

Recognition of Complication of Superficial Brachial Axial Pattern Flap in a Dog

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Abstract : A 13-year-old female 30 kg Korean Jin-do dog was presented with severe defects due to vasculitis and perivascular dermatitis at the left antebrachium area. A left superficial brachial axial pattern flap was elevated to cover the defect and the wound was covered. However, one week post surgery, the flap was survived about 1/3 of total flap length. Remaining two thirds defects were performed by the free skin mesh graft as an additional method. After ten days, the entire wound was achieved completely. Skin flaps carry own blood supply in other hands, the flap method is dependent upon continuation of adequate circulation until vascularization takes place. Because they are much thicker than other grafts, this is a slower process and the flap method is vulnerable to problems with kinking or tension of the base. According to this case, a practitioner has to consider length of flap and thickness in order to vascular perfusion when superficial brachial axial pattern flap is performed in a dog.

Key words : axial pattern flap, dog, reconstruction.

Introduction

Small animal cosmetic surgery is a relatively new and rapidly expanding field of veterinary medicine. Pedicle graft or skin flap is a partially detached segment of skin and subcutaneous tissue transferred to a recipient bed to cover a defect. The base or pedicle of the flap maintains the circulation. Axial pattern flaps can be subclassified as peninsular and island axial pattern flaps. The axial pattern flaps include a cutaneous artery and vein in their pedicle improving the perfusion to the flap, but requires predictable anatomic landmarks and are difficult to perform. So, there are complications according to the surgery. The superficial brachial axial pattern flap has potential application for closure of major cutaneous defects involving the canine antebrachium above the carpus (5). Axial pattern flap has, however, a potential of developing a rim of necrosis at the distal tip (1). Distal limb reconstruction is complicated by the paucity of local tissues and the frequent association of orthopedic injury with cutaneous loss. Second-intention healing or skin stretching techniques are used for wounds involving less than a 30% circumference of the limb (4). In this case, although the patient was treated by the text, yet the patient got the complication. Careful planning and atraumatic surgical technique are essential to prevent excessive tension and vascular compromise of skin flaps, especially those based on the subdermal plexus. Therefore, this case helps us find the clue for solving the problem.

Case

A 13-year-old female 30 kg Korean Jin-do dog was presented with severe defects. The dog was involved in a vasculitis and a para-vasculitis (Fig 1). Due to partial parenteral nutrition, the left antebrachium area was developed severe defect. Radiographs made at the time revealed no evidence of bone damage. The defect persisted for 18 days. The skin on the antebrachium aspect of the limb sloughed at this time. The area was debrided and managed as an open wound, and then the wound was granulating and re-epithelializing (Fig 2). Contracture was noted and there was little. The wound surface and pocket were swabbed; culture revealed no evidence of bacteria. The chronic granulating tissue and epithelial defect were excised and a superficial brachial artery-based flap was raised, with the distal extremity of the flap at the contralateral acromion, and rotated 180 degrees. These allowed complete coverage of the excised wound. An antebrachial defect which based on the superficial brachial axial pattern flap was closed by its island arterial flap variation. Donor site closure was routine, due to the elastic nature of the skin over the dorsum. Penrose drains were placed to manage dead space (Fig 3). The flap achieved excellent coverage of the wound. Due to the nature of the dog, it was necessary to dress the wound. We used bandages to protect the flaps and the donor region, preventing excessive movement, contamination and self-inflicted trauma, and improving healing. We did not observe evidence of vascular compromise. Observation of the flap every 12 hours permitted earlier detection of complications. Five days post surgery it was clear that the

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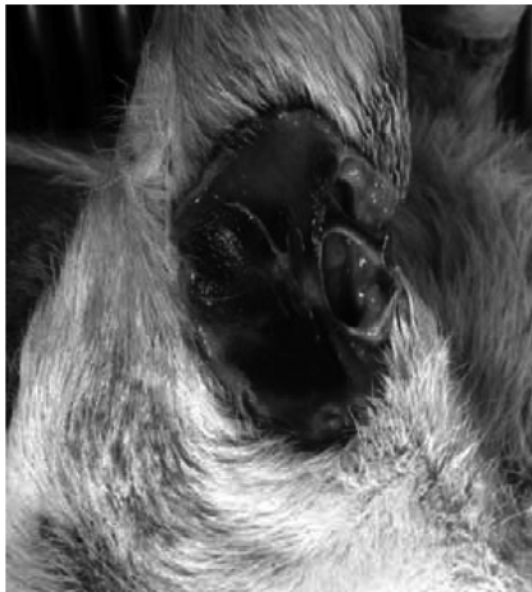


Fig 1. A 13-year-old female 30 kg Korean Jin-do dog was involved in a vasculitis and a paravasculitis due to partial parenteral nutrition through the left antebrachium area. The skin on the antebrachium aspect of the limb sloughed at this time.



