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SURGICAL REPAIR OF LEFT TIBIA AND FIBULA FRACTURES OF A FOUR-YEAROLD MALEGERMAN SHEPHERD DOG

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ABSTRACT

This paper demonstrates the use of open reduction, intra-medullary pinning, and orthopaedic wiring for the treatment of diaphyseal fractures. This clinical case study involved an intact male German Shepherd dog, aged 4 years and weighing 25 kg that was presented to the Veterinary Teaching Hospital of Michael Okpara University of Agriculture, Umudike with the primary complaint of lameness on the left hind limb, vomiting and lack of appetite. Mediolateral and lateromedial radiographic views of the affected hind limb were obtained to confirm a clinical diagnosis of tibial and fibular fractures. Orthopaedic surgery was performed and the incision wound closed by approximating the muscles and subcutis with absorbable sutures and the skin with nylon materials. The patient recovered and resumed normal ambulation three months post-surgery.The results suggest that surgical intervention using intra-medullary pin and cerclage wire may be effective in repairing fractures of the tibia and fibula. The present report supports the use of implants in the treatment of fractures.

Keywords: Tibia, fibula, Fracture, Orthopaedic, Surgery, Intra-medullary pin, Cerclage wire, Dog

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INTRODUCTION

A fracture is a breach in the continuity of a bone (with or without displacement of fragments) as a result of injury caused by trauma, twisting due to muscle spasm, or indirect loss of leverage or by decalcifying disease of bones [1,2]. Radiographic signs of fractures may be disruption of the normal shape of bone, cortex or trabecular pattern; a line of lucency when fragments are distracted or a line of increased opacity when fragments are compressed, impacted or superimposed or any combination of the above features[3].

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Many fractures occur as a result of violent traumas as occurs in road traffic accidents, gun-shot, fall from a height, or due to pathological causes such as neoplasia, infection, nutritional imbalance, etc.[1]. It is very important that life-threatening injuries, if any, be identified and managed urgently before treating the accompanying fracture. Irrespective of aetiology, the treatment methods available for different tibial fracture types include internal fixation or operational (using implants e.g. bone plates, intramedullary pins, screws, nails, cerclage wires, etc.) and external coaptation or nonoperational (using casts such as plaster cast, plastics, wooden cast, fiberglass cast, etc.)[4,5,6]. With the correct management, most fractures in the dog and cat heal satisfactorily enabling the patients to regain normal ambulation after recovery, although complications such as infection, non-union, mal-union, etc. may occasionally occur [1,4,7].

Diagnosis of fracture is based on history of injury or sudden onset of symptoms, clinical findings of pain, lameness, dysfunction, abnormal posture, recumbency or crepitation and results of laboratory examination [1]. Laboratory investigations, such as radiography, ultrasonography, and blood tests, may be necessary in order to detect possible chest, abdominal, brain or spinal damage. Diagnostic imaging provides information on the type, size, shape, location, severity, and associated complications of fractures as well as a basis for planning treatment [8]. The most common imaging modality for fracture evaluation in veterinary medicine is radiography. Identification of a major skeletal lesion, or a preconceived fracture should not distract from detailed, thorough, and complete radiographic examination for subtle less-obvious but equally significant fractures. Effective pain management, adequate physical, chemical, and occasionally manual restraint, as well as adequate facilities and expertise are needed to obtain optimal radio-density for patient evaluation and treatment plan [9]. Open wounds should be treated promptly within 48 hours to avoid contamination and secondary bacterial infection, delayed wound healing or any other poorer outcome [10,11]. It is important to make adequate number of views of radiographs to ensure that no lesion is missed. For complete fracture evaluation, at least two orthogonal radiographs of the limb are necessary. The joints proximal and distal to the fracture of long bones in small animals should be included in the radiograph for assessment of any joint involvement [12,13].

Fractures of the tibia are relatively common in all ages of people and animals with oblique, spiral and comminuted fractures being the most common fracture pattern [1,5,6]. Majority of tibial fractures are compound fractures, with the distal tibia of mature animals being the most common site of open wound. Immediate immobilization of the leg is recommended and surgical treatment is often indicated for fractures of the tibia. A selection of a repair procedures depend on the type and location of the fracture, the age of the animal, its health status, the presence of associated soft tissue defects and infections especially in open fractures. Other considerations include economic considerations and the preferences of the surgeon [4,5,6].

One method of fracture treatment is the use of new hybrid fixator consisting of interlocking nail connected with type 1 external fixator. Connection of nails to external fixators, developed recently, has maximized treatment efficiency [6]. Complete healing of most tibial shaft fractures in man takes $\geq 4 - 6$ months, especially if the fracture is compound, comminuted or segmental. Use of tobacco products prolongs fracture healing [14]. In the dog, fractures require $\geq$3-6 weeks to heal completely, especially if facilitated by external coaptation or internal fixation. Bone

healing usually involves haematoma and primary callous formations, stage of consolidation, and then resorption, replacement and remodeling processes [1].

CASE REPORT

A four-year old male German Shepherd Dog of body weight 25 kg was referred by OZ Veterinary Services, Owerri, Imo State to the Veterinary Teaching Hospital of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria with a primary complaint of injury to the left hind limb and reduced appetite. Historical information revealed that the patient was a new comer to a home with a resident dog. Although the two dogs were kept in separate cages, they were said to have been in a very fierce fight during which the owner in an attempt to separate them, impulsively hit the patient with a piece of wood. The animal instantly became motionless and lame on the left hind leg.

On physical examination, there were bruises on the face of the patient probably from the fight. The left hind leg was lame and swollen from the stifle joint to the tarsus. The affected limb crepitated, was very painful on palpation and the patient could not bear weight on it. There was no external wound at the painful and swollen site. A degree of muscle contraction was observed on the affected hind limb. The patient had no ectoparasites and its vital parameters were within their normal ranges except for the rectal temperature that was slightly high at 39.9ºC.

