

**MANAGEMENT OF CHAIN BURN IN ONE-YEAR OLD NIGERIAN
LOCAL CROSS-BRED DOG: CASE REPORT**

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ABSTRACT

A one-year old Nigerian local cross-bred dog was presented on November 15, 2016 at the Small Animal Clinic of the Veterinary Teaching Hospital, University of Ilorin, Nigeria with the chief complaint of wound on the neck at the point where a chain was applied on the neck from when the patient was younger. Physical examination of the animal was carried out and the vital parameters determined and recorded. A chain was observed on the neck of the dog with a peripheral wound into the neck muscles at about 4th-6th cervical vertebrae. The wounds were more severe at the dorsal and ventral aspects of the neck. The case was diagnosed as a burn wound due to a very tight-fitting neck chain and referred to the Small Animal Surgery Unit, where it was managed by removal of the chain, primary closure of the wound after mechanical debriding and placement of an improvised drainage tube. The drainage tube was removed on day 8 while the sutures were removed on day 15 post-surgery. This case was the first of such to be observed in the locality and reported to enlighten Veterinarians on its possible management and to educate and create awareness among clients on the use of neck collar before placing a leash/chain rather than placing the chain or leash directly on the neck of the animal. This report further showcases the simple neglect form of cruelty to animals resulting in neck chain burn and its management.

Keywords: Chain burn, infected wound, drainage tube, animal cruelty

INTRODUCTION

Cruelty to animals has several forms which include those of simple neglect, gross neglect, intentional abuse, animal hoarding, organized abuse, ritualistic abuse or animal sexual assault [1]. The simple neglect form of animal cruelty is the most common around the world today [2]. The most common example of simple neglect form of cruelty to animals is the case of owners chaining their dogs around the neck without a dog belt/collar and most often the dog is kept stagnant at the backyard for hours if not days without proper shelter [1].

Dog leash using chain directly on the neck could exert pressure on the cervical skin and pressure sore could result if the circumference of chain is not adjusted to accommodate the increase in cervical circumference with age. Hairy dogs could be more prone to injury because the hair covers the chain, thereby concealing the underlying injury [3,4,5,6]. With advancement in age, weight and body size, the chain exerts pressure on the skin and get burnt into the muscles, creating a relatively deep, wide and infected wound around the neck.

A wound is a disruption of the normal continuity of body structure [3,4] or an interruption in the continuity of the external surface of the body or of an internal organ [6]. Wounds have a wide variety of aetiologies and their patterns of tissue trauma vary considerably such that the clinician must have a thorough appreciation of their causation and possible complications in order to provide the most effective treatment for the individual wound types [6].

Septic injuries resulting from prolonged pressure on an appendage could be common in dogs, but this case is a rare documented cervical injury resulting from sustained pressure of chain on the neck of a hairy patient for almost nine months. For the fact that there is no universally accepted wound classification system [3], it is useful to categorize wounds according to their aetiology [6]. A classification of wound as chain burn has not been seen documented in literature. The management of this case is presented below.

CASE HISTORY

Gold, a Nigerian Local cross-breed dog was presented on November 15, 2016 at the Small Animal Clinic of the Veterinary Teaching Hospital, University of Ilorin, Ilorin with the chief complaint of wound on the neck at the point where a chain was applied. The client reported that the wound was noticed on the morning of presentation and attempts to remove the chain failed.

The patient was properly restrained and a muzzle applied. Respiratory rate, pulse rate and temperature were respectively 56 cycles/min, 88 beats/min and 40.5°C. On physical examination, the patient was alert, capillary refill time was less than 2 seconds, ocular and oral mucous membranes were pinkish but there was mild tick infestation.

The hair around the neck chain was clipped to reveal a deep-seated septic wound. The chain was observed burnt into the skin, subcutis and the superficial muscles at about the level of 4th-6th cervical vertebrae (Fig. 1). There were bilateral prescapular and submandibular lymphadenopathies. The chain was then carefully removed.

DIAGNOSIS

Based on the history and the observations from the physical examination of the dog, the case was diagnosed as that of chain burn wound.

MANAGEMENT

Swab samples were of the wound area were taken for microbial culture and sensitivity test while jugular blood sample was collected for complete blood count [7].

