Fractures of the forelimb and hindlimb

Diaphyseal fractures

Fractures of the shaft (diaphysis) of a long bone (e.g. femur, tibia, humerus, radius, ulna) may be repaired with implants including bone plates, intramedullary pins, lag screws and cerclage wires (not uncommonly combinations of two or more of these implants are used) and also by external skeletal fixators.

Fractures involving the mid-region of the shaft are the simplest to repair and typically carry the best prognosis. Fractures closer to the ends of the bone (juxta-articular fractures) and especially fractures that involve a joint are more difficult to repair (less bone to place implants into), as are fractures where the bone is in multiple pieces. Factors that may influence bone healing and therefore the likelihood of a successful outcome without complications include:

- age (young animals heal more quickly than old animals),
- injury to soft tissues e.g. when large skin and muscle wounds are present blood vessels to the area are likely to be injured – less blood supply to the healing bone results in delayed healing times and a reduced ability to fight infections. Blood vessels may also be injured when there are no external wounds. Significant swelling may be associated with a compromised blood supply.
- Contamination of wounds with bacteria and foreign material compromises healing.
- Medical conditions may also affect bone healing e.g. diabetes, kidney disease etc.
- Bone “quality”. Puppies and (old) dogs with osteoporosis tend to have “softer” bone, as may dogs with medical conditions; screws are more likely to pull out. Using locking plates with locking screws significantly reduces but doesn’t eliminate this risk.

Fractures of the lower limb (carpus and tarsus)

The carpus ("wrist") and tarsus ('hock" or "ankle") are made up of many small bones. The small size of the bones may be a limiting factor for successful repair. Some of these bones are especially hard which makes them more prone to shattering, both at time of fracture and when placing implants during fracture repair e.g. calcaneus. The accessory carpal bone in the carpus and the calcaneus in the tarsus function as lever arms; significant tensile force is applied to these bones during normal movement of an animal. The forces acting on these bones following fracture repair are problematic and must be adequately countered to reduce the chance of failure.

Outcome and potential risks of surgery

Overall success rates with fracture repair are typically very good, however as with any surgery complications may arise and are detailed below; the likelihood of complications is influenced by the factors discussed above, however a fracture with a guarded prognosis may heal without any complications and a fracture with an excellent prognosis may still suffer complications.

- When the bone is in multiple pieces the pieces may be quite fragile e.g. there may be microfractures or even fissures in the individual bone pieces. Occasionally these bone pieces may suffer additional fractures during attempted repair. Bone in older dogs is more brittle and splinters more easily.

- Infection is an uncommon complication as strict sterile technique is used during the surgery and antibiotics are administered during and potentially after the procedure. Should infection occur, early detection and treatment often results in rapid resolution, although sometimes removal of the implants may be required once the bone has healed. More serious problems may occur if infection progresses untreated or if your dog suffers an infection that is resistant to multiple antibiotics e.g., MRSA. Some medical conditions will increase the risk of a post-surgical infection, such as diabetes or pre-existing infection elsewhere e.g., skin and ear infections, cystitis, gingivitis. Pre-existing infections should be eliminated whenever possible. Some chronic infections e.g., skin and ear cannot be entirely eliminated, yet it may still be in your dog’s best interests to undergo surgery despite a degree of increased risk. Pre-surgical treatment will aim at minimising the risk of post-surgical infection.

- Fractures of bones with tendinous attachments (e.g. greater trochanter, tibial tuberosity) are at higher risk of failure due to the high tensile forces acting across the fracture site. These risks are greater for bones that also function as

lever arms (e.g. olecranon, calcaneus, accessory carpal bone). As these forces are generated during normal movement strict confinement is essential to reduce the risk of problems whilst the fractures are healing.

- Excessive activity will reduce the likelihood of bone healing and will increase the risk of implant loosening/failure.
- Puppies and (old) dogs with osteoporosis tend to have “softer” bone and screws are more likely to pull out. Using locking plates with locking screws significantly reduces, but doesn’t eliminate this risk.
- Fractures that had had previous, unsuccessful surgery have a more guarded prognosis, particularly if there has been prolonged disuse of the limb. Disuse results in atrophy (shrinking) and weakening of soft tissues such as muscles, ligaments and tendons, in addition to atrophy and "softening" (osteoporosis) of the bone.
    - Muscles can contract and suffer fibrosis; these changes may be permanent and will impact the degree of function that can be restored to the limb, even if bone healing is successfully achieved. Physiotherapy is an important aspect of treatment in these cases.
    - Weakened bone will not hold implants as well as "normal" bone. (An analogy is comparing placing screws into a hardwood as opposed to placing screws into a soft plastic.) Nevertheless, with specialised implants (e.g. locking plates & screws) satisfactory fixation of osteoporotic bone can be achieved, and with careful post-operative care good outcomes are still possible.
- Even after the bone has healed it is still important to have a controlled, gradual increase in activity, similar to human patients undergoing rehabilitation following surgery. If activity is increased too quickly after surgery straining of joint structures may occur. Rest and anti-inflammatory medications typically resolve these problems.

Postoperative care

A pad may be covering the wound at the time of discharge from the hospital. This can be removed after several days, or immediately if soiled. Medications e.g., Pain killers will be dispensed.

Ice packs may also be helpful in the days following surgery to reduce swelling and improve comfort.

Your dog should be kept confined to a large cage to restrict activity (a single room with **non-slip** flooring may be sufficient but with increased risk). Short **leash** walks in the garden (a few minutes four to six times daily) are recommended to allow toileting. Confinement should be maintained at all times for at least the first six weeks following surgery; only relax confinement when your Vet specifically advises you to do so.

X-rays should be performed approximately four to eight weeks following surgery to assess implant position and healing. The actual timing of follow-up x-rays will be advised at discharge.

Implant removal may be advised in certain situations e.g. young animals, contaminated wounds, and areas with reduced soft tissue cover and bony prominences e.g. tibial tuberosity, hock, carpus.

Declaration:

I have read the information contained herein and am satisfied I have a sufficient understanding of the procedures my dog is scheduled to undergo, including potential complications that may occur and requirements for aftercare following surgery.

I hereby consent for my dog to undergo fracture repair.

Owner’s name: Dog’s Name:

Owner’s signature: Date: