
SUCCESSFUL MANAGEMENT OF A COMPOUND FRACTURE AND INFECTED WOUND USING ALGERIAN PROPOLIS PASTE IN A DOG

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ABSTRACT

The present clinical case deals with the application of Algerian propolis paste in a dog admitted to the surgery clinic of the Veterinary Sciences Institute in Tiaret University. The animal patient presented with an open fracture complicated by infection of the wound in the left hind limb. Physical examination of the injured limb revealed the presence of a bone crack, clearly palpable at the site of the fracture, as well as localized signs of inflammation. Radiographic projections revealed complete multiple fractures of the distal portions of the metatarsus number II, III, IV and V. Ethanolic extract of Algerian propolis (EEAP) was applied topically during surgery and postoperatively. Results of the clinical case demonstrated that the topical application of the EEAP based paste improved wound healing, thereby promoted the process of bone

consolidation. The present report deals with successful management of fracture in dog using an unconventional treatment.

Keywords: Algerian Propolis, Osteomyelitis, Compound fracture, Skin healing

INTRODUCTION

Propolis is known for its antioxidant, immuno-modulating and wound healing effects (Meimandi-Parizi *et al.*, 2018). Different pharmacological properties were reported as local anesthetic effect, cartilage formation and its role in osteo- integration enhancement in autoclaved allograft (Niken *et al.*, 2014; Boudra *et al.*, 2014; Ezgi and Hasan, 2017). Propolis composition depends on the geographic region where it was extracted, the species of bees involved, as well as the extraction method employed. They appear commercially as Ethanol Extract of Propolis (EEP) in varied concentrations or as Pure Propolis Extract

(EPP) (Pereira *et al.*, 2018).

Osteomyelitis is frequently associated with surgical implant devices, including those required to optimize stability and healing of fractures. In fact, the most common causes of osteomyelitis among dogs are trauma and surgical site infections that extend to the bone (Gieling *et al.*, 2019). The treatment of osteomyelitis is difficult due to various factors including the low bioavailability of antibiotics in bone tissue, increasing resistance to antibiotics and biofilm producing pathogens. Moreover, this condition is usually complicated with the presence of nonhealing wounds and secondary infection due to multidrug resistant bacteria, which are common challenges in veterinary practice (Abu-Seida, 2015). In many cases, in order to freshen the wound site, surgical debridement is the only option to aggressively remove necrotic tissue and to eliminate invasive bacteria (Zimmerli *et al.*, 2004).

In the light of the afore mentioned problems and concerns, it is necessary to develop alternative treatment in order to limit the occurrence of staphylococcal osteomyelitis and to enhance wound and bone healing process. Natural products obtained from the bee including propolis represent a rich source of antimicrobial agents and are less toxic compared to

most conventional therapies. Rezende *et al.* (2006), had reported the antimicrobial activity of propolis against Gram-positive bacteria and yeast. The chemical composition of propolis depends on its floral origin, climate and geographical conditions (Lahouel *et al.*, 2010). A case of compound fracture of metatarsus in a dog treated with a prepared propolis paste during surgery and postoperative care, is described.

CASE HISTORY AND OBSERVATION

A one year-old female dog, weighting 25 kg was referred to the Clinic of Surgery in the Veterinary Sciences Institute at Ibn-Khaldoun University Tiaret, for an open foul-smelling wound on the distal aspect of the left hind limb. It had met with an accident a fortnight ago, leading to the compound fracture and the wound was found to be infected. At the time of consultation, the dog was presented with a good overall physical condition with lameness of the left hind limb and an infected wound on the distal aspect. Physical examination of the injured limb revealed crepitus and abnormal mobility at the level of metatarsals, along with localized tumefaction, pain, heat, oedema and stench. Orthogonal radiographic projections (lateral and dorsoplantar) of the distal left hind limb were obtained. The radiographic examination revealed

multiple fractures of the distal third of II, III, IV and V metatarsals (Fig. 1). The fracture on the distal third of II, III, IV and V of the left hind limb was immobilized using intramedullary nailing reinforced with metallic suture, which was performed 24 hours after the examination.

