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Management of partial thickness burn of the dorsum skin in a 3-year-old male German shepherd

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Abstract

A 3-year-old, 25 kg male German shepherd dog was presented to the Veterinary Teaching Hospital of Federal University of Agriculture, Abeokuta with the chief complaint of anorexia. History revealed that the dog had been off feed for about three days. Furthermore, there was a fire incidence in the residence of the dog in the absence of the owner five days prior to presentation. The fire burnt the skin of the dorsum. At presentation, general clinical examination revealed normal vital parameters, and normal mucous membrane. Physical examination revealed flame burns from the cervical region (the C-spine) to the caudal region (the sacral bone). This lesion was painful to touch. Anaesthesia was achieved using 6mg/kg Propofol® (Dongkook pharmaceutical, Korea) administered intravenously and 30ml of lignocaine HCL® (AzraZeneca,UK) infiltrated around the wound edge from the c-spine to the sacral bone. The hair around the burns area was clipped, the wound was debrided and cleansed using 10% solution of Chlorhexidine gluconate® (Saro LifeCare Ltd, Nigeria). Dermazin® cream was applied topically on the wound and the dog was given 4.5ml Enrofloxacin, intramuscularly (I.M), 4ml Multivitamin I.M and 4ml Vitamin B complex as supportives. On the second day of presentation, Dermazin® cream was replaced with pure honey® (FUNAAB Consult) for wound dressing. 5ml Vitamin C I.M. was included in the treatment regime on Day 4. All medications were given for 6 days except for wound dressing with pure honey® which continued until complete healing was achieved 88 days post presentation. Daily wound dressing with honey in this case re-vitalized the tissue, prevented re-infection and aided the lesion to proceed to the remodeling phase.

Keywords: German shepherd dog, Partial thickness burn, Pure honey, Rehabilitation, Wound debridement

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Introduction

A burn is an injury to the skin or any other organic tissue primarily caused by heat or due to radiation, radioactivity, electricity, friction or contact with chemicals (Luis, 2009; WHO, 2016). Thermal burns occur when some or all of the cells in the skin or other tissue are destroyed by hot objects. This could be hot solids (contact burns) or flame (flame burns)(WHO, 2016). Burns affect primarily the skin and eventually also the subcutaneous and muscular

layers (Luis, 2009). Generally, burns are evaluated according to the severity of the damage in the body system, while severity of insult is addressed according to the length of tissue exposure, the surface affected, the type of heat source and previous condition of the patient (Luis, 2009). Acute renal failure is a common complication in patients with severe burns. Persistent hypovolemia and hypotension can lead to acute ischemic failure of

other organs such as the lungs, liver, and gastrointestinal tract (Luis, 2009).

Severity of thermal injury depends on the temperature of the medium, the concentration of heat, and the duration of contact (Byers, 2013). Thermal injury is characterized by depth of affected tissue (Byers, 2013). First-degree burns affect only the superficial layer of the skin and the epidermis such as occurs in sun burns common in white coat dogs and cats (Dhupa & Pavletic, 1997). This is accompanied by redness and hyper-esthesia of the skin (Edlich, 2015). There are no blisters and normally these burns heal on their own with no scars (Sagar *et al.*, 2010). Second-degree (partial thickness) burns involve the epidermis and dermis layers of the skin. The burnt area will be red and may show blisters, while the skin is hot and painful to touch (Sagar *et al.*, 2010). The hair is well attached and usually mixed with yellow exudates accompanied by very painful lesions which often form scars. In third-degree (full thickness) burns all the layers of the skin are involved and the underlying structures such as nerve endings get damaged. Hence in case of third degree burns there will be no pain (Sagar *et al.*, 2010). Generally such patients are presented in shock, the skin looks dry, not perfused and do not bleed when cut. The hair coat can be easily epilated by mere pulling and there is no pain sensation. Large scar remains after a prolonged and slow healing process (Luis, 2009).

