

AUTO-SKIN TRANSPLANTATION IN DOGS

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ABSTRACT

This study was conducted using auto-skin transplantation for repairing of large skin loss of one front limb in dogs. The study was carried out on 8 clinical cases of dogs that brought to the Veterinary Teaching Hospital, College of Veterinary Medicine, University of Mosul, Mosul, Iraq; from October 2006 to September 2010. These animals underwent severe lacerated necrotic wounds especially at one front limb more than others. A protocol of general anesthesia was conducted by premedication with atropine sulphate, followed by a mixture of xylazine hydrochloride and ketamine hydrochloride. The large skin defect treated by creating a subcutaneous tunnel extended from the thoracic to the abdominal area at the lateral side of the trunk; therefore the naked area of affected limb covered by a new skin successfully from the subcutaneous tunnel. The result revealed that the all flaps healed without partial or total loss. The appearance, texture, and color of the flaps were similar to those of the donor site. The auto-skin transplantation by subcutaneous tunnel considers an effective and alternative method for the treatment of large skin defect of one front limb in dogs.

INTRODUCTION

The skin flap is a piece of tissue that is still attached to the body by a major artery and vein or at its base (1). The skin flap is required when the injury or area that has lost tissue is too big to sew the edges together directly. Because the flap has its own blood supply it is much more resistant to external factors such as movement, fluid accumulation beneath the flap, and infection (2). Sometimes, the flap is comprised of skin and fatty tissue only, but a flap may also include muscle from the donor site (3). A flap will help a wound to heal much faster and also reconstruct the damaged area, including poorly vascularized wound beds that are incapable of maintaining free grafts, so it is aesthetically acceptable (4). On the other hand, the skin graft is a simple thin piece of skin that does not have its own blood supply, and are transferred from one site on the body to another. Small blood vessels from the wound bed grow into the skin graft over a period of one week (2). Grafts commonly consist of one tissue, but occasionally contain a mixture, such as skin and cartilage from the ear for nasal ala reconstruction; these are known as composite grafts (5). When graft used for and to the same patient is autographed and can be applied easily in the clinical cases with almost minimal chances of rejection owing to their immunologic

identity. Skin allografts and xenografts have though been described and used for specific applications in wound reconstruction but have little role in the routine management of open wounds in small animals (6).

There are many kinds of skin flaps according to the types of injuries that have required a flap for complete healing. Flaps comes from many different locations, and are used in many different ways to accomplish the desired result (7). The local flap classified into four major types include the advancement flap (moves directly forward with no lateral movement), the rotation flap (rotates around a pivot point to be positioned into an adjacent defect), the transposition flap (moves laterally in relation to a pivot point to be positioned into an adjacent defect) and the interpolation flap. The interpolation flap is different from the others in that it rotates around a pivot point to be positioned in a nearby (but not adjacent) defect. In some flap surgery the flap is cut off from its native blood supply and reattached to blood supply at the recipient site, this is known as a free flap (8). The aim of this study was conducted using auto-skin transplantation for treatment of large skin defect of one front limb in dogs.

MATERIALS AND METHODS

This study was carried out on 8 clinical cases of dogs, both sexes 6 males and 2 females, aged 1-5 years that were brought to the Veterinary Teaching Hospital, College of Veterinary Medicine, University of Mosul, Mosul, Iraq; from October 2006 to September 2010. These animals had severe lacerated necrotic wounds at one of the front limbs more than others.

The surgical procedure was conducted by aseptic preparing for the site of operation after general anesthesia using atropine sulphate 0.04 mg/kg body weight intramuscularly as a premedication, followed 5 minutes later by an intramuscular mixture of xylazine hydrochloride 2% and ketamine hydrochloride 5% at a dose 5 mg/kg and 15 mg/kg body weight respectively. The animal was restrained at the lateral recumbent position with the affected limb upward.

