

양측 천외음부동맥 천공지 피판을 이용한 음경둘레 연조직 결손의 재건

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Reconstruction of a Circumferential Penile Shaft Defect Using Bilateral Superficial External Pudendal Artery Perforator Flaps

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Penile shaft reconstruction requires adequate soft tissue characteristics as well as constant vascular pedicles when considering a perforator flap. The free flap technique using various donor sites and regional conventional and perforator flaps have been utilized for penile shaft reconstruction. Still, the free flap techniques include challenging surgical procedures in addition to postoperative management. The regional flap can be applied to limited defects due to the size and shape. We performed the bilateral superficial external pudendal artery (SEPA) perforator flaps in order to reconstruct a circumferential penile shaft defect. The circumferential wound has noted necrotic tissue involving superficial (Dartos) fascia. We underwent debridement, preserving deep (Buck's) fascia and corpus spongiosum. Thereafter, the soft tissue defect was covered with bilateral SEPA perforator flaps. The patient has been observed for 27 months, showing penile resilience without deformity or wound-related problems.

Key Words: Penis, Circumference, Reconstruction, Perforator flap

Male genital skin and soft tissue defects are usually due to trauma, fasciitis, excessive circumcision, animal bites, burns, and surgery for benign and malignant lesions¹. The reconstruction of penile soft tissue defects are invariably challenging. Especially, that protruding morphology and resilient characteristics should be preserved. Various surgical techniques, including scrotal flap and pedicled anterolateral thigh flap, have been presented¹⁻³. Successful reconstruction requires adequate coverage with resilience and minimal donor site morbidity. We have utilized the

bilateral superficial external pudendal artery (SEPA) perforator flaps for the reconstruction of a circumferential penile shaft defect, and report the results herein.

CASE REPORT

A 49-year-old man was referred from the urology department where he had received repeated debridement and repair to resolve penile abscess and soft tissue necrosis caused by a trauma. The circumferential wound

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presented $3 \times 10 \text{ cm}^2$ necrotic tissues involving superficial (Dartos) fascia (Fig. 1). We underwent debridement, preserving the deep (Buck's) facial and corpus spongiosum. Thereafter, the locations of pedicles, namely superficial external pudendal arteries (SEPA) were traced using hand-held Doppler device on both sides of the penis and inguinal area. Then, we designed two elliptical flaps including perforators and wound margin (right, $7 \times 3 \text{ cm}$; left, $6 \times 3 \text{ cm}$). After incisions with regard to the design, flaps were elevated. The pedicle and vascular anatomy were visually confirmed under microscopic magnification. The diameter of the right perforator artery was 2.2 mm, and the diameter of the left perforator was 1.8 mm. The thickness of the flap was 4 mm. The flaps were transposed to the circumferential wound.

The donor sites were approximated at both subcutaneous and skin layers. Silastic drains were placed at subcutaneous layers of donor sites. Confirming the perforator wave sound on doppler device, the two transposed flaps were set in wrap-around manner. Subcutaneous layer sutures were followed by skin repair (Fig. 2, 3). The wound has healed; although there was congestion on the ventral side which resulted in a $1 \times 1 \text{ cm}$ sized partial flap loss. Additional debridement and repair have been performed, and flaps were maintained without complications. The patient has been observed for 27 months, showing penile resilience without deformity or wound-related problems (Fig. 4). A circumferential penile shaft defect has been successfully reconstructed using bilateral SEPA perforator flaps.

DISCUSSION

Over the past decades, penile shaft reconstruction has remained a great challenge for plastic surgeons in anatomical, functional, and aesthetic aspects. The primary goal of penile shaft reconstruction is achievement of acceptable phallus shape cosmetically as well as enough bulk with cylinder shape to guarantee sufficient rigidity for penetrative sexual intercourse. Ideally, surgical repair should be acceptable in terms of elasticity, texture, and color. When a regional local flap with genital tissue is not

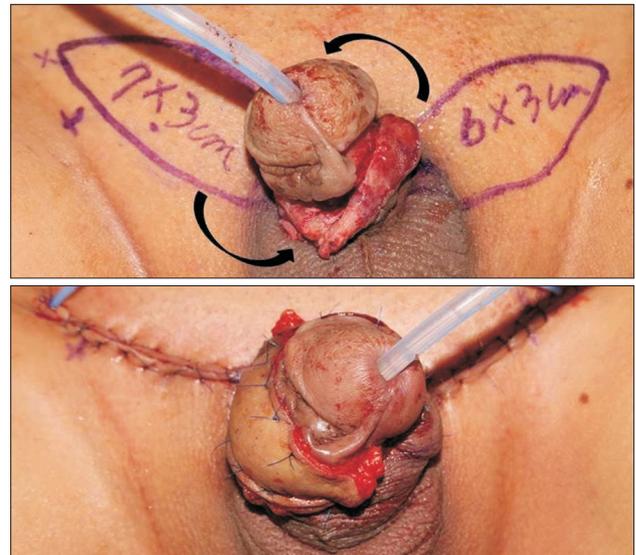


Fig. 2. We underwent debridement, preserving deep (Buck's) fascia and corpus spongiosum. Thereafter, soft tissue defects have been covered with bilateral superficial external pudendal artery perforator flaps.