Wound healing is dependent on various factors. These include: wound characteristics (degree of trauma, whether the wound is acute or chronic, location of the wound, underlying soft tissue and blood supply), Local factors (temperature, hydration, presence of necrotic or foreign bodies), systemic factors (age, malnutrition and essential vitamins such as Vitamin C) and concurrent diseases such as diabetes reduce healing (Krahwinkel, 2005).

Case Report

History

A 3-year-old male German Shepherd dog weighing 25kg was presented to the Veterinary Teaching Hospital, Federal University of Agriculture, Abeokuta on the 10th of May, 2016 with the chief complaint of anorexia. History revealed that the dog had been off feed for about three days and that there was a fire outbreak incidence which occurred earlier in the afternoon of 5th of May 2016 (five days prior to presentation) while the owner was at work. The dog

was left behind alone in the house and was affected by the fire outbreak.

Clinical examination

The dog was apparently alert and active. The physiologic parameters were: rectal temperature 38.6^oc, pulse rate 104beats/minute and respiratory rate 20 breaths/minute. Physical evaluation revealed pink ocular mucous membrane (normal), but slightly enlarged pre-scapular and popliteal lymph nodes.

Also observed were flame burns of the skin of the dorsal region of the dog from the cervical region (from the C₁ spine) through the trunk and terminating at the croup. There was also a thickened leathery brown-black eschar from the cervical region to the perineal area (Plate 1) which was suspected to be infected due to the odour emanating from underneath the eschar. The wound measured about ten (10) cm in width along the whole span of the spine from the cervical to the perineal area. The burn was estimated as 27% of the Total Body Surface Area (Edlich, 2015).

Further examination showed involvement of the epidermis and dermis with some yellowish foul-smelling exudative discharges under the dry charred material. The burn site was painful to touch, an attempt to remove the eschar from the body of the dog to expose the tissue underneath with a gloved hand elicited more pain.

Diagnosis was partial thickness skin burn

Management

Anaesthetic Protocol: Venous access was secured with a 21G winged needle at the cephalic vein. Lactated Ringer's solution was put up to flow at 5mlkg⁻¹ (Davis *et al.*, 2013).

Patient received intravenous propofol[®] (Dongkook Pharmaceutical, Korea) at 6mg/kg for induction, followed with 0.15mgkg⁻¹ (Chan & Chung, 1996) for maintenance of anaesthesia using Total Intravenous Anaesthetic Technique (TIVA). Analgesia was achieved with 30mls of 2% lignocaine HCL[®] (AstraZeneca, UK) administered by infiltration under the viable tissue around the burns from the c-spine to the caudal thoracic terminating at the perineal area and analgesia was repeated every 20 minutes for an hour while wound debridement was completed.

The hair around the burns was clipped and cleansed with 10% solution of Chlorhexidine gluconate[®] (Saro LifeCare Ltd, Nigeria). The dry charred material was slowly and gently pulled using a pair of traumatic

thumb forceps while it was detached from the tissue underneath with a pair of scissors, the wound was successfully debrided, revealing a blanched white tissue mixed with blood indicating the proliferative phase of tissue repair but because the granulation tissue formed was already necrotic, the process of tissue repair was terminated. Sample of the exudate from the underlining tissue was taken with swab for culture and sensitivity test.

The underlining tissue was flushed with normal saline removing the yellowish exudative materials on the tissue, and dried with sterile gauze.

Daily wound dressing was achieved with pure honey[®] (FUNAAB Consult) and sterile gauze.

An improvised Elizabethan Collar was attached to the collar belt.

Topical wound dressing continued till wound was completely healed 88 days post presentation (Plates II - IV).

Chemotherapy was instituted to treat bacterial infection and supportives were also given:

4.5ml of 10% Enrofloxacin (Shijazhuang Guanghua Pharmaceutical Co. Ltd, China) I.M. 5/7

4ml Multivitamin (Shijazhuang Guanghua Pharmaceutical Co. Ltd, China) I.M. 5/7 days .

