th postoperative day. A follow-up examination 6 months later showed that the patient's wounds had recovered well with good aesthetic results (Figure 3).

## Discussion

A commonly employed method for defects in the hip and groin region is the use of a rectus abdominis flap and anterolateral thigh flap.<sup>1,2</sup> When the defect is extensive, primary closure of the reconstructed or flap harvest site may not be possible, in which case an STSG is frequently chosen.<sup>3</sup>

In this case, the patient had a history of IST, RT, and ipsilateral thigh grafting. IST and RT can lead to delayed wound healing and an increased risk of infection.<sup>4,5</sup> Therefore, we aimed to achieve primary closure by utilizing an ORAM flap containing the rectus abdominis, known for its abundant blood supply.

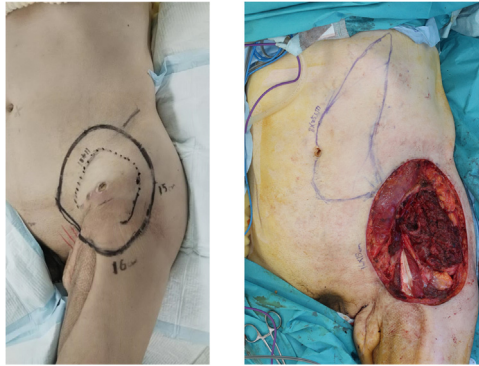


Figure 1. Preoperative photograph and surgical defects.

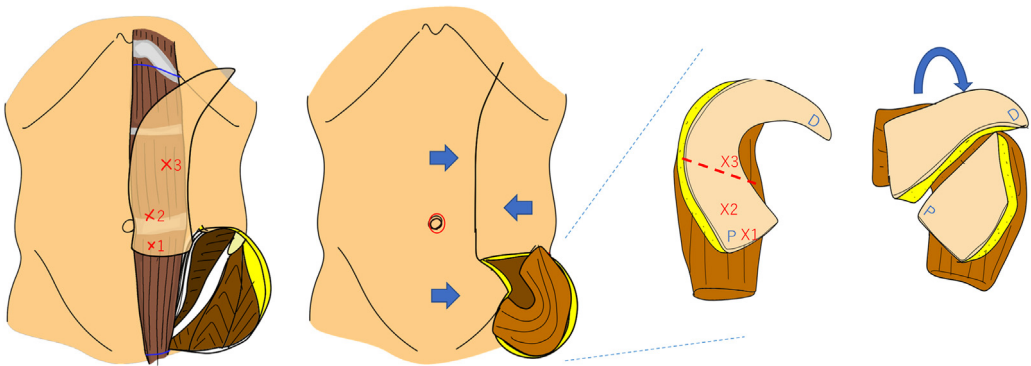


Figure 2. Surgical procedure.

Design of pedicled oblique rectus abdominis musculocutaneous flap. Each X indicates a perforator. Technique of the skin paddle division and rotation between the perforators.

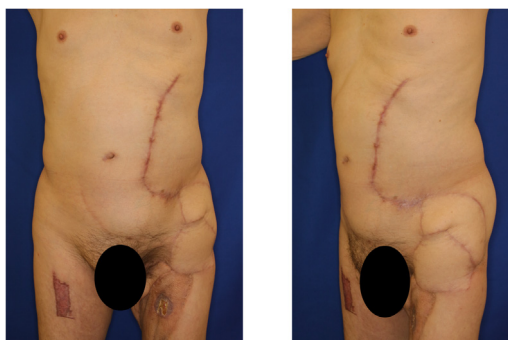
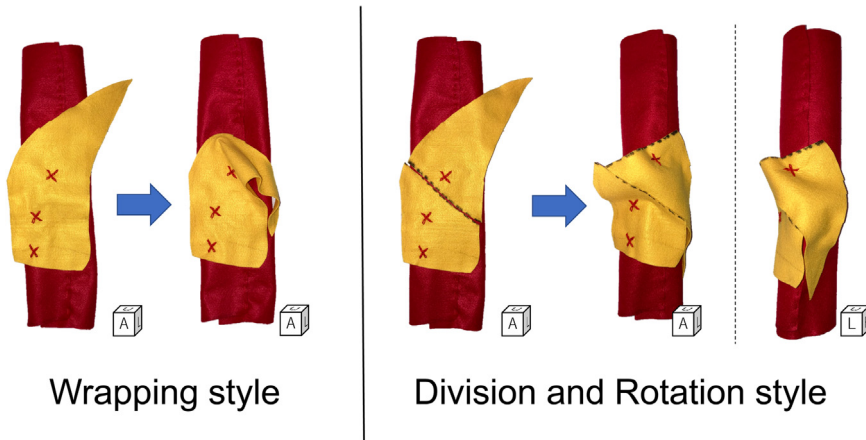


Figure 3. Six-month postoperative photographs.

