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Metacarpal/tarsal and phalangeal fractures

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METACARPAL AND METATARSAL FRACTURES

Metacarpal and metatarsal fractures are common injuries in small animals and usually result from direct trauma, such as a road traffic accident or collision with a stationary object. Other recognized causes of fracture are falls from a height. In these cases, the metacarpal/tarsal fractures are usually associated with concurrent hyperextension injury of the carpus or tarsus. In a retrospective study of 37 cases of meta-bone fractures, metatarsal fractures were over represented (Muir 1997). According to the same study, fractures of one metacarpal or metatarsal bone occurred in 24% of the dogs, two meta-bones in 16% of the dogs, three meta-bones in 19% and four meta-bones in 43% of the dogs. Fractures of the metacarpal/tarsal bones are classified according to their anatomical location as: fractures of the base, fractures of the shaft and fractures of the head.

Radiographic assessment: Dorso-palmar/plantar (DP) and lateral (L) views are the standard. In addition, dorso-palmar/plantar 15 degree oblique views and lateral 45 degree oblique views are often necessary to isolate individual bones or to evaluate complex multiple fractures. The application of a well-padded Robert Jones bandage supported by a meta splint for 24 to 48 hours prior to surgery is recommended to decrease the swelling, which will in turn facilitate fracture reduction.

Fractures of the Base: Basilar fractures are generally avulsions of the ligamentous or tendinous insertions and usually involve the second and the fifth meta-bones. Conservative treatment is an acceptable treatment option for non-displaced and inherently stable fractures. In unstable fractures, due to the tendency of the fragment to displace, there is the risk of mal-union and angular deviation. In these selected cases open reduction and internal fixation represents the treatment of choice. Fixation can be achieved with a small diameter K wire and a figure of eight tension band wire. As an alternative multiple 1.5 mm or 2.0 mm lag screws are inserted following anatomical fracture reduction.

Fractures of the Shaft: Metacarpal/tarsal fractures can be treated either conservatively or surgically. The decision between these methods will be based on the type and location of fractures, the number of bones involved, and the inherent stability of the fractures. Transverse fractures of either one or two metacarpal/tarsal bones, located at the proximal and middle third portion of the bones, tend to be stable, and can be treated with closed reduction and external coaptation. Fractures located in the distal portion of the shaft tend to displace and are more difficult to maintain in a reduced position with external coaptation. Internal fixation of shaft fractures is usually indicated when there are multiple bones fractured, when the two central weight-bearing bones (third and fourth) are fractured, or in fractures with severe displacement. In large breed dogs and athletic or working dogs, open reduction and internal fixation should be considered in order to achieve the best functional results. Plate application in transverse fractures assures a very stable fixation. The plate is applied to the dorsal aspect of metacarpals/tarsals III and IV, to the medial aspect of metacarpals/tarsals II and to lateral aspect of metacarpals/tarsals V. The Veterinary Cuttable Plate (VCP –Synthes; 1.5 mm/2.0 mm and 2.0 mm/2.7 mm) is an excellent implant for repair of metacarpal/tarsal fractures. Intramedullary pinning has been described as a successful method of treatment and its indications are: fractures involving only one or two meta-bones that are stable after reduction, and fractures in young non-athletic breeds. A small diameter Kirschner wire (1.5 or 2.0 mm) is inserted, starting distally, close to the dorsal attachment of the joint capsule and driven into the proximal fragment, up to the base of the bone. A slot can be created in the dorsal cortex at the insertion point for the wire with a high-speed burr to facilitate the insertion of the wire. The protruding portion of the wire is bent over into a hook and lodged in the slot. Long-oblique and spiral fractures are generally repaired with multiple lag screws. If screws are used as the only form of fixation, the length of the fracture has to be at least twice the diameter of the metacarpal/tarsal bone and a minimum of two screws need to be placed. If required, the repair can be supported with a neutralization plate. This is especially true in case of fractures involving the III or IV meta-bones. Commminuted fractures are best repaired with a combination of lag screws and mini plates or VCP. Large fragments can be lagged through the plate. A biological approach is recommended for non-reconstructable, highly comminuted fractures. The plate can simply be applied in a bridging fashion, maintaining axial alignment and length.