Fig 2. The wound was granulating and re-epithelializing.

distal extremity of the flap was not vascularized. By day 7 it was partial necrotic. Partial necrosis of the distal flap, two thirds of the flap surface area, occurred. The flap was survived about third of total flap. Dehiscence was occurred at proximal donor site (Fig 4). The patient was taken back to the theater and the ischemic area debrided. As there was concern that infection was present deep to the ischemic portion



Fig 3. Donor site closure was routine, due to the elastic nature of the skin over the dorsum. Penrose drains were placed to manage dead space.

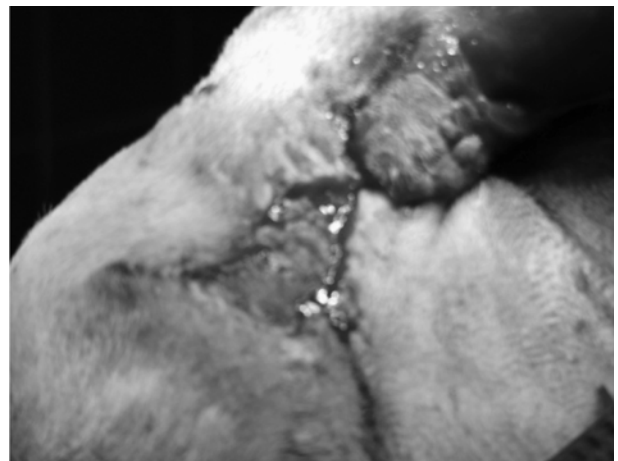


Fig 4. This is the result of a superficial brachial axial pattern flap. Partial necrosis of the distal flap, two thirds of the flap surface area, occurred. The flap was survived about third of total flap.

of the flap, then a free skin graft was applied. The graft donor site was the left flank of the dog, which healed without complications. The graft was applied as a meshed full thickness graft (Fig 5) and dressed with a non-adherent dressing. After ten days, the entire wound was achieved completely. We observed small variations in pattern and course of hair growth on the flaps when compared to adjacent skin, but owners were accepted this outcome. Nevertheless, this is a consideration when using skin flaps. Cosmetic outcome was satisfactory. Regardless of first or second intention healing all wounds had normal function.

Discussion

The superficial brachial artery branches from the brachial artery 3 cm proximal to the elbow joint. A cutaneous branch of this vessel supplies the cranio-medial antebrachium. This



Fig 5. The graft was applied as a meshed full thickness graft. The graft donor site was the left flank of a patient.

small, direct cutaneous artery lies medial to the cephalic vein. The vessel is capable of supporting an axial pattern flap of sufficient size to cover major defects involving the antebrachium and elbow (9).

Survival of axial pattern flaps is reportedly 96-100% (7,13), with a mean survival length 50% greater than subdermal plexus flaps (7,11,13). Others (6) report survival rates of 89-100% for transposition and advancement subdermal plexus flaps and for flaps created from elbow or flank skin-fold.

Skin flap complications are associated with vascular compromise, hematoma and seroma formation, inadequate immobilization, edema, and infection (12). If the bed is well vascularized, complications generally are only mechanical ones, either establishment of a barrier such as hematoma between the bed and the graft, or shearing forces tearing the graft from the bed.

Skin flaps carry own blood supply so they are not generally subject to those kinds of complication. But they are dependent upon continuation of adequate circulation until vascularization takes place. Because they are much thicker than other grafts, this is a slower process and the flap method is vulnerable to problems with kinking or tension of the base (2). Because of the small size of this vessel, meticulous surgical technique is critical in the preservation of the microcirculation to the flap (5). Necrosis of the distal portion of the flap is more common than complete flap loss. The flap must be accurately fixed to the edges of the recipient bed, with no tension, to allow revascularization and healing. Generally, the tension at distal limb was stronger than proximal. It is cause of performing the axial pattern flap. This case nevertheless performed the axial pattern flap from proximal site to distal, dehiscence occurred at proximal donor site. The reason why dehiscence occurred is the result of forcing tension at donor site. So, tension-relieving techniques are indicated. Already, in the first surgery, ischemic area necrotized. To restore the injured area, debridement of it and use of drugs such as streptokinase, Carbamyl-Erythropoietin and pyroglutamate-helix B

surface peptide (ARA 290) is need (3,8). Mesh graft has been very successful, with 90 to 100 percent "take" when the grafts have been applied on healthy granulation beds (10). Small defects heal by second intention. This case was performed second surgery as mesh graft. It is important to note that such an extended excision goes well beyond the boundaries of the flap's primary angiosome; the 'extended' portion of this flap should in fact be considered a sub-dermal plexus flap in terms of its perfusion and reliability.

