Journal of Sustainable Veterinary & Allied Sciences
p-ISSN: 2695-2661 e-ISSN: 2811-1346
JOSVAS

JoSVAS 2021, Vol 1, Issue 1: 89-92

Case Report
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Degloving wound management by second-intention healing in a dog: case report

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ABSTRACT

A degloving wound is a minimal to extensive loss of skin with variable amounts of deep tissues loss through trauma. The occurrence of degloving injuries has been reported to affect different body parts. This article presents a left forelimb degloving wound that was successfully managed via second intention following a failed first intention management in a 2-year-old German shepherd bitch.

Keywords: Degloving wound, dog, forelimb, second intention

INTRODUCTION

Degloving injuries of the lower extremity are high-energy trauma produced by torsion, abrasion and compression (Arnez *et al.,* 2010). Depending on the intensity and duration of each of the offending forces, the resulting injury consists of an open abraded wound of variable depth and surface (Hudson *et al.,* 1992). According to the theory of tangential stress, the skin and the subcutaneous tissues of a body part are sheared off the deep fascia and the skin detachment usually leaves the limb unwrapped (Lorenzo *et al.,* 2013). The muscles and surrounding deep tissues, protected by the skin, are only split away from each other and usually remain intact. As the knowledge of surgery evolved, the ability to repair these injuries and avoid amputation while reducing mortality and morbidity rate has greatly improved. Reconstruction choice included primary closure, second intention healing and use of grafts or flaps (Caleb, 2016; Peteoaca *et al.,* 2019). This article gives an account of a degloving injury in a dog that was successfully managed surgically in the face of a vascular loss.

CASE REPORT

A 2-year-old German shepherd bitch weighing 19 kg was presented to the Small Animal Unit of the Veterinary Teaching Hospital, Ahmadu Bello University, Zaria with the complaint of injury to the left forelimb. History revealed that the condition occurred about 12 hours before presentation. The bitch was housed in an iron cage and usually released at night within a compound fenced with barbed wires. The bitch's owner had no idea of the cause of the injury but suggested that it might have been caused by the barbed wire fence. The bitch was found bleeding profusely in the compound on the morning of presentation.

Physical examination showed a patient that was bright and alert, with vital parameters of temperature and pulse rate elevated while the respiratory rate was rapid. The patient was then premedicated with Atropine Sulphate (0.02 mg/kg, I.V) (Amopin®, Yanzhou Xierkangtai Pharma Ltd, China) and Chlorpromazine HCL injection (4 mg/kg, I.V) (Pauco Chlorpromazine HCL Injection®, Pauco Pharmaceutical Ltd, Nigeria) to allow for further examination. Other findings were shearing injury of the left forelimb extending from the proximal forearm to the digits with the distal radius visible (Plate I A&B) with some vascular bleeding evident. Aside these injuries on the left forelimb, there was no evidence of any injury in any other part of its body. A lateral radiograph of the left forelimb revealed no osseous or articular lesions. Based on these findings, the dog was diagnosed with degloving injury of the left distal thoracic limb with bone exposure and no fracture or luxation.

http://doi.org/10.54328/covm.josvas.2021.007

Blood samples were collected for haemogram and haemoparasite screening. The blood work was unremarkable, with a PCV result of 23 %. The patient was then scheduled for surgery. The entire wound surface was covered with polyethene sheet to reduced further contamination and the surrounding areas were liberally shaved. Thereafter, the entire limb was washed with soap and water. High-pressure irrigation and debridement were done with 0.05 % Chlorhexidine (Johnson & Johnson (Pty) Nigeria Ltd) and 3 % Hydrogen peroxide (Ugolab production Ltd, Nigeria)). The patient was then put under general anaesthesia with additional doses of the pre-anaesthetics and then was given Thiopental Sodium (Thosol sodium, Neon Laboratories Ltd, Mumbai India) injection (15 mg/kg, I.V) for induction and Ketamine Hydrochloride (Pauco Ketamine Injection®, Kwality Pharmaceutical Ltd, India) at dosage rate of 20 mg/kg, I.M for maintenance. Thereafter, the patient was put on the surgical table and restrained on sternal recumbency. The affected limb was then appropriately draped. The skin flap created by the shearing injury was evaluated for how best to use it to close the defect with minimal tension. The flap was then gently laid over the wound which gave coverage of over 95 % with minimal tension. Based on this, the wound was intended to be managed via first intention wound closure. A walking subcuticular suture using catgut size 2 was used to close the defect over the underlying musculature. Skin sutures were not applied (plate IC).

