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Clinical Commentary

Management of joint instability

M. R. W. Smith

Newmarket Equine Hospital, Cambridge Road, Newmarket, Suffolk CB8 0FG, UK.

Traumatic injuries to joints may result in instability, subluxation or luxation. This may be as a result of:

- Injury to the supporting soft tissue structures of the joint (collateral and other periarticular ligaments, joint capsule, periarticular tendons).
- Fracture and loss of support of soft tissue structures attached to the unstable fragment.
- Combinations of fracture and soft tissue injury.

In the acute phase following injury, pain and swelling are common. With minor strains, where there is minimal disruption of fibres, clinical signs quickly improve with rest and local and systemic anti-inflammatory treatments. However, with complete disruption to collateral support, regardless of the exact nature of the injury, joint instability causes severe pain and anxiety for the patient. Analgesics are often ineffective in satisfactorily managing pain and the primary means of providing analgesia is by re-establishing stability. Once achieved, anxiety is also reduced considerably. This can be provided by external coaptation, primary repair, internal fixation (of fractures) or arthrodesis.

Prognosis following luxation in the horse is often guarded. A number of factors contribute:

- The initial articular insult is frequently severe, with resultant irreversible cartilage damage.
- Healing of supporting soft tissue structures is incomplete and occurs predominantly by fibrous tissue formation. Although this may be modulated through appropriate convalescence programmes, a complete return to normal structure and function cannot be achieved.
- Progressive degenerative changes commonly occur in the affected joint as a result of ongoing instability, or secondary to the initial articular insult.

The means of achieving stability is determined on an individual case basis, although general principles apply. Management of fracture luxations or subluxations, or fracture and joint instability, requires accurate anatomic reconstruction of the fracture and articular surface, with stable fixation, usually provided by internal fixation with screws and/or plates. Once stability is achieved, the period of convalescence is usually dictated by the progression of fracture healing. The implants selected must be sufficient to provide stability. However, external coaptation has a key role in protection of the repair during recovery from general anaesthesia. Examples include complete displaced fractures of the lateral condyle of the third metacarpal/metatarsal bone. In other instances, the degree of comminution and/or fracture configuration preclude a return of stability by fracture reconstruction alone (or preclude reconstruction at all), and arthrodesis may be required. Examples include biaxial palmar/plantar eminence fractures of the middle phalanx, managed by reconstruction and proximal interphalangeal arthrodesis, and comminuted carpal bone fractures managed by partial or pan carpal arthrodesis (Bertone *et al.* 1989; Waselau *et al.* 2006). Alternatively, in select cases it may be appropriate to peruse a prolonged period of immobilisation to facilitate second intention healing.

Luxations or subluxations occurring solely as a result of soft tissue trauma most frequently involve the collateral ligaments. Invariably, however, capsular pathology is present concurrently. In man, following reduction, stability may be achieved by repair or prosthetic replacement of the injured collateral ligament (Brand *et al.* 1981). In the horse this is uncommonly attempted, in part due to concerns of failure during recovery from general anaesthesia. Although sparse, examples do exist in the literature (Edwards and Vaughan 1984; van der Harst and Rijkenhuizen 2000; Garcia-Lopez *et al.* 2001; Rodgerson and Spirito 2001). Most frequently external coaptation is the method used to provide stability, and is maintained whilst initial healing of damaged supporting soft tissue structures occurs (Yovich *et al.* 1987; Tenney and Whitcomb 2008; Rebsamen *et al.* 2009).

Often luxation or subluxation results from a combination of soft tissue injury and avulsion fracture (Tenney and Whitcomb 2008). If sufficiently large, avulsion fractures may be repaired with internal fixation techniques although smaller fragments may be removed. However, in a limited number of cases, conservative management of (sub)luxation with concurrent avulsion fracture did not appear to adversely influence prognosis (Yovich *et al.* 1987; Tenney and Whitcomb 2008).

The small carpal and tarsal joints are also affected by injuries resulting in luxation or subluxation (Bailey *et al.* 1984; Moll *et al.* 1987; Reeves and Trotter 1991). In such instances, radiographic examination may demonstrate this, or alternatively stressed projections may be required to demonstrate instability (Pilsworth 2002). These joints are complex, with multiple cuboidal bones connected and stabilised by intercarpal/intertarsal ligaments. Instability can occur due to disruption of the aforementioned ligaments, and/or cuboidal bone fracture with a loss of support of soft tissue structures attached to the unstable fragment. A common example is rupture of the medial palmar intercarpal ligament within the middle carpal joint (McIlwraith 1992). This ligament contributes significantly to restraint of dorsal displacement of the proximal row of carpal bones (Whitton *et al.* 1997). Demonstration of such injuries and the minor instability that results can be difficult, yet lameness may be severe. The former example relies on arthroscopic examination for confident diagnosis. In other instances, careful radiographic (including stressed projections) assessments may identify displacement or misalignment of adjacent bones, or ultrasonography and/or MRI may identify ligamentar disruption. In the case reported by Kearney *et al.* (2010), there was fracture of multiple adjacent tarsal bones (central, fourth and talus), and it is interesting to speculate that this may have resulted in instability due to loss of intertarsal ligamentar integrity (due to either ligamentar injury or unstable fragments at the site of ligamentar attachments), explaining the characteristic clinical signs without ability to demonstrate subluxation. In this case, reconstruction was not an option due to the degree of comminution. Partial tarsal arthrodesis (of the tarsometatarsal and centrodistal joints) was given consideration, although this method of treatment is costly and not without significant risks and potential complications.

