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Surgical treatment of a wound due to a knife-cut in the head of a two-year old Nigerian Indigenous Dog: a clinical case report

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Abstract

This clinical report presents a case in which surgical intervention was used for the treatment of a wound inflicted on a dog by a knife-cut. A 2-year old female Nigerian Indigenous Dog (NID) measuring 12 kg body weight was presented with a complaint of injury in the head, following a knife cut. The dog was subjected to comprehensive clinical examination, and a dorsoventral radiograph of the head showed no visible fracture of the calvarium. The wound was debrided, sutured, dressed with topical antibiotic spray and bandaged. Additional treatments that were given to the patient included injection of broad spectrum anti-bacterial, analgesic and multivitamins. The wound healed twelve days post-surgery. The sutures were then removed and the bitch was discharged 5 days later following complete healing of the wound. The animal recovered from the trauma. Surgical correction sped up the wound healing process and was effective for the treatment of the wound in the head of the dog due to the knife-cut. The present report suggests that, in clinical veterinary practice, surgery may be an effective therapeutic option for the management of soft tissue wounds.

Keywords: Surgical treatment; Knife-cut; Soft tissue wound; Healing; Head; Dog.

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Introduction

The Nigerian Indigenous Dog (NID) is usually adventurous and fearless, and is sometimes kept on free-range. For this reason, it may be exposed to all various forms of traumatic harm. Trauma may be defined as any wound, injury or damage inflicted by an external force including blunt force, penetrating, crushing, accelerating, or decelerating injuries (Blood *et al.*, 2008; Simpson *et al.*, 2019). An open wound is a traumatic separation of the skin, mucous membrane or an organ surface. Based on the type of injury, open wounds are classified into: incisions (produced by sharp or cutting object), lacerations (if accompanied by tearing of tissue), contusions (if skin is unbroken but bruised), penetrations/punctures (if the causative object passes completely through the skin into underlying tissues), and critical wounds (e.g. large split burns causing fluid loss, electrolyte imbalances and increased catabolism). Open wounds may also be classified based on the degree of bacterial contamination, as follows: clean wounds (made under sterile condition), contaminated wounds (usually resulting from accidental injury containing pathogenic organism), infected wounds (that have proliferating pathogenic organisms and exhibiting clinical signs of infection e.g. oozing pus), and colonized wounds (that contain pathogenic organism, and which may be chronic and difficult to heal). Based on the extent of injury, open wounds can also be classified into: simple (if no deep tissues are involved) and compound (when nerves, muscles, bones are involved) (Blood *et al.*, 2008; AAP, 2011; Rae *et al.*, 2016; Nelson *et al.*, 2017). A closed wound may be a haematoma caused by damage to a blood vessel resulting in blood accumulation beneath the skin or a crush injury caused by a great compressing force.

The most commonly reported afflictions of dogs are traumatic injuries due to human attacks (gunshot, kicks, knife-cuts, floggings, traps, etc), road traffic accidents (motorbikes, tricycles, and other automobiles), fight/bite injuries by other animals, falls from heights and other traumatic affections of unknown aetiology (Kolata, 1992; Akinrinmade, 2014). Trauma is the most frequent cause of surgical and medical emergencies in small animal practice. Dogs commonly suffer head trauma (as in the present case), bone fractures, joint dislocation, internal bleeding, organ damage or rupture, skin wounds and other painful afflictions (Akinrinmade, 2014; Smith *et al.*, 2019). Trauma in dogs have been reported to induce systemic inflammatory reactions resulting in multiple organ failures and system dysfunctions (involving cardiovascular system, kidney, liver); digestive anomalies and acute respiratory disease syndromes (Blood *et al.*, 2008; Risselada, 2008; Hayes *et al.*, 2010; Holowaychuck, 2011). It is on record that the incidence of trauma is higher in male than female dogs, probably because male dogs naturally roam farther and wider exposing themselves to higher risks of injury than female dogs. Higher frequency of trauma has also been documented in young dogs, due probably to their relative deficiency in environmental experience compared with adult dogs, coupled with the fact that in canine population young animals commonly outnumber adult dogs (Simpson, 2009; Akinrinmade, 2014).

Diagnosis of traumatic injuries is based on correct historical information, clinical observations, and on results of laboratory investigations, depending on the nature and severity of the conditions. Adequate diagnostic knowledge of the trauma is a prerequisite for effective management of the associated pathology (Hayes *et al.*, 2010). The veterinary surgeon should thoroughly evaluate the lesion with a view to stabilizing it, identifying life-threatening lesions, initiating adequate supportive treatment and hastily instituting an effective definitive treatment.