After the surgery, the wound was then dressed with honey and bandaged. Post-operative treatment involved the administration of Enrofloxacin (A.S.T. farma B.V, Netherlands) injection (5 mg/kg I.M), Piroxicam (Healthdoc Lab Manimajra, Chandigarh India) injection at rate of 0.3 mg I.M, Vitamin B complex injection (0.1 ml/kg I.M) and Tetanus toxoid (Bellerophon Biotec Pvt Ltd India) injection (1500 IU, I.M). An Elizabethan collar was then applied to the neck to prevent self-mutilation. The client was advised to allow for the hospitalization of the patient in our facility but declined, but rather preferred it to be treated on an out-patient basis.

OUTCOME

Upon re-presentation 48 hours post-surgery, the sutures were intact, minimal soft tissues swelling with no discharge from the wound and the patient was bearing minimal weight on the limb when walking. The bandage was removed and a new one applied.

However, on day 4, physical examination showed extensive necrosis of the sutured skin flap and varying degree of extensor carpi radialis and common digital extensor muscles underlying the necrotic skin area (Plate IIA). At this juncture, the wound management was converted to a second intention with a future delayed primary closure. The client was compelled to allow for the hospitalization of the patient in our facility in order to salvage the limb from deteriorating further and avert possible limb amputation. A culture of the wound swab revealed *Staphylococcus aureus* which was most sensitive to Enrofloxacin. The necrotic wound was then thoroughly flushed with 3 % Hydrogen peroxide and 0.05% Chlorhexidine and surgically debrided (Plate IIB).

Following the debridement, a wet-to-dry dressing was applied using Honey+Cicatrin powder® (Neomycin Sulphate) impregnated bandage while the Enrofloxacin injection was continued for the next 7 days. The debridement was continued for the next 3 days and the bandage changed every day for 2 weeks and then extended to every 2 days. The Honey+Cicatrin powder® was applied with each bandage change until significant healthy granulation and epithelialization, as well as a significant decrease in exudation. During each bandage change, the volume and character of wound exudate in addition to appearance of tissue on the wound surface were evaluated for evidence of infection. By day 15 post-surgery, there was extensive healthy granulation tissue formation which covered the entire wound surface with some degree of wound contraction (Plate IIIA).

By day 32 post-surgery, the wound had contracted and re-epithelialized by more than 50 % with significantly decreased exudation (Plate IIIB). On this day, the client requested that the patient be discharged and be treated as out-patient which was granted. He was informed that the patient will be re-scheduled for another surgery for surgical closure of the healing wound by delayed primary closure to minimize the wound scar and improve the cosmesis but the client declined. Therefore, the second intention management was continued until healing. The Honey+Cicatrin powder® dressing was changed to a petroleum-impregnated non-adherent dressing using Penicillin ointment (MIM Pharma India Ltd). By day 46, the wound had almost completely closed with wound epithelization more than 95 % complete (Plate IIIC). By day 52, the wound had healed completely and the patient was discharged.

POST-HEALING EVALUATION

The bitch was followed up for 24 months. Twenty four months post-discharge, visual examination showed a matured scar at the site of the healed wound (Plate IIID). The gait of the bitch was not affected when walking as it walked smoothly without lameness. However, lameness became obvious when the bitch ran. A close observation of the affected limb revealed a reduction in the range of motion of the carpal joint. This had resulted in the bitch scratching the toes of the injured limb on the ground when running and this was evident by the breakage of the tip of the nails of the second and third digits (Plate IIID).

