

MANAGEMENT OF OPEN FRACTURE IN CATTLE

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Cattle are considered great orthopedic patients. They tolerate orthopedic devices to stabilize the fracture site and have a prodigious potential of bone healing. As they lay down several hours a day, they protect the fracture site and are less prone to suffer of contro-lateral limb diseases. Long bone fracture management in cattle varies from external coaptation to open reduction and internal fixation and is essentially driven by the economic limitation. However for all cases, dealing with an open fracture in cattle will lower the prognosis from overall good to guarded whatever is the degree of contamination. Dealing with open fracture will always remain a challenge for the clinician and cost of treatment as to be clarified with the owner before starting it as we should ensure the animal worth the investment to make relatively to the prognosis.

Evaluation of open fracture follows the same steps as any fracture and at least two orthogonal radiographs have to be taken to determine the type of fracture and the degree of comminution and displacement of the bone segments. In addition to that, open fractures are classified following the Gustilo and Anderson classification. Open fracture type I refers to a wound less than 1 cm associated with minimal soft tissue damage and a relatively clean wound bed. Open fracture type II follows the type I characteristics with the exception of the wound's length (>1 cm) and a moderate soft tissue damage. The type III is associated with extensive damage to the soft tissue compromising the blood supply to the distal aspect of the leg, exposed bones and massive contamination. Type III open fractures are usually due to a high velocity trauma or a severe crushing component and therefore are severely comminuted fractures. Open fractures type III are subdivided in 3 groups: IIIA for which there is a sufficient amount of viable soft tissue so that it can be reapposed over the bones during surgery; IIIB for which the soft tissue loss will necessitate plastic reconstructive surgery to protect the bone ends; and IIIC for which there is a major arterial injury that will require vascular repair to salvage distal part of the leg.

Considering the typical environment of cattle, any penetrating wound should be considered infected. A mixed bacterial flora can usually be cultured from a swab sample from the wound bed. Common bacteria isolated are coliforms, *Arcanobacter pyogenes*, *Staphylococcus* spp and *Streptococcus* spp.

The control the infection is the main target to reach the ultimate goal of fracture healing. Surgical debridement should be considered as the most effective way to reduce the bacterial load of the wound. With the animal under general anesthesia, a sharp debridement allows the removal of gross contamination and organic debris embedded in the fibrin clots. The wound is copiously lavaged with a poly-ionic solution using a simple lavage system (35-mL syringe and a 18-gauge needle) to add a mechanical action to the sharp debridement. Efficacy of the dilution of crystalline antibiotics in the lavage solution has not been established and therefore is not necessarily recommended.

Antibiotherapy should be started immediately. The initial broad spectrum therapy will be reassessed depending on the bacterial culture and sensitivity results of the sample obtained at the time of the surgery. Common antibiotics used in orthopedic infections are penicillin, cephalosporins, fluoroquinolones and trimethoprim-sulfa as it has been established they reach tissue contraction above MIC in bones. Route of administration is preferably IV, but this may be modified upon patient behavior.

Local antibiotic delivery is achieved with slow release implants *in situ* or local injections. Antibiotic impregnated implants (collagen sponges, orthopedic polymethylmethacrylate, and laster of Paris) can be inserted at the time of the surgery if the wound is closed and first intent healing process is targeted. Increase of the antibiotic concentration in the wound bed and bones can also be performed using regional IV perfusion distal to a tourniquet or intraosseous perfusion.¹

Stabilization of open fracture is best achieved by the use of external skeletal fixation (ESF) as it allows a direct access to the wound and a daily assessment and cleaning. Fiberglass cast covers the wound and impair the evaluation of the healing process. However use of simple external coaptation on type I open fractures after a thorough debridement and lavage of the wound may lead to success.² Fiberglass cast are routinely used on calving chain fractures. Those fractures are characterized by a severe disruption of the vasculature of the distal aspect of the leg. The skin damages may lead to skin necrosis during the following days with no advertising signs and impairment of the cortical blood supply may induce the formation of sequestrum. Clients should be warned about the associated risks. Complete reassessment of the wound with a cast change should be done in 10 to 12 days. Fenestrated cast are difficult to manage adequately and should be discouraged: they offer limited access to the wound and the hole in the cast acts as a weak point in the external coaptation system weakening the fracture stabilization.

If young stock is considered as a bone healing machine when dealing with closed fracture, its poor resistance to infection makes it a less ideal candidate when dealing with open fractures. Delayed union is not uncommon in young calves. Prognosis in adults is guarded and mainly limited by the weight of the patient and the degree of contamination of the wound.

References

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