Outcomes of orthopaedic interventions in farm dogs

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Trauma is reported to be common amongst working farm dogs (Cave et al. 2009). The leading three causes of traumatic injury amongst NZ farm working dogs were motor vehicle accidents, injury involving a fence and being trampled by stock. Dog-fights were the forth most significant cause of trauma.

Many of the more serious injuries involve the musculoskeletal system including fractures, lacerations and ligament avulsions and tendon injury.

At the Massey University Veterinary Teaching Hospital (MUVTH) the three orthopaedic injuries for which working farm dogs most commonly present are carpal hyperextension with or without medial collateral ligament injury, common calcanean tendon rupture and injury to the ligaments of the hock with resultant instability. In non-referral practice acute cranial cruciate ligament rupture with or without collateral and meniscal involvement (stifle disruption) is the most common orthopaedic injury in farm dogs.

As veterinarians we should base our treatment decisions on the best available evidence. There is a marked lack of reporting on orthopaedic injury in farm dogs working under New Zealand conditions. During the last several years, colleagues and I have published three retrospective studies, one each of these syndromes, and collaborated in a prospective study of carpal arthrodesis. In each of the studies the owners/shepherds were asked to rate the outcome of the surgery on ability to return to work and at what level of work the dog returned to.

These studies represent a lower level of evidence than randomized clinical trials (unlikely to ever be performed on clinical patients) yet are better as an indicator of prognosis than anecdotal evidence.

A prospective, multi-centre research database would provide New Zealand veterinarians with a better level of evidence. The Massey University Working Dog Centre (MU-WDC) has funded the development of such a database. Naomi Cogger, a member of the Epicentre and a director of the WDC, will be developing the database using a web-platform developed by the Ministry of Primary Industries. Once the database has been created we will invite practices to participate. The aim is to gather data on the common injuries that farm dogs experience and categorize treatments. Outcome will be measured by an arthrotomy.

Common calcanean tendon injury

This is a common injury in farm working dogs. Most working farm dogs experience an athletic rupture during activity. The gastrocnemius +/- combined tendon ruptures but the superficial digital flexor tendon remains intact (also called an incomplete rupture). On rarer occasions the rupture is due to a laceration and results in a complete rupture with the superficial digital flexor the first to be severed. Repair consists of locating and suturing the torn elements using a heavy non-absorbable suture. The 3-loop pulley has the greatest resistance to gap formation and is faster to tie than the Kessler locking loop (but either is
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Avulsions should be secured back to the calcaneus using tunnels drilled at the insertion points. The repair then must be protected from overload. Options include a cast alone (not reliable in my hands) a calcaneo-tibial screw (temporarily fixing the hock in extension), a trans-articular type II external skeletal fixator (ESF) or a ring fixator and olive tension wire. In humans there is greater emphasis on early controlled loading of tendons to facilitate collagen fibre alignment and return in strength. Such a regime relies on patient compliance with leg bracing and a graded return to function under the supervision of a physiotherapist. Our patients are poorly compliant by comparison.

My preference is for a calcaneo-tibial screw in farm dogs due to the lower cost and less need for revisits to someone familiar with ESFs. In addition there is a higher incidence of pin tract associated infection (anecdotally) in farm dogs with ESFs in place than pets, likely due to outdoor housing in less clean conditions than a household pet. Of course casting comes with an inherent risk of complications (potentially serious) and must be very carefully managed. We typically bivalve all our casts to facilitate changes, however it is vital that when a leg is redressed under a bivalved cast, that the amount of cast padding used is exactly the same as when it was first applied. Too much padding compressed under the splint increases the risk of pressure sores as well as placement of the splint in the wrong position through loss of anatomical landmarks. There is a strong argument for the cast to be redressed by the same person that placed it initially. Twice weekly checks are ideal but possibly unrealistic. Redressing is performed when there is; any change in comfort (chewing the cast or less willing to weight-bear); evidence of skin rubbing proximally; toe swelling (only leave digits three and four visible below cast); toe ulceration; or strike-through. The cast is left in place for six weeks in combination with the screw. At six weeks the screw is removed and the cranial half of the cast is used as a splint over a soft-padded bandage for another 7–14 days. The dog then requires a graded return to exercise over a further month. Tendons heal very slowly and at two months post-op are still vulnerable to injury. Many dogs will experience partial tearing and elongation of the repaired tendon at this time though most will be unaffected by this and can still return to work.

We also see chronic partial tearing characterized by a very swollen insertion on the calcaneus. These dogs often present acutely when there is a tear that overpowers the disordered collagen being laid down at the site of the chronic partial tear. If presented without a plantigrade stance, i.e. with intact tendon bundles, then it is possible that a calcaneo-tibial screw without a primary tenorrhaphy will allow the tendon to reorganize to sufficient strength to prevent a full tear. A cast should still be used in these cases. The cast helps protect the screw from early failure due to cyclic loading. On insertion the screw should be long enough to project several millimetres beyond the cranial cortex of the tibia so that if the screw does break the headless segment can be removed from the tibia cranially. The screw reduces the risk of cast complications because the limb moves less (and hence rubs less) inside the cast.