The healing process of a traumatic wound is composed of dynamic phases of events that are not mutually exclusive but overlap in time, namely: inflammation, chemotaxis, cellular proliferation, differentiation and maturation phases (Mandelbaum *et al.*, 2003; Pavletic, 2018). Cytokines (blood proteins that bind to cell surface receptors and transduce signals leading to differentiation and proliferation of cells) play a major role in regulating the processes of traumatic wound repair (Pavletic, 2018). Bandages and wound dressings essentially provide protection to the wound. During tissue repair process, the wound contracts in order to approximate tissue borders/edges, and healing contraction is favoured where the skin is loose, as in the abdomen and trunk (Coelho *et al.*, 1999). Skin sutures are normally removed at the completion of wound healing, but when there is a concern regarding the completeness in wound healing, removal of skin sutures is usually delayed well beyond the normal healing time (Pavletic, 2018). The case presented is that of the use of surgical correction for the treatment of a knife-cut induced traumatic injury in a female dog.

Case Report

An intact two-year-old female Nigerian Indigenous Dog (NID), weighing 12 kg with a gape injury in the head, was presented to the Surgery and Radiology Unit of the Veterinary Teaching Hospital of the Michael Okpara University of Agriculture, Umudike, Nigeria. The client said that the dog went outside his gate and growled at an irate passer-by who reacted by inflicting a deep knife-cut in the dog's head. On general examination, the patient was feverish with rectal temperature: 40.1°C (reference range: 37.9°C – 39.9°C) whereas the other physiological parameters evaluated including heart rate: 84 (reference range: 70 – 120) beats per minute, pulse rate: 80 (reference range: 70 – 120) beats per minute, respiratory rate: 30 (reference range: 18 – 34) cycles per minute, mucous membrane colour: pink (reference colour: pink), capillary refill time: < 2 seconds (reference value: < 2 seconds), were all normal (Detweiler, 1993; Reece, 1993; Hassan and Hassan, 2003; Kahn and Line, 2005). There was an open, contaminated, slightly oblique, incised, non-bleeding, compound wound (approximately 7 × 2 cm, length × width) about the midpoint of the right half of the head at the level of the right ear (Figure 1). The trauma, probably inflicted 4 – 6 hours before presentation, cut through the skin into the muscles and other underlying tissues. The animal was conscious, alert, well-oriented and in good body condition without any evidence of the presence of ectoparasites. The owner revealed the animal's appetite was reduced by the trauma, and from the client also, we learnt that the dog was overdue for anti-rabies re-vaccination.

The patient was then referred to the Radiology subunit for x-ray investigation of the head injury for any sign of skull bone involvement of the lesion.

Figures 1: The knife-cut wound in the head of the dog at presentation (arrow).

Radiographic Examination

The patient was restrained for radiography using xylazine hydrochloride (XYL-M2®, VMD Belgium) at the dose of 1 mg/kg administered intramuscularly and thiopentone (Intraval sodium® or Pentothal®, Merial, South Africa) given at 25 mg/kg fast intravenously. The dog was controlled in sternal recumbency with the hind limbs placed in the normal crouching position. The forelimbs were moved forward and abducted making way for the placement of the head. A dorsoventral (DV) projection of the patient's head was subsequently obtained using film-screen system and low kilovoltage peak-high milliampere second (low kVp-high mAs) technique. Evaluation of the view showed no visible radiographic evidence of fracture in the calvaria or any sign of discontinuity in the skull bones (Figure 2). It was therefore assumed that the lesion was a soft tissue damage affecting only the skin, muscles, blood vessels and nerves.

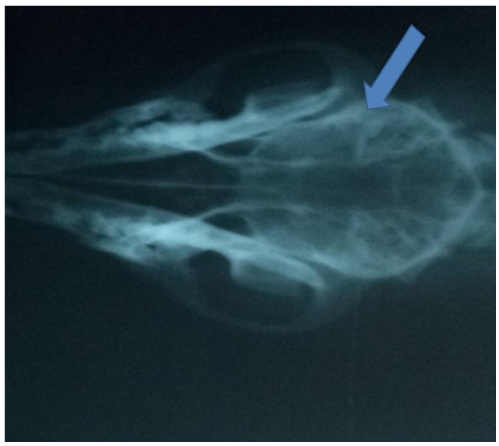

Figure 2: Radiograph of the head of the dog; without any evidence of calvarial fracture (arrow).

Surgical Treatment

The bitch was prepared for surgery by shaving the area surrounding the lesion and scrubbing it with chlorhexidine gluconate 0.3% w/v (Purit®, Saro Lifecare, Ibadan, Nigeria) antiseptic solution. The wound was debrided using swabs soaked in a solution of boric acid and calcium hypochlorous acid (Eusol®, JL Morison, India). Pre-anaesthetic medication was instituted with atropine sulphate (Pauco Atropine®, Jiangsu Huayang Pharmaceutical, Jiangsu China) given intramuscularly at the dose of 0.02mg/kg. Five minutes following pre-medication, a chemical restraint was achieved using xylazine hydrochloride (XYL-M2®, VMD, Belgium), a sedative given at the dose of 0.2 mg/kg intramuscularly and ketamine injection (Ketanir®, Aculife Healthcare, India), an induction agent injected at 10mg/kg, intramuscularly as well. The patient was controlled in sternal recumbency and draped with its head lifted up with a soft padding. About 5 ml of lignocaine 2% solution with adrenaline (Lignolab®, Laborate Pharmaceutical, India) was infiltrated around the wound area for improved analgesia and haemostatic advantage.