Conclusion

In this case, the patient underwent the necrosis of an extreme of flap region. It thought that there was not adequate circulation before vascularization takes place. The vascularization slowly processed depend on their thickness and length. This patient has a 7 cm*5 cm sized circle shaped of skin lesion. According to this case, a practitioner has to consider length of flap and thickness in order to vascular perfusion when superficial brachial axial pattern flap is performed in a dog. Careful attention must be also paid to prevention of the problems, especially in the first few days. Axial flaps are preferable to random ones, but any flap must be carefully planned in order to assure adequate vascular perfusion and minimal tension (2).

References

1. Aper, R. and D. Smeak, Complications and outcome after thoracodorsal axial pattern flap reconstruction of forelimb skin defects in 10 dogs, 1989-2001. *Vet Surg*, 2003. 32(4): 378-84.
2. Browne, E.Z., Jr., Complications of skin grafts and pedicle flaps. *Hand Clin*, 1986. 2(2): 353-9.
3. Erbayraktar Z Fau - Erbayraktar, S., et al., Nonerythropoietic tissue protective compounds are highly effective facilitators of wound healing. (1528-3658 (Electronic)).
4. Fowler, D., Distal Limb and Paw Injuries. *Veterinary Clinics of North America: Small Animal Practice*, 2006. 36(4): 819-845.
5. Henney, L.H. and M.M. Pavletic, Axial pattern flap based on the superficial brachial artery in the dog. *Vet Surg*, 1988. 17(6): 311-7.
6. Hunt, G.B., et al., Skin-fold advancement flaps for closing large proximal limb and trunk defects in dogs and cats. *Vet Surg*, 2001. 30(5): 440-8.
7. Kostolich, M. and M.M. Pavletic, Axial pattern flap based on the genicular branch of the saphenous artery in the dog. *Vet Surg*, 1987. 16(3): 217-22.
8. Moura T Fau - Marques, A.d.A., et al., [Study of the effect of streptokinase and allopurinol in island skin flaps submitted to prolonged ischemia: experimental study in rats.]. (0104-4230 (Print))
9. Pavletic, M.M., Axial pattern flaps in small animal practice. *Vet Clin North Am Small Anim Pract*, 1990. 20(1): 105-25.
10. Pope, E.R., Mesh skin grafting. *Vet Clin North Am Small Anim Pract*, 1990. 20(1): 177-87.
11. Remedios, A.M., et al., Axial pattern skin flaps in cats.

- Microsurgery, 1991. 12(2): 125-9.
12. Szentimrey, D., Principles of reconstructive surgery for the tumor patient. Clin Tech Small Anim Pract, 1998. 13(1): 70-6.
13. Trevor, P.B., et al., Clinical evaluation of axial pattern skin flaps in dogs and cats: 19 cases (1981-1990). J Am Vet Med Assoc, 1992. 201(4): 608-12.

표층상완축상피판이식술과 전층망상식피술의 적용 예

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요 약 : 13개월령, 체중 30 kg의 암컷 진도개가 왼쪽 전완부의 혈관염과 혈관 주위염으로 인한 심한 피부 결손을 주 증상으로 내원하였다. 환자에 왼쪽 표층 상완 축상 피판술이 시행 되었다. 수술 일주일 후 평가에서, 피판은 1/3만이 성공적으로 이식이 이루어졌다. 따라서 결손 된 2/3부위는 전층 망상 식피술로써 재수술을 시행 하였다. 2차 수술 10 일 후 결손부가 완전 복구되었다. 이식된 피판의 평가에서도 스스로 혈액 공급이 이루어지고 있었다. 이러한 피판 이식술은 피판의 혈관화가 이루어질 때까지 적절한 혈액 순환의 연속성이 중요하다. 피판 이식술은 다른 이식판보다 두 껍기 때문에 이식에 따른 치유 진행 속도가 늦고, 꼬임이나 기저의 장력에 약하다. 따라서, 표층 상완 피판 이식술을 시행할 때, 반드시 피판의 길이와 두께 고려되어야 할 것으로 생각된다.

주요어 : 표층상완축상피판이식술, 전층망상식피술, 진도개, 피부결손.