TREATMENT AND DISCUSSION

Surgical procedure

The animal was sedated using Xylazine (ROMPUN® 2%; Belgium) at 1 mg/kg body weight subcutaneously. General anesthesia was induced with Ketamine (IMALGEN® 1000, 10ml, France) at 15 mg/kg body weight intramuscularly. Surgical debridement was performed (Fig. 2) on the open wound at the level of the metatarsal region. Due to their necrotic state, the phalanges III and IV were amputated. The fracture was managed by reduction of the lateral metatarsal bone fragments and introduction of unlocked retrograde pin in combination with metallic suture for proper retention (size 0.4) (Stainless steel wire-BRINS 0.40mm-067804242-Laboratoires Bruneau, France).

At the end of the surgery, the wound was cleaned with normal saline solution and then dressed with a prepared ethanolic extract of Algerian propolis paste. The limb was bandaged with Vaseline gauze, and supported by a Thomas splint.

Postoperative care

Postoperatively, the patient received an anti-inflammatory treatment with Meloxicam (MELOVEM® 2% Coophavet, France) at 0.2mg/kg body weight subcutaneously repeated 24 hours later, along with a daily injection of Buprenorphine (TEMGESIC®, Schering-plough; Levallois-Perret; France) at 15µg/kg body weight for 5 days. On a daily basis, a broad-spectrum antibiotic treatment with Penicillin-Streptomycin (PEN & STREP®, Laboratories Norbook; Newry) was administered intramuscularly at 1 ml/25 kg body weight for 10 days. The wound was cleaned daily with normal saline followed by the application of prepared propolis paste.

Result of treatment

The progress of wound healing was observed on a daily basis for a period of one month. The granulation tissue was observed from the first week, completely covering the metatarsal bones by 30 days (Fig. 3).

Sixty days after surgery, (Fig. 4) radiography was carried out after removal of the osteosynthesis material. The radiographic image showed excellent bone consolidation and there was no evidence of osteomyelitis.

The treatment of osteomyelitis is difficult because of various factors, including the low bioavailability of antibiotics in bone tissue, increased antibiotic resistance, and



Fig. 1. Preoperative X-ray image of the dorsoplantar projection of the metatarsus with multiple fractures (white arrows).



Fig. 3. Wound healing at (A) 7 days; (B) 15 days; (C) 21 days; and (D) 30 days post-surgery.



Fig. 4. Wound healing at 60 days post-surgery.



Fig. 2. Trimming of the wound and removal of necrotic tissue.

the biofilm forming properties of bacteria (Olson and Horswill, 2013). The *in vitro* antimicrobial activity of propolis has been observed against *Staphylococcus aureus* (Boudra *et al.*, 2020). The aim of our case study was to show the role of Algerian propolis on the skin and bone healing.

Following the surgical debridement, the wound showed signs of soft tissue healing without any symptoms of infection. The formation of granulation tissue and less time taken for healing in this case, might be due to the effect of propolis, as described by Farooqui and Farooqui (2012) along with its effect on the bone healing (Boudra *et al.*, 2014; Ezgi and Hasan, 2017). In fact, it has been pointed out that the propolis has a significant effect on the wound reepithelization, contraction, and total wound healing (Abu-Seida, 2015).

Angiogenesis, increased blood supply and high oxygen tension are the key factors for a good bone consolidation process. Vascularization allows the supply of minerals and oxygen, which are essential elements for ossification. The oxygen content within the fracture site has a major role in wound healing since it directly influences the transformation of the pre-osteogenic cells. In fact, the stem cells differentiate into chondroblasts if the oxygen content is low and into osteoblasts if the oxygenation is high (Autefage, 1992).

Extra-osseous vascularization develops from the surrounding soft tissues of the fracture callus. Insufficient stabilization of bone fragments and inadequate reduction can modify the vascular response and therefore disturb bone-healing (Brinker *et al.*, 1994).

Plain radiography has low sensitivity and specificity for detecting acute osteomyelitis. As many as 80% of human patients who are presented in the first two weeks of infection, will have a normal radiograph (Jaramillo *et al.*, 2011). However, in this study such a possibility was excluded by performing post operative radiography 60 days after surgery.

SUMMARY

The present report deals with successful management of fracture in dog using an unconventional treatment. The topical application of the Ethanolic extract of Algerian propolis based paste improved wound healing, thereby promoting the process of bone consolidation. There is scope for a systematic clinical trial to establish its efficacy both for wound healing and fracture healing.

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