Fractures of the head: Fractures of the head are usually intra-articular fractures involving the condyles. Closed reduction is only used for incomplete fractures. Surgical treatment is indicated for mono-condylar and for T or Y fractures. Simple fractures can be repaired with application of a lag screw or with a small cerclage wire. In more complex fractures it is possible to use mini T or L plates.

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Post operative treatment: After surgery, a padded bandage is applied for approximately 3 to 4 weeks until radiographic signs of bone healing are seen. Kennel or cage confinement is necessary until bandage removal. This period is followed by 4 to 8 weeks of restricted exercise. A molded splint is applied in case of fractures involving multiple bones in order to offer a stronger support to the repair. Conservative treatment: A padded bandage is reinforced with a moulded splint or with a fiberglass cast. Kennel confinement and rest are required until there are radiographic signs of bone healing, which occurs usually within 4 to 8 weeks.

PHALANGEAL FRACTURES

Introduction: Phalangeal fractures are common injuries and often considered insignificant. As a direct consequence of this underestimation, the treatment of these injuries is not always optimal. Several factors should be considered when deciding upon the optimal treatment. Breed, age, type of activity, owner expectations and compliance as well as injury characteristics, pattern of the fracture and soft tissue damage are all important factors that must be taken into account when establishing a treatment plan.

Radiographic assessment: Radiological evaluation of phalangeal injuries should commence with plain radiographs. A minimum of two views taken at orthogonal angles provide information on two planes. Standard dorso – palmar/plantar (DP) and lateral (L) views are the core of the radiological assessment. DP views should include the metacarpo/tarso-pHALANGEAL joints and the distal inter-phalangeal joints. The L view is taken spreading the toes with the aid of a stirrup of tape applied on the nail of the second and fifth digit ("fan lateral"). Oblique views are used to increase the sensitivity of imaging of phalangeal fractures, especially in case of severely comminuted fractures. A lateral view with traction applied to the nail is useful to assess the shape and size of the fragments in case of comminuted fracture of P2.

Fractures of the shaft of P1 and P2 can vary in configuration from transverse, oblique, spiral with or without a butterfly fragment, to highly comminuted. Simple, stable non displaced fractures, especially in young dogs, can be treated with closed reduction with splinting in functional position. Fractures with unstable configuration are traditionally treated with open reduction and internal fixation with lag screws (1.5 mm-2.0 mm) or mini plates. Careful handling of the fracture fragments with appropriate instruments and gentle traction is required in order not to compromise the delicate vascular structures in this area. Failure to respect the blood supply can lead to severe complications from non-union to necrosis of the toe.

Fractures of the base or of the head are articular and almost invariably involve the insertion of the collateral ligament. Fractures of the condyles can be managed with application of lag screws or with a loop of cerclage wire unless the fragments are too small to be safely secured in place. Very small fragments can be excised, but in cases with large unfixable fragments involving the joint, amputation or arthrodesis is usually done. Traditionally the lag screw technique has been the standard for fixation of oblique, spiral and condylar fractures. This technique is relatively straightforward for most of the long bones fractures, but can be technically challenging for the fracture fixation of small bones. Despite the availability of very small implants (1.0 mm - 1.5 mm – 2.0 mm) the size of these screws remain large relative to the phalanges and the fragments to be fixed, leaving little room for error and increasing the chance of iatrogenic comminution. The application of bicortical (positional) self tapping screws provides the advantage of elimination of a surgical step. There is less chance for the reduction to be lost and for splitting of the fragments. With bicortical screws, the proximal cortex is not over drilled and the screw treads achieve purchase in both cortical surfaces.

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References available from the author upon request.