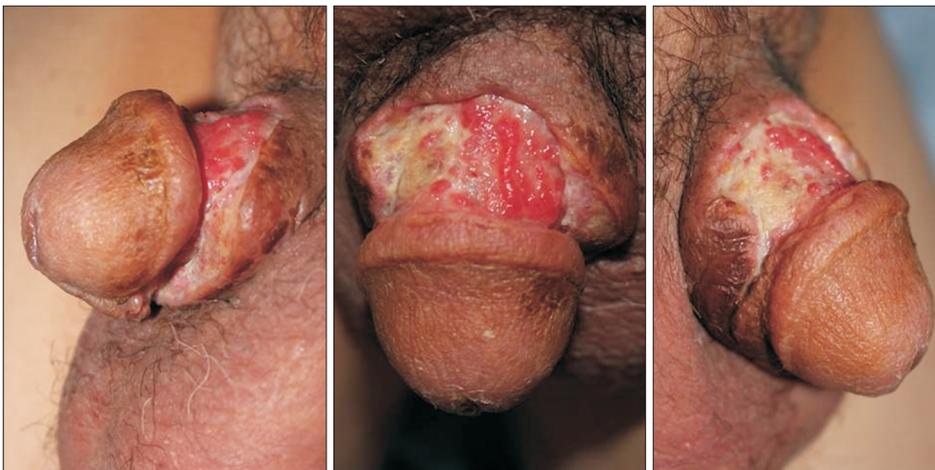


Fig. 1. A 49-year-old man was referred from the urology department, where he had received repeated debridement and repair to resolve penile abscess. The circumferential wound was noted at $3 \times 10 \text{ cm}$ of necrotic tissue involving superficial (Dartos) fascia.

feasible, reconstruction can be achieved with the use of skin grafts⁴. Conventional regional flaps, such as various scrotal flaps show poor cosmetic results due to discrepant skin texture¹. For similar reasons, split-thickness skin grafts and full-thickness skin grafts exhibit disadvantages. Resilient characteristic should be preserved in penile reconstruction. However, skin graft technique can lead to wound contracture more frequently, resulting in deformation of the penile shaft^{5,6}. On the contrary, a thin subcutaneous layer of SEPA flap is advantageous for preserving resilience. In addition, this method does not require a tunneling procedure on adjacent soft tissue, which can cause morbidities. Soft tissue coverage using a free flap may be considered as the treatment of choice to overcome the above disadvantages inherent in penile reconstruction⁷. They are possible through various methods using radial forearm free flap, anterolateral thigh free flap, latissimus dorsi flap, scapular free flap, and so on¹. Compared with the reconstruction methods mentioned above, strategic advantage of our case was well-traced SEPA perforator which existed close to the penile root showing consistent vascular anatomy.

With regard to vascular anatomy, the branches from SEPA travel medially. The branch is typically originated from the inferior level of the great saphenous vein, and extended horizontally. SEPA gives rise to many willow-like branches that supply the upper perineal region. Af-

ter entering the scrotum from the lateral upper side, the branch continues to run inferiorly. It supplies the upper one-third of the scrotum. The main stem anastomoses with the medial and posterior scrotal arteries⁸. For these reasons, surgeons can perform the operation more efficiently and confidently. In order to create a successful flap, it is important to understand detailed anatomy of the arteries that promote vascularity. There are four types of SEPA variations⁹. In our case, both arterial vessels pre-

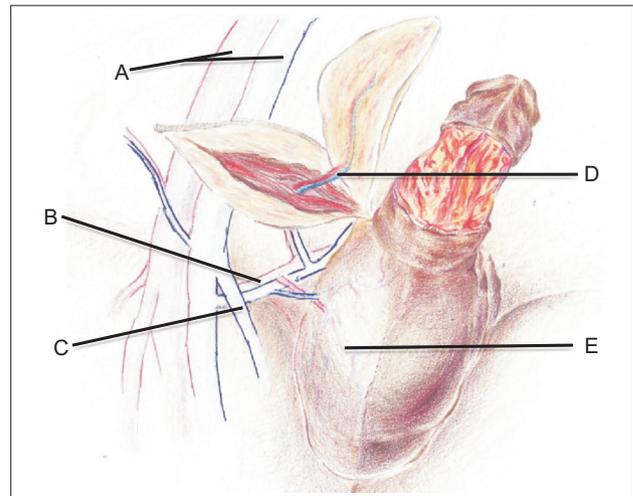


Fig. 3. Illustration of the right superficial external pudendal artery (SEPA) perforator flap when it was elevated. A: femoral artery and vein, B: external pudendal artery and vein, C: long saphenous vein, D: SEPA perforator, E: anterior scrotal branch of external pudendal artery and vein.



Fig. 4. Circumferential penile shaft defect has been reconstructed using bilateral superficial external pudendal artery perforator flaps successfully. A thin subcutaneous layer of the flap is advantageous in preserving resilience.

sented single arteries corresponding to Type 1.

SEPA perforator flap is Type A (adipo-cutaneous course) in fasciocutaneous flap classification¹⁰. The thickness of the flap has been measured from 3 mm to 10 mm¹⁰. The flap is applicable when thin flaps are crucial, such as in penile shaft reconstruction. However, care should be taken when planning a reconstruction with limited pedicle length. Therefore, the surgical technique may be limited when the defect or penis size is large.

In conclusion, surgeons have to consider various functional and aesthetic aspects of penile reconstruction. Successful penile reconstruction can be achieved by using a flap that provides sufficient resilience with thin characteristic. The SEPA perforator flap is versatile in penile reconstruction, since the perforator exists close to the penile root and shows consistent vascular anatomy. A thin subcutaneous layer of the flap is advantageous in preserving resilience. Adequate surgical indication should be considered to accomplish favorable outcomes.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

REFERENCES

1. Garaffa G, Sansalone S, Ralph DJ. Penile reconstruction. *Asian J Androl*. 2013;15:16-9.
2. Kim SW, Yoon BI, Ha US, Kim SW, Cho YH, Sohn DW.

2014. Treatment of paraffin-induced lipogranuloma of the penis by bipediced scrotal flap with Y-V incision. *Ann Plast Surg*. 2014;73:692-5.
3. Guo L, Zhang M, Zeng J, Liang P, Zhang P, Huang X. Utilities of scrotal flap for reconstruction of penile skin defects after severe burn injury. *Int Urol Nephrol*. 2017;49:1593-603.
4. Doornaert M, Hoebeke P, Ceulemans P, T'Sjoen G, Heylens G, Monstrey S. Penile reconstruction with the radial forearm flap: an update. *Handchir Mikrochir Plast Chir*. 2011;43:208-14.
5. Garaffa G, Christopher N, Ralph DJ. The management of genital lymphedema. *BJU Int*. 2008;102:480-4.
6. Black PC, Friedrich JB, Engrav LH, Wessells H. Meshed unexpanded split-thickness skin grafting for reconstruction of penile skin loss. *J Urol*. 2004;172:976-9.
7. Yao A, Ingargiola MJ, Lopez CD, et al. Total penile reconstruction: a systematic review. *J Plast Reconstr Aesthet Surg*. 2018;71:788-806.
8. Seo BF, Choi JY, Han HH, et al. Perforators as recipients for free flap reconstruction of the inguinal and perineal region. *Microsurgery*. 2015;35:627-33.
9. La Falce OL, Ambrosio JD, Souza RR. The anatomy of the superficial external pudendal artery: a quantitative study. *Clinics (Sao Paulo)*. 2006;61:441-4.
10. Cormack GC, Lamberty BG. A classification of fasciocutaneous flaps according to their patterns of vascularisation. *Br J Plast Surg*. 1984;37:80-7.

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음경 둘레 연조직 결손은 다양한 공여부를 이용하여 재건할 수 있으며, 유리피판술 및 국소피판술을 응용할 수 있다. 유리피판술의 경우 성공적인 결과를 위해 수술 과정 및 술 후 관리에 기술적인 어려움이 있으며, 기존 국소피판술은 결손 부위의 크기나 모양에 제약이 따르게 된다. 이에 양측 천외음부동맥 천공지피판을 이용한 음경둘레 연조직 결손 재건의 성공적인 사례를 발표하고자 한다. 음경 둘레 연조직 결손은 음낭근막까지 관찰되었으며, 변연절제술 시행 이후 심부근막과 해면체는 보존하였다. 이후 양측 천외음부동맥 천공지 피판을 이용하여 음경 전체 둘레 연조직 결손 부위를 재건하였다. 27개월의 추적 관찰 기간 동안 음경의 형태와 기능은 보존되었으며, 창상치유와 연관된 문제는 관찰되지 않았다.

색인단어: 음경, 둘레, 재건, 천공지 피판

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