How to Construct and Use a Transfixation Cast

Scott McClure, DVM, PhD, Dipl. ACVS

Transfixation casting provides an alternative method of stabilizing distal limb fractures and should be considered as an option for complicated distal limb fractures. Author's address: Dept. of Veterinary Clinical Sciences, School of Veterinary Medicine, Purdue University, West Lafayette, IN 47906-1248. © 1998 AAEP.

1. Introduction

Even as techniques of open reduction and internal fixation continue to improve, we recognize fracture configurations that are not amenable to this type of repair and complications that can occur with internal techniques. For some fractures, an alternative mechanism of fracture stabilization, such as external fixation, is indicated. Transfixation casts, a form of external fixation, are not new, and reports in the literature date back to the 1950's. However, improvements in casting materials, transfixation pins, and a greater understanding of the mechanics of the transfixation casts have improved the stability provided by transfixation casts and have reduced the risk of complications.

The standard cast does little to remove loading from the distal limb, but the transfixation cast effectively transfers the forces of weight bearing from the bony column to the fiber glass cast. The transfixation cast utilizes pins placed through bones in the limb proximally to the fracture, and the cast suspends the limb distally to the pins. The transfixation cast can be used as the sole method for support or in combination with methods of internal fixation such as lag screws.

2. Methods

The transfixation cast is technically easy to construct and consists of readily available components. The equipment required to construct a transfixation cast is limited and an extensive inventory of hardware is not required. Fiber glass cast material has replaced the need for plaster of Paris and is three times as strong with half the weight. An acceptable use of plaster, which some practitioners prefer, is to use a few layers of plaster underneath the fiber glass because it conforms to the leg and may decrease the occurrence of cast sores.

Proper pin placement is the most important step in constructing a transfixation cast that will provide long-term weight bearing. I prefer to use IMEX large animal centrally threaded transfixation pins. This third-generation ¼ in. (0.63 cm) positive profile transfixion pin has a tap to thread the bone following predrilling with a 6.2-mm bit. The three-step pin placement method reduces the thermal necrosis of bone that can occur with self-tapping transfixation pins, and it appears to prolong the stability of the bone–pin interface. Pins should be placed as far from the top of the cast as possible so the cast does not act as a lever at the bone–pin interface. This decreases the likelihood of fracture.
through the bone-pin interface. For most adult horses, two or three transfixation pins are adequate. I often use two pins; however, I have seen horses with three pins wear the cast well for 6 weeks. For adult horses, I use the ¼ in. pin described above; the ⅜ in. centrally threaded transfixation pin can adequately support foals. Pins should be placed through releasing incisions of adequate length so that the skin will lie smoothly around the pin. During drilling and tapping, the bit and tap should be irrigated with saline to lubricate and dissipate the heat. Placing pins in a divergent direction from the frontal plane appears to decrease the likelihood of secondary fracture through the bone-pin interface.4

For phalangeal injuries, a short limb cast to the proximal third metacarpal or metatarsal (MC–MT) bone with pins through the distal MC–MT is adequate. When the transfixation pins have to be placed through the mid or proximal MC–MT or distal radius, a full limb cast is indicated. I place the cast as I would for any normal full or short limb cast. I use a double layer of stockinette, felt at the top and heel-bulb region, and a thin layer of cast padding. An assistant is needed to cut the casting tape, parallel to the roll, as you roll over the pins. Cutting the material allows it to lie smoothly against the limb. When an adequate amount of fiber glass is applied, cut the pins nearly flush with the cast. The ends of the pins can be covered with another roll of fiber glass cast material or with acrylic (Techovit).5

3. Results

This method of stabilizing lower limb injuries provides a method to increase the fixation of lower limb injuries for which open reduction and internal fixation is feasible or the best mechanism of repair. In approximately 25 cases with which I have been associated, only 25% of them did not survive, and only one failure was a direct result of the transfixation cast. Most horses will wear the cast for 4–6 weeks before becoming uncomfortable as a result of loosening of the pins. If necessary, the cast can be changed earlier with the pins left in place and then recast as initially described. In cases in which the pins loosen before adequate fracture healing has occurred, a second pair of pins may be placed proximally to the initial pair.

4. Discussion

Transfixation casts provide an excellent method of stabilizing lower limb injuries. When appropriately applied, a transfixation cast can provide pain-free weight bearing up to 6 weeks before pin loosening occurs. The transfixation cast is not the answer for dealing with all fracture configurations, and the practitioner should consider the complications associated with its use prior to application. The primary complication of transfixation casting is premature loosening of the transfixation pins. Loosening of the pins is detected by an increased lameness in the transfixed limb and radiographic evidence of osteolysis at the bone-pin interface. Pin loosening can occur as a result of an improper pin placement technique that causes thermal necrosis and microfractures and subsequent osteolysis. Pin loosening allows for the establishment of an infection at the bone-pin interface that increases the osteolysis around the transfixation pin. The most severe complication of transfixation casting is secondary fracture through the bone-pin interface. This can be limited by utilizing the smallest diameter pins capable of withstanding the weight of the horse, using divergent pin placement, and maximizing the distance between the pins and the top of the cast.

With the transfixation cast, further soft-tissue disruption that increases the risk of infection and devascularization of fracture fragments is avoided. Distal limb fractures that are open or severely comminuted may be best treated with a transfixation cast, with or without limited internal fixation. For comminuted fractures, I like to use a minimal internal fixation consisting of lag screws placed through stab incisions, with the axial stabilization provided by a transfixation cast.

Transfixation casting is not the answer to all complicated distal limb fractures, but it can provide an alternative method for stabilizing distal limb fractures.

References and Footnotes


1Imex Inc., 1227 Market St., Longview, TX 75604.
2Jorgensen Laboratory Inc., 1450 North Van Buren Ave., Loveland, CO 80538.