

Decision Analysis for Fracture Management in Cattle

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KEYWORDS

- Cattle • Fracture • Decision analysis • External coaptation • Internal fixation
- External fixator • Stall rest

KEY POINTS

- Bovine fractures are common and each bovine patient is unique, presents innumerable challenges, and requires careful judgment.
- In cattle the fracture repair usually should be of acceptable quality to not cause a decrease in milk or meat production or interfere with natural breeding.
- The decision to treat a fracture in cattle is made by evaluating the cost and success rates of the treatment, the value of the animal, and the location and type of fracture.
- Temporary stabilization of limb fractures often is the one difference between success and failure.
- External coaptation often is appropriate and an economic treatment to repair a fractured bone in cattle.
- Open fractures in cattle have guarded prognosis. The success rate often depends on the degree of contamination and the economic limitation of the owner.

Appendicular fractures (bones of the front limbs or hind limbs) are common in cattle, are commonly found in calves, and often occur following trauma during handling or a dystocia.¹ Fractures involving the axial skeleton (skull, spine, pelvis) are less common and less commonly treated. The most common bones involved in fractures of cattle are the metacarpus and metatarsus, followed by the tibia, radius and ulna, humerus, and femur.^{1–5} Fractures of the axial skeleton and phalanges are rare, but the most common axial skeleton fractures are the sacrum, pelvis, and mandible.¹

Each bovine patient with a fracture is unique and presents various challenges requiring careful judgment. Decision analysis is always part of clinical cases in any species, but economic factors are a particularly significant influence on decision analysis for cattle under consideration for treatment because of the requirement for

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economic returns in nearly every case. Every animal with a fracture is different. Every owner, farm manager, and rancher brings a different set of circumstances and expectations. With the exception of rodeo livestock, cattle most often do not need to perform at the same athletic capacity as horses. In cattle, return to productivity after fracture repair should be of acceptable quality so as not to negatively impact growth for meat production, cause a decrease in milk production, or interfere with reproductive efficiency, including embryo or semen production and natural service breeding. Each veterinarian brings a different point of view to the decision analysis process, but there are common features to all cases that must be considered: owner expectations, perceived value of animal, prognosis for treatment, and likely outcome after successful treatment.

Most cattle are favorable patients for treatment of fractures because they have a calm demeanor, are capable of spending most of the time lying down during convalescence, have tremendous potential for bone healing because of vascular density and enhanced cambial layer to the periosteum, infrequently suffer permanent contralateral limb breakdown or stress laminitis in the unaffected limbs, and usually do not resist having orthopedic devices (eg, splints, casts, external skeletal fixators) on their limbs.^{4,5}

ECONOMICS

In cattle, the decision to treat a fracture is made by evaluating the severity of the injury (eg, open vs closed fracture, neurovascular trauma), cost of treatment, expected success rate of treatment, perceived or potential economic and genetic value of the animal, and the location and type of fracture (eg, articular vs nonarticular, amenable to cast vs bone plate vs external skeletal fixation [ESF]). The presence of sepsis, nerve damage, and vascular trauma negatively impacts prognosis and significantly increases cost of treatment. Closed fractures are expected to heal in most cases, whereas open fractures are more likely to suffer complications such as sequestration of bone, delayed union, or nonunion. The temperament and behavior of the animal can improve or worsen prognosis. Cattle with aggressive behavior are more likely to maintain the ability to stand, walk, and care for themselves. However, these patients are more difficult and dangerous to treat and therefore may receive lesser quality care. Proximal limb injuries, such as humeral or femoral fractures, have greater soft tissue support and collateral blood supply, but are more difficult to stabilize than more distal fractures. External coaptation devices are more easily adjusted to forelimb injuries than hind limb injuries. Fracture treatment in younger patients with lighter body weights is more easily healed because of their remarkable healing rate and greater stability of fixation devices than adult cattle. Although expensive, orthopedic implants designed for use in small animal and human surgery are often of adequate mechanical strength for use in young calves and have been used successfully in the management of various fractures in cattle. After the multitude of factors that affect prognosis has been considered, the veterinarian can offer options for the client to choose from. The veterinarian's responsibility is to ensure that the owner can make an informed decision about the cost of treatment as it relates to the ultimate outcome of the case.

In general, cattle producers will elect the least expensive treatment for any given fracture that still offers a reasonable success rate. Often, owners are willing to elect costly treatments, even when the prognosis is poor, when cattle are perceived to have high economic or genetic potential. Occasionally, these options are chosen because the animal has attained a "pet" status on the farm. In many cases, bulls carry

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