The choices of external coaptation available to manage joint instability in the horse include:

- Cast coaptation (fitted either under general anaesthesia or standing in the sedated patient).
- Bandaging with or without splints.
- Specially designed braces.

Cast coaptation is considered the treatment of choice by many clinicians when managing complete collateral ligament rupture. If possible placement in the standing, sedated patient is optimal obviating the need for general anaesthesia, and its inherent risks and expense. However, placement in a standing position requires achievement and maintenance of joint reduction, and consistent weight bearing on the injured limb during application. The latter particularly, often necessitates placement under general anaesthesia. Additionally, the presence of wounds requiring debridement frequently dictates general anaesthesia. Either way, cast complications can occur and close patient monitoring is required (ideally in a hospital environment). For the reasons outlined above, it may be desirable on an individual case basis to provide support with bandaging in combination with splints. However, the degree of immobilisation is inferior (and may result in requirements for a more protracted period of support), and sufficient stability may not be achievable in all cases by this means. More frequent bandage changes (every 7–10 days) soon add significantly to the cost of treatment, making the savings of bandaging compared to casting much less of a reality.

The period of immobilisation chosen is currently empiric, based on opinion and individuals' experiences. This may be guided by clinical progress, and should be selected on an individual case basis. With concurrent fracture, serial radiographic examinations may aid decision-making on the basis of fracture healing. Review of the equine literature reveals widely different periods both used and recommended, from 2–19 weeks (Moll *et al.* 1987; Yovich *et al.* 1987; Reeves and Trotter 1991; van der Harst and Rijkenhuizen 2000; Sullins 2002; Tenney and Whitcomb 2008).

Exercise is important in modulating healing, and there is strong evidence in man to suggest that functional treatment strategies (early mobilisation programmes with external support) offer improved outcome in patients with acute lateral ankle ligament strains (without fracture), compared to complete immobilisation (Kerkhoffs *et al.* 2002a). Methods of support used with a functional approach vary but include semi-rigid support and elastic bandages, although the former appears to be associated with improved success (Kerkhoffs *et al.* 2002b). Exercises recommended in functional treatment protocols include flexibility exercises, strength and balancing training, ankle joint proprioception, muscular strength training and even exercises in water (Mattacola and Dwyer 2002). Greater debate exists regarding optimal management of severe strains (complete collateral ligament rupture), with opinions divided between conservative and surgical treatment (Kerkhoffs *et al.* 2007). However, interestingly, it is accepted that immobilisation should no longer be the nonoperative treatment of choice for patients suffering from an acute ankle ligament sprain in man (Kerkhoffs *et al.* 2002a).

In the horse, the joint most frequently reported on in the literature is the fetlock, where success in managing (sub)luxation has been achieved with surgical treatment, cast immobilisation and bandaging (Edwards and Vaughan 1984; Yovich *et al.* 1987; van der Harst and Rijkenhuizen 2000; Tenney and Whitcomb 2008). Numbers are too small to draw conclusions regarding the best means of treatment. The inability to instruct careful ambulation, and the greater stresses placed on healing tissues by the weight of equine patients has led to a more cautious approach with respect to the time frame for immobilisation. Although there are uncertainties regarding the ideal period and method of immobilisation/support, it is logical that some form should be provided whilst demonstrable instability remains.

The case reported by Kearney *et al.* (2010) failed to demonstrate conclusively joint instability. However, instability appears feasible with the observed injuries, and this is supported by the characteristic clinical features described of severe pain and anxiety in the unsupported joint. The persistence of these clinical features suggest the presence of instability through to approximately 14 weeks after injury, and it appears logical, therefore, to have maintained support until these clinical signs resolved. Serial radiographic examinations were performed to monitor fracture healing to aid decision-making regarding provision of external support. Although convalescence was protracted, the long-term case outcome was surprisingly good. As the authors point out, however, despite the relative comfort of the horse, extensive degenerative changes were present involving not only the small tarsal joints, but also the tarsocrural joint. Although serviceably sound for the intended purpose, this might be expected to preclude a higher level of athletic activity. More importantly, this report highlights that such injuries may be (relatively) successfully managed conservatively with sufficient care and patience.

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