The muscle layer was approximated with the fascia in a continuous horizontal mattress suture pattern using chromic catgut. The subcutaneous tissue was sutured using a simple continuous suture pattern also with chromic catgut, while the skin was apposed in an interrupted horizontal mattress suture pattern with a nylon material (Figure 3).

Figures 3: The wound after surgery (arrow).

Post-operatively, streptomycin sulphate (Streptocin®, CSPC Zhongnuo Pharmaceutical Co., Schijiazhuang) and penicillin (Antipen®, Biochemie, Austria) were given intramuscularly, twice daily, for five days at the doses of 20 mg/kg and 20,000 IU/kg respectively. Diclofenac was injected at 0.3 mg/kg intramuscularly once a day for two days; the patient was also treated with 1 ml of B complex vitamins (VitBCare®, AdvaCare, India) intramuscularly, once a day for two days. Oxytetracycline spray (Oxytetravet aerosol®, The Arab Pesticides and Veterinary Drugs Manufacturing Co., Jordan) was applied topically on the surgical wound. Elizabethan collar was applied on the patient to prevent self-mutilation of the wound.

Skin sutures were removed 12 days after the surgical intervention (Cornell, 2012) when the wound was completely healed (Figure 4).

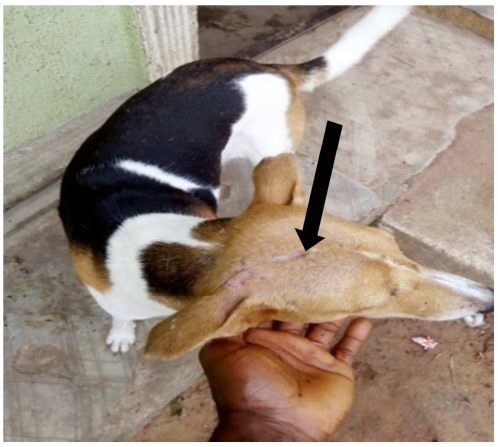

Figure 4: Scar left after complete wound healing in the dog (arrow)

Discussion

Examination of the head is an infrequent radiographic investigation performed in general small animal practice (Kus and Morgan, 1985; Morgan, 1993; Butler *et al.*, 2000; Petite and Dennis, 2006; Rohleder *et al.*, 2006; Thrall, 2013), and has been replaced in specialty practices by the more accurate tomographic modalities such as computed tomography (CT) and magnetic resonance imaging (MRI). According to these authors, this is because of the complexity of the skull and the number of special views of adequate quality that should be acquired so that different areas of the skull bone can be visualized. However, when evaluating the canine skull by radiography with a film-screen system, there are different indications for low kilovoltage peak (low kVp)-high milliampere second (high mAs) and high kVp-low mAs techniques. Thrall (2013) reported that contrast is increased in low kVp-high mAs technique, thereby enhancing assessment of bone changes; and that soft tissue changes may not be well visualized. Thrall's investigation further disclosed that a high kVp-low mAs technique, on the other hand, makes for a thorough and improved evaluation of soft tissues. Thus, the technique adopted relates to the reason for the radiographic inquiry. In the case presented, the clinicians were only interested in the possible involvement of the calvarium, the soft tissue damage being evident. That was the reason why the patient was studied using the low kVp-high mAs technique: 40 kV 20 mAs.

Ferrel *et al.* (2007) reported that the normal canine skull is bilaterally symmetrical, making contralateral comparison possible in a straight dorsoventral (DV) or ventrodorsal (VD) projection. In the present case, the injury was inflicted about the midpoint of the right hemisphere of the head; but the overall calvarial silhouette was of similar opacity on both halves of the skull bone without a disruption in bone continuity or any other feature of radiographic lesion (Figure 2). In other words, there was no boney affection associated with the trauma. However, if the knife-cut was harder and deeper, the skull would have been broken and the enclosed brain tissues damaged. Incidentally, only the skin and the underlying soft tissues were slashed resulting in the open, incision,

contaminated, compound wound that was presented.

The wound was closed by apposing the muscles with absorbable materials and everting the skin with a non-absorbable suture. The antibiosis that was initiated was aimed at forestalling bacterial proliferation and possible wound infection. The surgical treatment was successful and the patient returned to normal life following complete wound healing, suture removal, recovery and discharge of the animal.

The client was advised to prevent recurrence of such traumatic human attacks by ensuring always that the dog is on a leash during the day, especially when outdoors. The pet owner was also told to use his gate or any other barricade to restrain the animal within the compound whenever he is away.

Conflict of Interest

The authors of this paper report no conflict of interest.

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