

# Plates, Pins, and Interlocking Nails

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## KEYWORDS

- Cattle • Long bone fractures • Internal fixation • Locking plates
- Intramedullary nails

## KEY POINTS

- Treatment decisions for repair of long bone fractures in cattle should ideally be made quickly using evidence-based criteria that promise the best outcome for the patient. Such criteria have not been established.
- Open reduction and internal fixation require surgical expertise and substantial input of time and finances to be successful. Plate osteosynthesis usually provides the most stable type of internal fixation in cattle.
- Recently introduced locking compression plates offer a wide range of treatment options; the type of plate can be selected to accommodate calves with relatively soft bones or heavy patients.
- Internal fixation may therefore be the treatment of choice not only for fractures in cattle of high economic value but also for certain types of fractures, in which rapid and uneventful healing can be better achieved through surgical intervention.

## INTRODUCTION

This article provides farm animal veterinarians with an overview of newer implants (**Tables 1** and **2**) and established and newer methods of open reduction and internal fixation of long bone fractures in cattle. The results of surgical treatment of specific fractures in cattle from the literature are summarized (**Tables 3–9**), and the advantages and disadvantages of intramedullary fixation and plate osteosynthesis are discussed to provide information for decision making in clinical cases.

### *Prevalence*

Long bone fractures are probably the most dramatic cause of lameness in cattle; a decision as to whether the patient should be euthanized, slaughtered, or treated must be made promptly. Because the value of individual cattle and treatment costs are

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Conflicts of Interest: None.

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Screw Type	Cortex	Cortex	Cortex	Cancellous	Locking	Cannulated
Thread diameter (mm)	3.5	4.5	5.5	6.5	5.0	7.3
Glide hole diameter (mm)	3.5	4.5	5.5	4.5	None	7.3
Thread hole diameter (mm)	2.5	3.2	4.0	3.2	4.3	5
Core diameter (mm)	2.4	3.0	3.8	3.0	4.4	4.5
Tap diameter (mm)	3.5	4.5	5.5	6.5	Self-tapping	Self-tapping
Pitch (mm)	1.25	1.7	2	2.75	1	2.75
Drive type	2.5	3.5	3.5	3.5	T25	4 mm
	Hexagonal	Hexagonal	Hexagonal	Hexagonal	Stardrive	Hexagonal

The stardrive recess provides torque transmission to the screw, and a holding sleeve for the screw is not necessary.

\* SYNTHES (USA), Paoli, Philadelphia.

increasingly divergent, it is unlikely that most cattle with a long bone fracture are referred to a clinic for therapy. The prevalence of long bone fractures in cattle is not known, because the available data originate from older or regional studies.<sup>1-5</sup> In more recent studies of causes of death in dairy cows, fractures are seldom listed.<sup>6,7</sup> The bones commonly fractured in cattle are the large metacarpal/metatarsal bones (21%–50% of cases), the tibia (12%–58% of cases), and the femur (15%–40% of cases); fractures of the humerus, the radius/ulna, and the calcaneus are less commonly reported.

### Literature

The use of internal fixation of fractures in cattle started to increase in the 1950s; it was first reported in individual patients<sup>8</sup> and later progressed to studies of case series.<sup>9,10</sup> **Tables 3–9** summarize the literature and show the individual bones in which plates, pins, and intramedullary nails were used for repair of fractures in cattle. These tables are not meant to be complete; not all case series were published<sup>11,12</sup>; some appeared in conference proceedings<sup>13,14</sup> and others in dissertations that are not easily accessible.<sup>1,10,15,16</sup> Some studies<sup>4,17–19</sup> were not included in the tables because the results of the operations were not clear with regard to the type of repair, type of bone repaired, or individual animal operated.

### Methods

The choice of type of surgical treatment in bovine fracture patients depends on many factors. Instruments and implants are expensive, and most clinics do not have all types of instruments at their disposal; this limits the number of repair methods that can be used. It can be assumed that for this reason, a particular repair technique is preferred by a clinic,<sup>3,20–24</sup> although many fractures can be treated with equal success using a different technique. Because fracture repair is uncommon in cattle, it is difficult to gather sufficient information on all repair methods. Some fractures are more commonly treated because certain breeds tend to incur a particular type of fracture, for example tibia fractures in Belgian blue cattle.<sup>5,24,25</sup> Individuals of this breed are

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