5ml Vitamin C (Yanzhou Xierkangtai Pharmaceutical Co. Ltd, China) I.M. 5/7 days.

Discussion

On presentation, assessment of the wound and the patient was carried out to ascertain the patient's physiological status, the extent of damage done to



Plate I: Dog at presentation showing thickened leathery brown-black skin



Plate II: On-going wound debridement showing the mixture of blanched tissue and blood



Plate III: Day 22 post wound debridement, wound already contracting



Plate IV: Day 88 post wound debridement showing hair growing in the burn skin

the tissue, particularly blood flow to the wound area. This was done as the first line of wound management as reported by Velnar *et al.* (2009). Assessment of patient was carried out under anaesthesia to eliminate pain and anxiety resulting from touch and hence a thorough examination of the wound was carried out. The animal was placed on fluid at a specific flow rate. This is the standard practice in anaesthesia. It is very important to have a patent vein during and after anaesthesia for both body fluid maintenance and emergency (Davis *et al.*, 2013).

The state of the tissue five days post burn injury in this patient did not strictly follow the process of acute tissue repair as reported by Velnar *et al.* (2009) and Edlich (2015). They reported the various processes of acute tissue repair, which are triggered by tissue injury, as sequence of four dependent phases: Coagulation and haemostasis (which occur immediately after injury and help to prevent exsanguination); inflammatory phase (occurs to establish immune barriers against invading microorganisms; proliferative phase (which involves an abundant formation of granulation tissue) and remodeling phase (which is responsible for the development of new epithelium and final scar formation), and the three zones coagulation, stasis and hyperemia were to have been completed by the fourth day respectively. These phases were not well established in the process of tissue repair in this case, remodeling, which is the last phase of healing should have been completed on day 4 post injury hence the purulence of the injury and the need for intervention on the 5th day post injury.

Treatment of the wound started with sedation and pain management because of the adverse effects of pain to wound healing process (Kata *et al.*, 2015). A thorough preparation of the burns site included removal of hairs around the site to prevent further contamination of the wound. The wound was debrided, in order to accelerate wound healing by removing devitalized tissue, bacteria and other foreign bodies (Martens *et al.*, 2008; Velnar *et al.*, 2009).

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The daily wound dressing carried out in this case agrees with the write up of Luis (2009), Edlich (2015) and WHO, 2016. The pure honey used for wound dressing aids in wound healing by attracting macrophages; it is an energy source and provides a moist environment. It is also an antibacterial agent because of the production of hydrogen peroxide, H₂O₂, and stimulates angiogenesis and fibroblastosis (Krahwinkel, 2005). 10% chlorhexidine solution was used as a wound lavage. It is best at reducing contamination which decreases wound healing (Krahwinkel, 2005).

Wound healing is a period of cell proliferation, migration and expression of various biochemical substances (Palenzuela, 2013). Many of the repair processes are common to all tissues. Although the process of healing is continuous and divided into different phases, separate parts of a wound may be at different stages of healing at any time; this probably explains why the caudal region healed faster than the cervical region (Plate IV).

The dog was presented apparently alert, active and vital signs were within normal values. The swollen lymph nodes, the wound being five days old at presentation, the presence of purulent exudate (contaminated wound) seen at wound debridement all necessitated the use of antibiotics to treat infection.

The use of Vitamin C is aimed at replenishing lost vitamin C (as a result of anorexia) to accelerate tissue repair; this agrees with the recommendation of Luis (2009). The use of multivitamins as supportive therapy was aimed at improving the patient appetite and hence accelerating wound healing.

In conclusion, the use of pure honey as a dressing agent for burn wound in this study aided in revitalization of the necrotic tissue, prevented re-infection and proceeded to the remodeling phase of tissue repair resulting in complete wound healing without scar formation. Pure honey as a dressing agent may be useful for similar cases in future.

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