Plane mediolateral and lateromedial radiographs of the affected hind limb were obtained and these revealed simple, complete, oblique, diaphyseal (mid-shaft) tibial and fibular fractures of the left hind limb (Fig. 1).

SURGICAL TREATMENT

The operation site was prepared for surgery by shaving distally from mid femoral to tarsal region of the lower left hind leg. The surgical site was scrubbed, washed, cleaned with alcohol (50% ethanol) solution, and dried with sterile gauze. The animal was transferred to the surgical table and draped for surgical operation. The patient was pre-medicated with atropine sulphate (Amopin®, YanzhouXierkangtai, India) and xylazine hydrochloride (XYL-M2®, VMD, Belgium) given 5 minutes apart respectively at 0.04 mg/kg and 0.15ml/kg intramuscularly. Induction of anaesthesia was achieved using ketamine hydrochloride (Ketanir®, Nirma Ltd., India)administered intramuscularly at 15 mg/kg.

The patient was placed on right lateral recumbency. A linear incision was made on the craniolateral aspect of the left lower hind limb through the skin, subcutis, and then the muscles were dissected to expose the underlying fractured segments of the tibia and fibular. An intramedullary pin was inserted in a retrograde fashion using a Jacob's chuck through the fracture line proximally beyond the head of the tibia, and then distally by counter sinking using a mallet after reduction of the fracture fragments (Fig. 2). A cerclage wiring was also applied to further ensure adequate immobilization of the fragments (Fig. 2). The muscles and the subcutaneous tissues were approximated with chromic catgut size 1 (Seamchrom®, Surgical Sutures Pvt Ltd., Bangalore India) in a simple continuous pattern while the skin was everted with nylon size 1 (Ethilon®, Ethicon USA) using horizontal mattress sutures.

Figure 1. Pre-operative mediolateral radiograph of the left hind limb showing simple, complete oblique (angled) mid-shaft fractures of the left tibia (thick horizontal arrow) and fibula (thin horizontal arrow).

Fig. 2. Post-operative mediolateral roentgenograph: The tibial fracture was corrected with an intramedullary pin and cerclage wiring (vertical arrows) which is faintly visualized.

Fig. 3. Plastered limb with window over the surgical wound (arrow) for wound dressing.

Figure 1. Pre-operative mediolateral radiograph of the left hind limb showing simple, complete oblique (angled) mid-shaft fractures of the left tibia (thick horizontal arrow) and fibula (thin horizontal arrow).

Postoperative care to the patient included the intramuscular administration of antibiotics, penicillin (Antipen®, Biochemie, Austria) at 20,000 iu/kg and streptomycin sulphate (Streptocin®, CSPC Zhongnuo Pharmaceutical Co., Schijiazhuang) at 20 mg/kg for five days, anti-inflammatory, antipyretic, analgesic agent, diclofenac sodium (Dicloecnu Injection®, Ecnu Pharmaceutical, Shandong China) at 1 mg/kg im sid x 3/7, and topical coverage with oxytetracycline spray (Oxytetravet aerosol®, The Arab Pesticides and Veterinary Drugs Manufacturing Co., Jordan). The affected leg was immobilized with a plaster cast (plaster of Paris) with a fenestration created over the surgical wound for wound dressing (Fig. 3).

Further immobilization was achieved using a sling method to prevent the use of the affected limb for ambulation. The patient was monitored until it recovered from general anaesthesia, and the recovery was smooth and uneventful. An Elizabethan collar was placed on the patient to prevent auto-mutilation through scratching, licking, bitingor chewing off the bandages and sutures of the surgical wound. The dog was followed up for three days and then returned to the referring clinician at his instance, who thereafter discharged the animal following complete surgical wound healing (Fig. 4) and suture removal.

DISCUSSION

Radiographic examination of the affected limb showed a simple, complete, unstable, oblique, mid-diaphyseal tibial and fibular fracture of the left hind leg. Medical literature revealed that mid-diaphyseal fractures are significantly more common than fractures of proximal and distal regions of the tibia and that concurrent fractures of the tibia and fibula are common[1].In the present case, there were simultaneous fractures of the tibial and fibular bones. The oblique, thick line of lucency indicated where the fracture fragments were distracted (Fig. 1). The tibial fracture was reduced openly and stabilized with intramedullary pinning (Fig. 2). The fibular fracture was not fixed because this may itself contribute to increased morbility. Fibular fracture reductions are not usually needed to achieve fibular bone fixation and healing [4]. When the fibular fragments are displaced, fixation of the fibula prior to reduction of the tibia is a useful technique for the restoration of alignment. However, fibular immobilization is necessary if there is instability of the talus associated with a distal fibular fracture. Unfortunately, information is scarce on the role of fibular fragment reduction and fixation in tibial fracture healing.

Although the treatment of tibial shaft fractures in canine patients is usually associated with significant risk involving bone healing complications, there were no healing complications in the present case. Possible bone healing complications include delayed or non-union, mal-union, osteomyelitis, infections and growth disturbances in young animals [15,16,17]. Some of these complications and problems may result from implant breakage and iatrogenic damage to blood vessels and nerves during fracture stabilization [6]. None of these complications was observed in the present case of tibia and fibula fractures after repair. The results of the present case of treating tibial and fibular fractures by intramedullary pinning agrees with previous reports [1,18,19] that intramedullary pinning or nailing is effective in handling tibial and fibular fractures with a very good treatment outcome.In the present case, the surgical wound healed completely and the patient recovered uneventfully and resumed the use of the affected limb for ambulation.

The client was advised to always use cold water to separate fighting dogs and be kind to animals even when they misbehaved.

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