The area around the wound was clipped and prepared for aseptic surgery. Pre-surgical analgesia was achieved by intramuscular injection of diclofenac (Yanzhou Xier Kangtai Pharmaceutical Co., Ltd., China) at 3 mg/kg and anaesthesia by intramuscular injections of 5% Ketamine hydrochloride (ROTEXMEDIA, Trittau, Germany) at 10 mg/kg and 2% Xylazine hydrochloride (XYL-M2[®], VMD, Belgium) at 1 mg/kg. Onset of anaesthesia was uneventful. The anaesthesia was maintained on same xylazine-ketamine combination for the period of the surgery.

The affected neck region was re-scrubbed for aseptic surgery. The patient was first placed on dorsal recumbence to first manage the wound on the ventral aspect of the neck (Fig. 2). The wound was cleaned by hydropulsation of normal saline, debrided mechanically using scapel blade and an improvised drainage tube (fenestrated sterile infusion line) was applied. The wound edges were apposed with nylon size 0 suture (ShenzenRunch Industrial Corp., China) using simple interrupted horizontal mattress in a single layer. The improvised drainage tube was ensured to be on the dependent aspect, so that drainage could be by gravity. Same procedure was repeated for the wound on the dorsal aspect after placing the patient on sternal recumbence (Fig. 3).



Fig. 1: Showing the patient with the neck chain



Fig 2: Management of the wound on the ventral aspect of the neck

Since Elizabethan collar could not be used, the four paws were protected with gauze bandage and elastoplasts to avoid mutilation of the wound (Fig. 4). The wounds were drained through the tube and Penstrep[®] (Penicillin-Streptomycin) was infused through the drainage tube. Gentamicin ointment was

applied on the wound surface and dressed with gauze bandage and elastoplast. Post-surgical antibiotics (Penstrept[®]) and vitamin B complex were administered.



Fig. 3: Management of the wound on the dorsal aspect of the neck

POST-SURGICAL FOLLOW-UPS

On 16 November 2016, the patient was presented for follow-up. The dressings were removed, the inner part of the wound was cleaned by infusing diluted chlorhexidine through the tube for proper drainage. The outer wounds were also cleaned with dilute chlorhexidine. Penstrept[®] was infused through the tube and gentamicin ointment was applied on the surface.

On 18 November 2016, the microbial culture and sensitivity test results were received and these revealed the growth of *Proteus* species that was susceptible to streptomycin, ampicillin, ceftazidime, ciprofloxacin and ofloxacin. There was no need for change in medication as the organism was susceptible to the drugs already being administered. The antibiotics (Penstrept[®]), was continued four days post-surgery.

The draining, infusing and dressing of the wound were continued eight days post-surgery until there were no more exudates and was resistance to suctioning with syringe and infusion of Penstrept[®]. The drainage tubes were then removed. On the 15th day post-surgery, the sutures were removed and site cleaned with dilute chlorhexidine (Fig. 5).

DISCUSSION

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 [6,8,9]. The wound in question caused by chain is neither a penetrating, puncture, abrasion, laceration, avulsion nor a crush injury but as a result of continuous friction of the chain on the neck. With appearance affecting full skin thickness and underlying muscles, it looked like a long standing infected burn, hence, the diagnosis of chain burn.

After the 'golden period' which is 6-8 hours between wound contamination at injury and bacterial multiplication to greater than 10^5 cfu per gram of tissue [10], a wound is classified as infected rather than contaminated [10].



Fig. 4: Application of protective bandages on the paws



Fig. 5. After the removal of the sutures and drainage tubes

In addition, any wound created outside surgical theatre or a non-incisional wound that has exceeded 24 hours is usually considered infected. Infected wounds are dirty and covered with thick viscous exudates [10]. Also, old traumatic wounds and operative wounds in which purulent inflammation exist are infected [3]. Foreign bodies in contaminated wounds dramatically lower the number of bacteria necessary to cause infection in wounds [3,11]. Therefore, the present case was an infected wound and the protocol of managing infected wound was adhered to.