In a retrospective study 10 Huntaway or Heading dogs with complete or partial tears of the common calcanean tendon, were treated by locking-loop suturing and casting, with (7) or without (3), a calcaneo-tibial screw. All dogs were actively in work on sheep or cattle farms at the time of injury, and return to work was the desired outcome. Ability to work and owner satisfaction were investigated by a telephone questionnaire at a mean follow-up interval of 14.6 months. Overall, seven dogs returned to full or substantial levels of work. Post-operative complications occurred in two dogs that did not return to full or substantial levels of work. Moderate persistent lameness (3/5) was present in 2 of the 7 dogs that returned to full or substantial levels of work, equating to a 71% good to excellent functional outcome within this group. Seven owners felt the financial investment in opting for surgical repair was worthwhile. A screw and cast method of rigid immobilisation was superior (7/7 returned to work) to casting alone (0/3) (Worth et al. 2004).
Carpal hyperextension injury

Injury to the carpus is typically the result of a fall or jump from a height but can also result from being trampled by stock. Some injuries are very severe with tearing of one or both collaterals and luxation of the antebrachiocarpal joint. Injury to the palmar carpal fibrocartilage results in hyperextension that is severely limiting in a working dog. Diagnosis is via: careful observation of the dog’s stance, loading the injured leg by lifting the uninjured leg and observing the carpal angle, manipulation under sedation and stress radiography. The goal is to identify the level and extent of the injury to determine the best course of action. Isolated injury to one collateral without injury to the palmar support can occur but it’s imperative that hyperextension is ruled out prior to embarking on repair of a supposed collateral ligament injury. Hyperextension affecting the antebrachiocarpal joint requires fusion of all levels of the carpus (pancarpal arthrodesis). In theory isolated injury to the middle carpal or carpo-metacarpal joints should be amenable to partial carpal arthrodesis.

If a partial carpal arthrodesis is performed then the surgeon needs to recheck the antebrachiocarpal joint for resistance to hyperextension whilst still in surgery (following the partial arthrodesis). If hyperextension still occurs then the partial carpal arthrodesis must be converted into a pan-carpal arthrodesis.

The standard method of pancarpal arthrodesis is dorsal compression plating. The use of a standard DCP plate has been superseded by the advent of hybrid plates. The most commonly used is the ‘carpal arthrodesis plate’ introduced by Veterinary Instrumentation UK. This has smaller screw holes over the third metacarpal in comparison to the larger screws the plate accepts proximally. The profile is also tapered and designed to give a 7–10 degree of hyperextension. Standard and XL plate lengths are available and the surgeon should ensure >50% coverage of the third metacarpal bone to lower the risk of iatrogenic metacarpal bone fracture. Many surgeons also place a full cylinder or bivalved cast to support the plate for a minimum of 6 weeks. Arthrodesis is rarely complete before twelve weeks and a working dog will require four months off work. A more recent development is the so-called ‘cast-less’ hybrid plate (Orthomed UK). This plate is designed to be screwed to both the third and fourth meta-carpals but shares many of the other features with aforementioned hybrid plate. Application is more difficult and iatrogenic metacarpal fractures have been reported as an intra-operative complication. At the MUVTH we have used both plates and I use templates/xrays to determine the best fit using any of our plate options.

A retrospective study of pancarpal arthrodesis performed on working dogs at the MUVTH found that 6/12 (50%) of dogs could perform all duties as before surgery. A further three (33%) dogs could perform most former duties. Overall, 83% of the dogs treated using PCA returned to full or substantial degrees of work (Worth et al. 2008). A later prospective study using only hybrid plating yielded the same results with 83% return to work (Jerram et al. 2009). This and a soon to be published paper by the same authors revealed that eventual plate removal may be required in around 40% of cases. My experience with orthotic braces for carpal injury (N=1) was not favourable. Custom orthotics are expensive and frequently require adjustment as they cause skin complications from pressure points.
Injury to the ligaments of the hock

Talocrural instability is associated with collateral ligament tearing or avulsion or fracture of one or both malleoli. Though technically easy to perform, a primary repair of the injury (e.g. suturing the collaterals then placing a prosthesis) is very vulnerable to mechanical overload for several months after the surgery. A trans-articular ESF is recommended but can be problematic (see section on Achilles injury above) and greatly adds to the cost of surgical management. A cheaper and less complicated means of stabilization is required.

Injury to the proximal/intermediate tarsal joints, or tarso-metatarsal joints can be very successfully treated via partial tarsal arthrodesis. I prefer lateral or medial plating but external skeletal fixation has been reported (though not in a cohort of working dogs). Cross-pinning, whilst seemingly a cheaper and less complicated option has not been a reliable method in the author’s hands. A retrospective study performed at the MUVTH revealed that following partial tarsal arthrodesis, 7/14 (50%) dogs could perform normal work duties required while 4/14 (29%) dogs could perform most of the duties they had undertaken before injury, though some allowance had to be made for reduced performance. Thirteen owners were satisfied or very satisfied with the outcome of surgery and 12/14 thought the financial investment required for the surgery was worthwhile (Scrimgeour et al. 2011).

References


Worth AJ, Bruce WJ. Long-term assessment of pancarpal arthrodesis performed on New Zealand working dogs. New Zealand Veterinary Journal 56 (2) 78–64, 2008