

Case report: Posterior arm perforator flap for reconstruction of axillary defect after infected radiation-induced ulcer

Pham Ngoc Minh, Luu Phuong Lan

108 Military Central Hospital

Summary

Axillary soft tissue defects are uncommon in Vietnam. We report a case of an 81-year-old female patient had an infected axillary skin ulcer after going through a radical surgery and radiation therapy 30 years ago. In this case, a CT scanner was used to evaluate the fundus of the lesion and biopsy to rule out malignancy. The treatment procedure was eliminating infection based on the antibiogram, wound care, debridement, negative pressure wound therapy and reconstruction of defect. The optimal choice in this case was to use posterior arm perforator flap. After the surgery, the flap had a good vitality and the wound healed after 3 weeks. The case affirmed that the posterior arm perforator flap is suitable for axillary coverage and should be considered as one of the main options for axillary reconstruction.

Keywords: Posterior arm perforator flap, posterior arm flap, axillary defect.

1. Background

In general, axillary soft tissue defects are rare lesions and have not been mentioned much in Vietnam. The most common causes are defects after pyogenic hidradenitis suppurativa excision or release scar of burn sequelae, tumor excision or non healing ulcers [1, 2]. According to the reconstructive ladder, there are different reconstructive options available from skin grafting to random flaps or axial flaps in adjacent areas: Arms, back, lateral chest wall, anterior chest area or free flaps. Skin grafting can cause contractions that limit movement and require a clean, good base. Some axial flaps with good mobility have been mentioned in axillary defect reconstruction. This article discusses the use of the posterior arm flap (PAF), an often-overlooked option in axillary reconstruction. However, this is a fasciocutaneous flap with many advantages: A constant vascular pedicle, flexible mobility, simple flap dissection, large skin flap,

no destruction of the donor site, especially suitable for cases with excessive skin on the arms.

2. Case presentation

A 81 years-old female patient with a history of right breast cancer was treated by radical mastectomy, axillary lymphadenectomy, extensive radiotherapy 30 years ago. She was performed to remove infected axillary skin ulcer and cover defect by the local rotation flap at Thai Nguyen General Hospital. After surgery, the lesion continued discharge purulent, non healing. On admission to 108 Military Central Hospital, the right axillary lesion was necrotic infected ulcer with a size of 3 × 5cm. The surrounding area was redish swelling and sclerosing with the size 6 × 8cm (Figure 1A). The anterior and lateral wall of the right chest were atrophied, firmly adherent, the pectoralis major muscle was contracted, leading to joint stiffness due to long-term radiotherapy causing limited movement of the shoulder joint with 700 maximum abduction and 800 maximum flexion. A CT scanner used to evaluate the fundus of the leision, no fistula to pleural cavity and biopsy to rule out malignancy.

Received: 28 September 2023, **Accepted:** 02 December 2023

Correspondence to: Pham Ngoc Minh - The Craniofacial and Plastic Surgery Center, 108 Military Central Hospital

Email: minhphamngoc81@yahoo.com

The treatment plan was eliminate infection based on antibiogram, local injury care, debridement, using negative pressure wound therapy, wide excision and recontruction of defect when granular tissue formed. After ulcer excision, a right axillary defect was a size of $7 \times 8\text{cm}$, with the base of defect was fibrous tissue without exposed bone. A PAF with a size of $7 \times 14\text{cm}$ was designed with 3.5cm wide skin bridge, the flap axis is along with the midline of the posterior side of the arm and a handheld doppler device to determine the perforator of the flap (Figure 1B). The

fasciocutaneous flap was dissected and preserved the perforator. Based on the skin pinch test, the donor site ensured directly closure. After surgery, the flap was pink, good vitality. (Figure 3A). The incision in the arm was swollen, moderately tense, edematous, blood stasis in the forearm, hand. The arm was elevated and abducted 300 and the edema returned to normal after 3 weeks. The wound was minor healing disturbance. Postoperative 1 month, shoulder joint range of motion improved to 900 maximum flexion and 90 maximum abduction.



Figure 1. Preoperative images. A: Lesion at admission. B: PAF flap design. C: Lesion after negative pressure wound therapy



Figure 2. Intraoperative images. A: The axillary defect after excision. B: Perforator at the blue arrow. C: The flap is raised

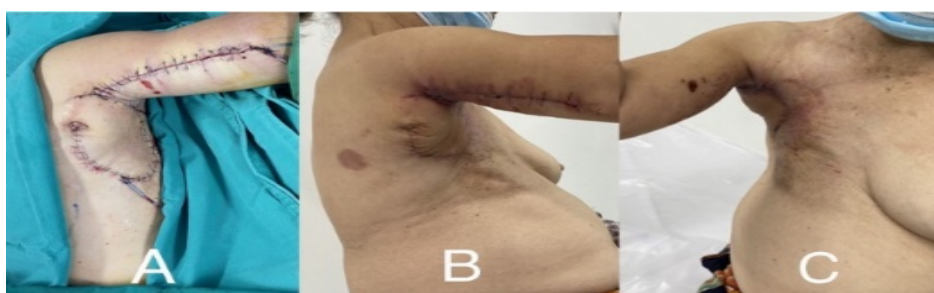


Figure 3. Postoperative images. A: Immediately after surgery. B, C: Postoperative 3 weeks

3. Discussion

The axillary skin is thin and very mobile, that is suitable for the flexible movement of shoulder joint, covering important blood vessels, nerves. According to reconstructive ladder, depending on the size, location and complexity of the defect to choose the appropriate covering technique. For medium - large defects, skin grafting is a popular technique apply for the shallow defect with good blood supply and no important structures exposure. However, the disadvantage is shrinkage, restricted movement. Choosing the regional flaps method is necessary. Pectoralis major and latissimus dorsi myocutaneous flaps are optimal choices for filling gaps and preventing infection, but it can hinder shoulder joint movement due to the thickness of the flap [3]. Therefore, fasciocutaneous flaps are preferred to be used as latissimus dorsi fasciocutaneous flap, lateral pectoral flap, propeller parascapular flap, Scapular Island Flap, posterior arm flap (PAF)... [1, 4, 6] Diverse forms are used: Pedicled flap or island flap, rotation, transposition or VY advancement flap, random flap or axial flap. Types of perforator flaps such as the thoracodorsal artery perforator flap have recently been introduced as a new alternative technique for covering the axillary defect, but it requires surgical experience to preserve the small perforating vessels, dissect through the muscle to ensure free tension flap transfer and prolonged surgery time [2, 7]. On the contrary, the deep tissue and muscle structures are kept intact when using the PAF. Free flaps are applied to large and complex defects. It is more difficult, long surgery time, performed at large centers with highly qualified plastic surgeons. In our case, skin on the anterior and lower lateral chest wall were atrophic, adherent to muscle, poor elasticity so unfavorable for flap creation. Skin on the back had a thick fat layer, if using flap in here, the donor site could not be directly closed, especially when using a myocutaneous flap. Therefore, the PAF was an excellent choice, especially when the skin on the arm was loose, a lot of excess, thin fat layer and it did not affect the local lymphatic, nervous system.

The PAF was first described by Masquelet (1985) as a new free flap [5]. This is an excellent option for axillary coverage. Surprisingly, this flap had not

received much attention by surgeons for a long time. In 1992, Elliot et al reported the use of pedicle PAF for axillary reconstruction, but not routinely. The pedicle of the flap is a cutaneous branch, which arises from the brachial artery (71%), deep brachial artery (23.5%), average diameter at the point of origin was 1.5mm, the average length of the artery in the subcutaneous tissue was 11cm, so the flap can be used as a pedicle flap or a free flap [5, 8]. There is a chance that may be 1 or 2 veins drain the flap. The posterior brachial cutaneous nerve controls sensation for the PAF [5, 8]. In Guha's study, the anatomical vascular pedicle of the flap is constant, moving below the fibrous ring connecting the long head of the triceps muscles and latissimus dorsi muscles [9]. It can be easily identified with a hand-held doppler device and during surgery, the flap elevation time is often less than 30 minutes, without the need for magnifier or microscope for pedicle or muscle dissection. The distal edge of the flap can reach the intersection between the distal and middle of the arm. To avoid dog-ear after flap transfer, Elliot reduced skin at the pedicle flap based on its vascular axis, making it more aesthetically pleasing [10]. The island flap form was used to increase the flexibility of the flap's rotation arc and minimize risk of dog-ear [2]. In the article, the PAF perforator flap was used, dissection to release fibers around the vascular pedicle, retained the 3.5cm fasciocutaneous bridge for reinforcement to strengthen and ensured the perforating vessels, in which large flap size was 7 × 14cm (Figure 2B). Masquelet's research on 35 human cadavers on both sides showed that when methylene blue was injected into the vascular pedicle, the blood supply area was very diverse, the minimum length was 13cm, the minimum width was 7cm. Schmidt (2015) used 35 PAF flaps to reconstruct the axillary region with average flap size of 8 × 12cm, of especially the largest flap was 12 × 16cm, the donor site still be directly closed [2].

The donor site can be directly closed with a flap width of 7-8cm without additional skin grafting [5]. In the previous discussed case, the donor site was directly closed with width of 7cm. However, the forearm, hand were blood stasis, edema, that had returned to normal after 3 weeks, when arm was

elevated and abducted 300, using medicine to reduce swelling, masage gently from the periphery to the center. This was just a condition related to the tension of the incision and no evidence of lymphedema. In fact, harvesting the PAF flap is similar to remove excess arm skin, creat contour and hide scars behind the arm, not aesthetically affected but still visible when wearing a T-shirt. PAF is a fasciocutaneous flap with a strong blood supply and good anti-infection property, so the complication rate is low. Schmidt (2015) reported 35 PAF island flaps with 31 flaps for reconstruction after excision of hidradenitis suppurativa. After surgery, only 4 flaps had minor wound healing disturbance, 1 flap had a partial infection wound, and 1 flap had tip necrosis following intial venous congestion, none of the flaps had seroma and did not affect the function of the donor site [2]. Three cases had been revised by liposuction for flap debulking [2]. Our case was a infected radiation-induced ulcer in the elderly patient diagnosed with obesse, postoperative PAF flap was completel vitality, no seroma. Minor wound healing disturbance occured due to the deep and moistness of the axilla region, the remaining skin edge of the axilla had weaker vitality and infected. Due to long-term shoulder join stiffness and contraction of the pectoralis major muscle, shoulder joint range of motion did not improve significantly after surgery.

4. Conclusion

Defect of axilla are uncommon lesions in Vietnam. The PAF is an exellent choice for axillary reconstruction with many advantages such as strong, constant vascular pedicles, stable, thin, sensory, large size flap, flexible mobility, simple flap elevation technique. The donor site is often directly closed without affecting the function and scar visibility within acceptable limits. In conclusion, PAF should be considered as one of the main options for axillary reconstruction.

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