DISCUSSION

A degloving injury is a minimal to extensive loss of skin with variable amounts of deep tissues loss through trauma (Santiparp & Jeanne, 2018). The occurrence of degloving injuries has been reported to affect different body parts such as the limbs and penis (Chauniqua *et al.*, 2011; Aineskog & Hus, 2016; Peteoaca *et al.*, 2019). A degloving injury is likely to cause minimal to extensive loss of skin with variable amounts of deep tissues loss through a defence mechanism or trauma (Lorenzo *et al*, 2013; Peteoaca *et al*., 2019). The choice of reconstruction method often depends on the preference and experience of the surgeon and client expectation (Caleb, 2016). In this present case, a degloving injury extending from the proximal forearm to the digits of unknown cause was presented.

Much of the medical literature support the removal of the avulsed tissue and replacement with a full-thickness skin graft but there is little support for the use of large full-thickness skin graft in the management of these types of extensive lesions (Albu *et al.*, 2014; Peteoaca *et al*., 2019). In this case, upon presentation, an initial attempt was made to repair the wound using the avulsed skin flap itself as coverage.

The general rules of acute wound debridement apply, meaning that every bit of a tissue that is physically disorganized or grossly impregnated with dirt or debris should be liberally excised and the wound should be copiously irrigated (Peteoaca *et al*., 2019). After these manoeuvres are successfully performed, the surgeon is still left with one difficult decision regarding the degloved skin envelope that has to do with estimating which part of this flap will survive as a randomly perfuse flap, and to be left

Plate I: A; The cranio-medial surface of the degloved wound, B; The caudo-lateral surface of the degloved wound, C: Completion of wound closure.

Plate II: A & B; The wound on day 6 with sutured skin flap completely necrotized along with a variable amount of underlying musculatures.

Plate III: A (Day 15): Mature bed of healthy granulation tissues formation which covered the entire wound surface with some contraction of the wound edges; B (Day 32): The wound had contracted and re-epithelized by more than 50 % with the open portion of the wound covered by a mature bed of healthy granulation tissue; C (Day 46): Wound contracted to about 1cm in diameter at the cranial aspect of the mid-forearm; D (24 months post wound healing): Matured scar at the middle of the previous degloved wound area at the cranial aspect of the forearm (yellow arrow), breaking off of the tip of the nails of the second and third digits (Red and blue arrows).

alone, and which part is going to die, and try to rescue it by defatting and reapplying it as a full-thickness graft, immediately or in a delayed fashion (Hidalgo, 1986; Albu *et al*., 2014). Because of the unreliability of visual inspection in judging the viability of the degloved flaps, we might have over-estimated the line of demarcation between viable and non-viable skin. Consequently, some authors have advocated that the "wait and see" policy could be a safe decision (Albu *et al*., 2014).

In this case, the repair was done immediately to enhance the chances of adequate flap viability, however, the entire skin of the reconstruction became necrotic within the following week post repair. This was attributed to the loss of the superficial brachial artery and the cephalic vein which are the main vessels supplying and draining the cranial part of the forearm, respectively. Ultimately, the wound had to be treated as an open wound to heal via a second intention. The involvement of deeper soft tissues (*extensor carpi radialis* and common digital extensor muscles) was unavoidable as they are also supplied by the lost vessels (Riegger-Krugh *et al*., 2016). Although, there was initial concern over whether the wound would be able to close without skin grafting, the addition of the honey assisted in the production and maintenance of a healthy granulation bed, which progressed to epithelialization and effective healing by second intention.

Honey has been used for millennia in the treatment of wounds due to the many benefits it conveys. General effects of honey on wound healing include causing contraction, promotion of the formation of granulation tissue, promotion of epithelialization of wounds, stimulation of tissue growth and synthesis of collagen, angiogenesis in the bed of wounds, reduction of inflammation, deodorization of wounds, promotion of moist wound healing, facilitation of debridement, and reduction of pain (Simon *et al.*, 2009; Al-Waili *et al*., 2011; Peteoaca *et al*., 2019). Such benefits were evident in the management of this case via second intention as it aided in the speedy healing of the limb thus avoiding limb amputation.