Initial wound management begins with removal of gross contaminants and copious lavage using a warm, balanced electrolyte solution, sterile saline or tap water [10]. This was carried out by removing the neck chain, clipping the hair around and normal saline hydropulsation. Wound lavage reduces bacterial numbers mechanically by loosening and flushing away bacteria, associated debris [10] and any other surface contaminant. Healing is delayed if necrotic tissue is left in the wound [10].

Devitalized tissue is removed from the wound by debridement. The goal of debridement is to obtain fresh clean wound margins and wound bed for primary or delayed closure [10]. The objective is to convert the wound to a clean status, containing tissue with adequate blood supply for normal healing [3]. In this case, debridement was done to achieve primary closure, using scalpel blade until capillary bleeding was observed.

In an infected wound debrided for the purpose of primary closure, there is a necessity to implant drainage tube, as there will be continued exudates formation. Implanting drains allow evacuation of potentially harmful fluids such as blood, pus and serum from wounds and helps to eliminate dead space [10]. A passive drain, which depend on gravity for fluid evacuation was improvised by fenestrating infusion line alternately along its length and all fenestrations were ensured embedded in the wound.

In the management of this case, the drainage tube performed two functions, as drainage proper and as line to infuse antibiotics (Penstrept[®]) into the wound. Drains are removed when the discharge is serosanguineous and the volume has diminished to one-fourth or less of the original drainage [10] or there is resistance to suctioning of fluid and resistance to infusion of antibiotics as observed in this case. A simple interrupted horizontal mattress with nylon size 0 was used to close the wound, while anchoring the drainage tube at one end of the wound.

To maintain moist wound environment, which allows optimal healing [10], gentamicin ointment was applied on the wound. Ointment prevents tissue desiccation and hence ensuring moist wound environment.

It is therefore concluded that the management of this case may be useful in managing similar cases in the future. This case further emphasizes the need for veterinarians to educate pet owners to ensure that neck collars are used with chains rather than applying chains directly on the neck of their pets.

REFERENCES

1. Mogbo, T. C., Oduah, F. N., Okeke, J. J., Ufele, A. N. and Nwankwo, O. D. (2013). Animal Cruelty: A Review. *Journal of Natural Sciences Research*, 3(8): 94 - 98
2. Randour, M. I. (2004). Including Animal Cruelty as a Factor in Assessing Risk and Designing Interventions. In: *Persistently Safe Schools*. Proceedings of the National Conference of the Halmilton Fish Institute on School and Community Violence, Washington DC.
3. Don, R. W. and Nancy, Z. P. (2003). Superficial Skin Wounds. In: *Douglas Slatter's Textbook of Small Animal Surgery*. 3rd Edition. Eslevier USA. 259 260.
4. Giselle, H., 2003: Wound Repair and Specific Tissue Response to Injury. In Douglas Slatter's *Textbook of Small Animal Surgery*. 3rd Edition. Eslevier USA. p66
5. Knapp, W. D., 2006: Management of Open Wound. In: *Saunders Manual of Small Animal Practice*. 3rd Edition. Stephen J. Burchard and Robert G. Sherding (Eds). Saunders. 549.
6. Richard, A. S. W., 1999: The Aetiology and Classification of Wounds and Skin Deficits. In: *BSAVA Manual of Canine and Feline Wound Management and Reconstruction*. BSAVA, UK. 5-10.
7. Feldman, B. F., Zinkl, J. G. and Jain, N. C. (2000). *Schalm's Veterinary Haematology*. 5th edn., Lee and Febiger, Philadelphia. 1 – 13.
8. Luis, H. T., 2009: Burns in Small Animals. In: *Proceedings of the 34th World Small Animal Veterinary Congress (WSAVA)*, São Paulo, Brazil. 660 – 663.
9. W. H. O., 2017. Burn. http://www.who.int/violence_injury_prevention/other_injury/burns/en/, retrieved on 3 September 2017.

10. Catriona, M. M., 2013: Surgery of the Integumentary System. In: Theresa Welch Fossum's *Small Animal Surgery*. 4th Edition. Elsevier Mosby Inc. 193-205.
11. Bohling, W. M., Swain, F. S., 2006: Management of the Traumatic Wound by Primary Closure. In: *Saunders Manual of Small Animal Practice*. 3rd Edition. Stephen J. Burchard and Robert G. Sherding (Eds). Saunders. 541-548.