The three-dimensionality of the hip and groin region requires careful consideration of the flap design in the reconstruction of skin and soft tissue defects. The defect in this case extended laterally to the hip and groin. To achieve well-defined hip reconstruction, a “corner” must be formed by filling in the deep layers with muscle and then reconstructing the front and lateral sides with a skin island. Two individual skin flaps can be raised to create the anterior and lateral surfaces, respectively, but



**Figure 4.** Usefulness of division and rotation of the flap in a simplified model surgery using felt. Red felt represents the rectus abdominis, yellow felt represents the skin paddle, and each X represents a perforator. Simply wrapping with the skin paddle creates a bulge in the center. However, dividing the skin paddle between the perforators and rotating the skin island results in efficient coverage with “corner” reconstruction.

this would increase the burden on the patient and would be difficult when the flap harvesting site is limited, as in this case. As proposed by Zhang et al.<sup>6</sup> the concept of dividing and repositioning the skin island to allow efficient reconstruction of a wide range of defects and minimize sacrifice of the skin flap harvesting sites (kiss flap technique) has been applied in a variety of cases.<sup>7,8</sup>

To apply this approach to “corner” reconstruction, we performed a simplified model surgery using felt (Figure 4). Usually, the goal is to cover the deep area with muscle and suture it in a way that wraps around the skin; however, this creates a bulge in the center of the skin paddle. Consequently, it is difficult to completely cover the skin defect, and an STSG is frequently used. By dividing the skin paddle between the perforating branches and rotating the skin islands, as performed in the present case, the skin islands are efficiently placed and create an anterior and lateral plane. Dividing the skin islands at an opposite angle (Supplementary Figure) would create overlap and could result in areas where the skin islands do not reach. In addition, when designed with a vertical rectus abdominis musculocutaneous flap (Supplementary Figure), it was difficult to place the distal skin island to cover the lateral side of the defects. Therefore, dividing and rotating the skin paddles with an ORAM flap was considered the optimal method to create an efficient and morphologically favorable hip “corner” and to provide primary closure of the flap harvest site. Reconstruction with good morphology can help prevent scar contracture and ensure morphological restoration without impediment of joint movements such as walking, sitting, and dressing, ultimately improving the patient’s quality of life.

## Conclusion

We have described the successful reconstruction of extensive defects in the hip and groin region with a favorable morphology by utilizing an ORAM flap, which involves division and rotation of a skin paddle. The patient’s background must be carefully considered to determine the most suitable reconstructive approach and improve their quality of life after treatment.

## Ethics approval

Not required.

## Informed consent

The patient has consented to the publication of his history and photographs in this academic journal.

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## Conflict of interest

The authors declare that they have no conflict of interest.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi: 10.1016/j.jpra.2024.06.012](https://doi.org/10.1016/j.jpra.2024.06.012).

## References

1. Schwabegger AH, Rainer C, Berresheim U, Stenzl A, Anderl H, Ninković MM. Reconstruction of large soft tissue defects in the inguinal and suprapubic region using a variety of flaps. *Eur Urol*. 1999;35(4):304–311.
2. LoGiudice JA, Haberman K, Sanger JR. The anterolateral thigh flap for groin and lower abdominal defects: a better alternative to the rectus abdominis flap. *Plast Reconstr Surg*. 2014;133(1):162–168.
3. Aslim EJ, Rasheed MZ, Lin F, Ong YS, Tan BK. Use of the anterolateral thigh and vertical rectus abdominis musculocutaneous flaps as utility flaps in reconstructing large groin defects. *Arch Plast Surg*. 2014;41(5):556–561.
4. Schaverien MV, Dean RA, Myers JN, Fang L, Largo RD, Yu P. Outcomes of microvascular flap reconstruction of the head and neck in patients receiving systemic immunosuppressive therapy for organ transplantation. *J Surg Oncol*. 2018;117(7):1575–1583.
5. Strawberry CW, Jacobs JS, McCraw JB. Reconstruction for cervical irradiation ulcers with myocutaneous flaps. *Head Neck Surg*. 1984;6(4):836–841.
6. Zhang YX, Hayakawa TJ, Levin LS, Hallock GG, Lazzeri D. The economy in autologous tissue transfer: part 1. The kiss flap technique. *Plast Reconstr Surg*. 2016;137(3):1018–1030.
7. Karakawa R, Yoshimatsu H, Tanakura K, Imai T, Yano T, Sawaizumi M. Triple-lobe combined latissimus dorsi and scapular flap for reconstruction of a large defect after sarcoma resection. *Microsurgery*. 2021;41(1):26–33.
8. Zhao W, Zhu W, Yu D, Zhu H, Liu J, Ni Y. Novel V-shaped kiss flap harvest technique for the forearm free flap in soft tissue reconstruction. *World J Surg Oncol*. 2023;21(1):128.