All cases that treated in this study were suffering from severe lacerated wounds at one of the fore limb more than others. These lacerated wounds caused by accidental trapping of the dogs in the barbed wire which brought to Iraq by American army during the invasion. After aseptically preparing to the lateral side of the trunk with affected limb the necrotic and lacerated skin tissue removed surgically to advertise to keep a part of skin at the proximal and distal end of the limb; that's used for suturing with the skin flap. The skin flap is still intact within the body therefore we will create a subcutaneous tunnel extended from the thoracic to the abdominal area at the lateral side of the trunk. The length of this tunnel depends on the defect length of the limb (Fig. 1). The affected limb brought in to the subcutaneous tunnel then sutured with skin of the trunk at the proximal and distal ends of the limb by silk No. 1 using a simple interrupted suture technique, with

attention to provide drainage opening at the proximal and distal ends of the limb rather than the insertion of a drainage tube along the defect area at the medial aspect (Fig. 2, 3).

The protocol for liberation this limb is depended on 2 stages. The first stage begins at 10-15 days after suturing of the limb skin with the trunk skin by partial liberation of this limb from the tunnel at the elbow and carpal joint area only with keeping the rest limb imbedded within the tunnel (Fig. 4). The second stage begins at 10-12 days from the first stage later, in this stage we will separate the whole rest limb from the tunnel, at this time the limb will gain on the new skin taken from the lateral side of the trunk. The edges of the new skin of liberated limb sutured together at the medial aspect by the simple interrupted suture technique with silk No. 1. Finally the wound on the lateral side of the trunk which is recited after liberation the whole limb from tunnel sutured by the same technique that used in the limb.



Fig. 1: Showing naked affected limb with incision sites for subcutaneous tunnel.

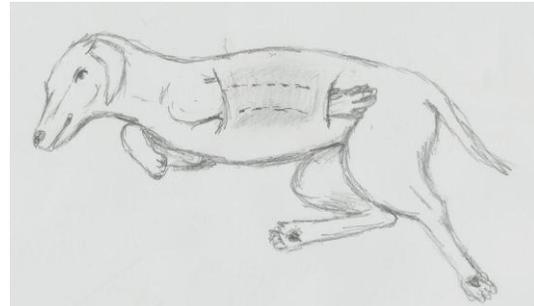


Fig. 2: Showing introducing the affected limb in the subcutaneous tunnel.



Fig. 3: Showings suturing the stump skin of the limb at the proximal and distal ends with the skin of the trunk at lateral side.

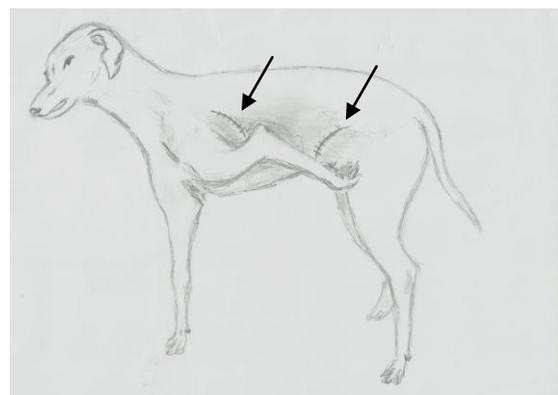


Fig. 4: Showing the first stage of liberation of the limb at the elbow and carpal joint area (arrows).

Post operative care including daily wound management and dressing including cleaning, antiseptic, wound spray, maintenance of drainage openings. The stitch thread removed at 10-12 days after suturing of the limb and after each stage of liberation of the limb, with systemic antibiotics by penicillin-streptomycine at a dose of 10000 IU, 20

mg/kg of body weight respectively for 5 consecutive days after each stage of treatment of the limb.

RESULTS

The follow-up time was between 7-16 months with an average of 11.5 months. No any serious complications were seen in any operative animals such as hematoma, infection and wound dehiscence. All flaps healed uneventfully without partial or total loss. The appearance, texture, and color of the flaps were similar to those of the donor site.

After complete debridement by removing the necrotic tissue from affected limb the result was a large naked area without skin (Fig. 5). The affected limb in all treated cases was gaining on the new skin from the subcutaneous tunnel (Fig 6). Healing between the limb and trunk skin in all cases was a good union without any complications (Fig. 7). The subcutaneous tunnel in some cases created comprised with few fibers of cutaneous trunkii muscle that's severely adherent to the skin, therefore the limb after healing will appear thicker than a sound one (Fig. 8)



Fig. 5: Showing large naked area after complete debridement and removing of lacerated necrotic tissue.