After the initial failed first intention management, the authors opted for second intention with delayed primary closure to reduce the lengthy secondary healing process and minimise scarring which the client rejected. This eventually led to the mature scar on the cranial aspect of the degloved limb 24 months post healing. The maturation phase of wound healing usually lasts up to 1-2 years after the traumatic event occurred. The initial collagen is replaced by a stronger form of collagen, which causes an increase in the strength of the scar tissue. The mature scar tissue will not reach the full strength of its initial strength but rather only reach 80% of the strength of the original epithelium. This new tissue being weaker is less elastic, without pigmentation, hair follicles and sweat or sebaceous glands (Pavletic, 2010).

In conclusion, many literatures have advocated a full-thickness surgical graft repair for degloving injuries to ensure the most desirable outcome. However, in this present case of degloving injuries extending from the proximal forearm to the digits with the distal radius visible which initially underwent a failed first intention management gave a desirable outcome after its management via second intention.

REFERENCES

Aineskog, H. & Huss, F. (2016). A case report of a complete degloving injury of the penile skin. *International Journal of Surgery Case Reports*, *29*, 1-3.

Albu, E. Alexandru, A., Marinescu, B. Ene, R. & Cârstoiu, C. (2014). Combining tangential hydrodissection, panniculectomy and negative pressure wound therapy in treating extensive degloving injury of the leg. *Journal of Medicine and Life Volume*, *7*, (Special Issue 3), 123-126.

Al-Waili, N.S., Salom, K. & Al-Ghamdi, A.A. (2011). Honey for wound healing, ulcers and burns; data supporting its use in clinical practice. *The Scientific Would Journal, 11*, 766-787.

Arnez, Z.M, Khan, U. & Tyler, M.P. (2010). Classification of soft-tissue degloving in limb trauma. *Journal of Plastic, Reconstructive and Aesthetic Surgery*, *63*, 1865-9.

Caleb, H. (2016). Degloving Wound Management by Second-Intention Healing. *Clinical Case: Wound Management.* https://files.brief.vet/migration/sectioned_content/31366/degloving-wound-management-by-second-intention-healing-31366-sectioned_content.pdf

Chauniqua, K., Matthew, P., Oksana, P., Byron, P., Daniel, P. & Joseph, D. (2012). Penile Degloving Injury in an Adolescent with Congenital Hypothyroid. *Case Reports in Medicine*, Article ID 464670, 3 http://dx.doi.org/10.1155/2012/464670

Hidalgo, D.A. (1986). Lower extremity avulsion injuries. Clinical Plastic Surgery, 13(4), 701-710.

Hudson, D.A., Knottenbelt, J.D., &Krige, J.E.J. (1992).Closed degloving injuries: results following conservative surgery.Plastic and Reconstructive Surgery, 89, 853-5

Lorenzo, G., Aniello, M., & Giorgio, B. (2013). A traffic accident resulting in a degloving Injury of the passenger: Case report and biomechanical theory. Romanian Journal of Legal Medicine, 21: 165-168.

Pavletic, M. (2010). *Atlas of small animal wound management and reconstructive surgery*. Hoboken: Wiley Blackwell. Pp. 11- 153.

Peteoaca, A., Istrate, A., Goanta, A., Girdan, G., Stefanescu, A. & Tanase, A. (2019). Therapeutic approach in managing degloving injuries of the front limbs in a dog - a case report. Veterinary Medicine, 65 (1), 70-78.

Riegger-Krugh, C., Millis, D.L. & Weigel, J.P. (2016). Canine Anatomy. In K.M, Dyce, W.O, Sack, C.J.G, Wensing, (Ed), *Textbook of veterinary anatomy*, (4thed). Philadelphia: Saunder.

Santiparp, S. & Jeanne, M. (2018). Severe Wound/degloving injuries, Mixed Breed. Worldwide Veterinary Service.http://www.litecure.com/blog/studies/worldwide-veterinary-service-severe-woundsdegloving-injuries-mixed-breed/

Simon, A., Traynor, K., Santos, K., Blaser, G., Bode, U. & Molan, P. (2009). Medical Honey for Wound Care – Still the 'Latest Resort'?, Evidence Based Complement Alternate Medicine, 6(2), 165-17.

Article History

Submitted: May 9, 2021, Revised: July 15, 2021, Accepted: July 16, 2021