Fig. 8: Showing good skin healing by union between the limb and trunk skin (arrows).



Fig. 6: Showing insertion the affected limb in the subcutaneous tunnel.

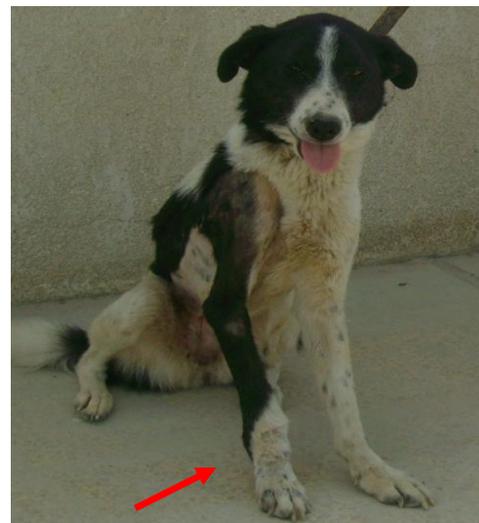


Fig. 9: Showing affected limb (arrow) got on the new skin from the lateral

Mini foci of necrosis developed in 3 cases within 4-8 days after complete separation of the limb from the tunnel, and then the flap heal and survived after good management and wound dressing (Fig. 9, 10). The other flaps survived successfully, and the incisions healed by first intention without necrosis or ulceration or any other serious complications.



Fig. 9: Showing mini foci of necrosis at the elbow joint area and lateral side of the trunk (donor area) occurred in 2 cases.

side of the trunk and appears thicker than sound one.



Fig. 10: Showing mini foci of necrosis at the medial aspect of the limb

DISCUSSION

All cases that treated in this study suffered from large skin defects in one of front limbs and this is considered a challenge to a veterinary surgeon, especially when there is no available surrounding skin to close the wound. This is coinciding with other authors (9, 10). Whom said that, the skin defects on the limbs of animals present a problem from the standpoint that there is no an abundance of skin on the limbs to reconstruct with, as there is on the trunk of an animal. The skin flap comes from many different locations to the defect site in many different ways to accomplish the desired result for the treatment the wounds that involving about 30% circumference of the limb (1, 4, 6, 9, 10). But in this study the defect site (recipient site) brought to the skin flap (donor site) by creating a subcutaneous tunnel at the lateral side of the trunk, this is opposite to the traditional technique that used in skin flap treatment. This new technique of treatment is simple, reliable, easy applied, least skin defect to the donor site and highly effective for treating wounds that involving more than 50 % circumference of the limb, and we think is not used before. This is agreement with another author (11), who said that, the veterinary surgeon should choose the simplest, least time consuming and less expensive techniques that will achieve the desired effect. The subcutaneous tunnel acts as bipediced flap because it has original attachment at the lateral side of trunk rather than a new attachment to the remaining skin at the affected limb. This is coinciding with other workers (12), who said that, the bipediced flap refers two attachments, whereas unipediced refers to a single attachment. The liberation of the affected limb from subcutaneous tunnel depends on two-stages to ensure that the skin flap has a maintenance blood supply from the trunk

then from the limb itself. This is agreement with another author (13), whom said that, the transplants allow for reconstruction of severe injuries in two or three stages forehead flap that were previously thought to be unreconstructable. The results of this study revealed partial necrosis of flap in 3 cases, and this is may be due to compression or tension or associated with the surgical technique applied. This is agreement with other authors (14), whom said that, the partial flap necrosis is a frequent complication of thoracodorsal axial pattern flap reconstruction of forelimb skin defects.

CONCLUSION

The subcutaneous tunnel considers an effective and alternative method for the surgical treatment of large skin defect in one of front limb in dogs.

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أترقيع الذاتي للجلد في الكلاب

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الخلاصة

هدف الدراسة الحالية هو استخدام الترقيع الذاتي للجلد في علاج النقص الكبير الحاصل لجلد احدى القوائم الامامية في الكلاب. اجريه هذه الدراسة على 8 كلاب جلبت الى المستشفى البيطري التعليمي التابع لكلية الطب البيطري في جامعة الموصل، للفترة الممتدة مابين تشرين الاول 2006 ولغاية ايلول 2010 وكانت تعاني من جروح تمزقية واسعة ومنتخرة في احدى القوائم الامامية اكثر من البقية. اجريه العملية الجراحية لاصلاح هذه الجروح تحت تأثير التخدير العام باستخدام خليط من الزايلازين والكيثامين بعد حقن الاتروبين. عولج الفقدان الكبير للجلد باستحداث نفق تحت الجلد يمتد من منطقة الصدر الى منطقة البطن في الجهة الوحشية للذرع، ولهذا فان المنطقة العاربية من الجلد حصلت على جلد جديد من هذا النفق بشكل ناجح. كان ألتنام جميع الرقع الجلدية ناجحا وبدون اي فقدان جزئي او كلي لهذه الرقع الجلدية. ان المظهر والقوام واللون لهذه الرقع الجلدية هو مشابه تماما للمكان الذي اخذت منه. تعتبر طريقة الترقيع الذاتي للجلد بوساطة النفق تحت الجلد فعالة ومتطورة في علاج التلف الكبير الحاصل لجلد احدى القوائم الامامية في الكلاب.

REFERENCES

1. Fisher, J., Georgaide, GS., Georgaide, NG., Riefkohl, R. and Barwick, WJ. Basic Principles of Skin Flaps; Textbook of Plastic, Maxillofacial and Reconstructive Surgery. Volume 1, 2nd edition, Williams & Wilkins. 1992. p 29-40.
2. Song, DH., Ginard, H., Russell, RR., Liza, Cwu., Garrett, W. and Amir, HD. Chapter 2: Grafts and Flaps. *Plastic Surgery: Essentials for Students*. Plastic Surgery Education Foundation 2007.
3. Tschoi, M., Hoy, FA. and Granick, MS. Skin Flaps. *Clin Plast Surg*. 2005. 32(2): p 261-273.
4. Pavletic, MM. Skin flaps in reconstructive surgery. *Vet Clin North Am Small Anim Pract*. 1990. 20 (1): 81-103.
5. Heather, LC. and Paul, RWS. Closing the gap: skin grafts and flaps. *Surg. J*. Elsevier. 2011. 29 (10): 502-506.
6. Ijaz, MS., Mahmood, AK., Ahmad, N., Khan, MA. and Farooq, U. Viability of split thickness autogenous skin transplantation in canine distal limb reconstruction- An experimental evaluation. *Pak Vet J*.2012. 32(2): 193-196.
7. David, WM., Marie, N., Scott, G., Robert, S., Tiffany, M., and Rainer, S. A pre-clinical canine model for composite tissue transplantation. *J Rec Microsurg*. 2010. 26(3): 201–207.
8. Tschoi, M., Hoy, FA. and Granick, MS. Skin Flaps. *Clin Plas Surg*. 2005. 32(2): p261-273.
9. Nevill, BG. Bilateral axillary skin fold flaps used for dorsal thoracic skin wound closure in a dog. *Tydskr.S.Afr.vet.Ver*. 2010. 81(1): 58–61
10. Fowler, D. Distal limb and paw injuries. *Vet Clin North Am Small Anim Pract*. 2006. 36(4): 819-45.
11. Swaim, SF. Basic principles for reconstruction of problem skin defects: trunk, head, and neck. *Tijdschr Diergeneeskd*. 1987. 112(1): 41-47.
12. Sullivan, SR., Engrav, LH., Anaya, DA., Bulger, EM. and Foy, HM. Bilateral anterior abdominal bipedicle flap with permanent prosthesis for the massive abdominal skin-grafted hernia. *Am J Surg*. 2007. 193(5):651-5.
13. Menick, FJ. Nasal reconstruction with a forehead flap. *Clin Plast Surg*. 2009. 36(3):443-59.
14. Aper, R. and Smeak, D. 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.