Clinical Commentary

Surgical treatment of severe, complex limb deformities in horses

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Introduction

The Case Report by Whitfield-Cargile and Watkins (2011) in this issue is a good example of how thinking ‘outside of the box’ is extremely valuable when dealing with cases of severe or complex limb deformities. As summarised nicely in the report, limb deformities in horses can be angular, rotational or flexural in nature and in severe cases there is often a combination of deformities present. The aetiology of all of these deformities is often multifactorial. In addition to the type and severity of the deformity present, treatment will differ depending on whether the condition is congenital or acquired and the age of the patient.

Treatment of severe angular limb deformities

Treatment of angular limb deformities depends largely on the age of the patient, location and severity of the deformity and whether or not other bony abnormalities are present.

In neonatal foals with obvious angular limb deformities of the carpus or tarsus it is of utmost importance to establish if the cuboidal carpal/tarsal bones are completely ossified (especially if the foal is premature). This should be done within the first 24–48 h of life, since continued locomotion on incompletely ossified cuboidal bones will lead to the development of carpal/tarsal bone crush and collapse, eventually causing chronic lameness at the very least and necessitating salvage procedures or euthanasia in other cases (Fig 1).

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Fig 1: Six-week-old Arabian filly with severe carpal valgus. a) Dorsopalmar radiographs of the right (b) and left (c) carpi. Note the crushing and collapse of the cuboidal carpal bones, especially laterally. Bilateral distomedial radial transphyseal bridging with a single transphyseal screw was performed to correct the deformities: right front 3 weeks post operatively (d), left front 6 weeks post operatively (e). Despite correction of the angular limb deformities the filly developed chronic lameness associated with the carpal collapse.
The least invasive surgical procedure used to address severe angular limb deformities is growth retardation. Typically, this is transphyseal bridging performed on the convex side of the leg with screws and wires or a single transphyseal screw. The patient’s age is extremely important in determining whether or not correction can be achieved using these methods. Deformities of the fetlock need to be addressed promptly, usually within the first 2 months of life, since the distal growth plates of the third metatarsal (MT3) and metacarpal (MC3) bones are largely fused by 4 months of age (Auer 2006). Tarsal and carpal deformities can be addressed later (as long as the deformity is not preventing relatively normal ambulation and there is no cuboidal bone collapse) since the growth plates of the distal tibia and radius are highly active until 4 and 6 months, respectively and a period of continued growth probably lasts for at least 12 months in the radius (Auer 2006). However, it is ill advised to delay treatment in foals with severe angular limb deformities as compensatory deformities are likely to develop and, if the deformity is severe enough, it is unlikely to improve with medical treatment or farrier work. For example, foals with a carpal valgus of greater than 15° will not correct without surgical intervention so treatment should not be delayed.

Beyond these time periods growth retardation procedures will not correct the deformities and more invasive surgical procedures will be required to provide correction. These procedures have a decreased chance of producing an athletically sound animal, so the

![Fig 2: Eight-month-old American Miniature horse with a severe fetlock varus limb deformity of the right front limb (a); dorsopalmar radiograph (b). A step ostectomy was performed to correct the deformity; resultant appearance of the limb (c) and immediate post operative dorsopalmar radiograph (d). Dorsopalmar radiograph taken 2 months post operatively (e): the ostectomy healed without complication and the horse is sound one year after surgery.](image)
importance of promptly identifying and addressing severe angular limb deformities cannot be overstated. Procedures used to correct angular limb deformities after the affected growth plates have closed include corrective osteotomies or ostectomies and arthrodesis. Osteotomies and ostectomies have been described for correction of angular limb deformities of the fetlock (Fretz and McIlwraith 1983; White 1983; Bramlage 1994; Epp 2007). Step ostectomies (performed in the sagittal plane) or step osteotomies (performed in the frontal plane) are preferred over closing wedge ostectomies because they maximise bone-to-bone contact, providing for a more stable repair and because bone length is maintained (Fig 2). Step ostectomies can also be performed in such a way as to correct rotational deformities. Prognosis for athletic activity following these procedures is fair to guarded and all of the complications associated with performing open reduction and internal fixation for fracture repair in horses are possible. This should be taken into consideration and thoroughly discussed with the owner prior to performing surgery.

Alternatively, once the growth plates are closed, arthrodesis of the affected joint can be considered. Arthrodesis of the metacarpophalangeal (MCPJ), metatarsophalangeal (MTPJ) and carpal joints have been described (Whitehair et al. 1992; Auer 2006). These are done in combination with corrective ostectomies or osteotomies and are performed when there is significant pre-existing degenerative joint disease of the affected joint or if the osteotomy/ostectomy required to correct

Fig 3: Eighteen-month-old Mustang gelding with a severe flexural limb deformity of the left hind DIPJ: preoperative appearance (a) and lateromedial radiograph of the left hind foot (b). Post operative appearance (c) and lateromedial radiograph (d). The horse was sound and used for trail riding 16 months after surgery.
the deformity results in a repair that would be unstable without engaging bone distal to the joint surface. This should be considered a salvage procedure with no expectation of athletic function and, again, potential complications include those associated with any arthrodesis in horses.

Treatment of severe flexural limb deformities

Severe flexural limb deformities can also be congenital or acquired and, in both instances, pain is an important potentiator of the deformity and should be managed aggressively. Mild cases of flexural limb deformities will often respond to medical management (including administration of analgesics and oxytetracycline, external coaptation and farrier work) if addressed as soon as the deformity is apparent. If cases are not treated promptly they tend to progress to become moderate to severe deformities. In these cases or in cases of severe congenital deformities, surgery is indicated.

Surgical procedure is dictated by location of the contracture and the primary soft tissue structure(s) involved. For severe contracture of the distal interphalangeal joint (DIPJ), i.e. grade II or when the dorsal hoof axis is ≥90° (past the vertical plane) inferior check desmotomy is unlikely to provide enough correction; therefore, deep digital flexor tenotomy is indicated. It is the author’s preference to perform the tenotomy at the level of the pastern in these cases (Fig 3). Occasionally these horses can perform athletically at a low level but the prognosis for high level athletic function is poor.

Flexural limb deformities centred at the fetlock joint can often be corrected in mild cases with medical therapy or by superior check desmotomy. In severe cases, additional structures (such as the superficial digital flexor tendon, suspensory ligament, inferior check ligament or deep digital flexor tendon) may require transection and, even with these procedures, the deformity may persist. Additionally, recurrence of the contracture is not uncommon following some initial improvement. In these cases or in cases with severe congenital or acquired bony abnormalities contributing to the condition, treatment options include corrective osteotomies or ostectomies, with or without arthrodesis of the fetlock joint (Fig 4). Prognosis and complications following these procedures are as listed above.

Treatment of carpal flexural deformities is similar to that of the fetlock. Mild cases (those with contracture of ≤40°) may respond to medical management or transection of the tendons of the flexor carpi ulnaris and ulnaris lateralis. More severe cases may necessitate transection of the palmar carpal ligament and palmar joint capsules of the radiocarpal and middle carpal joints. However, in the most severe cases, corrective osteotomies or ostectomies with
Conclusions

The Case Report by Whitfield-Cargile and Watkins (2011) is a nice example of how ‘unconventional’ surgeries can be used to treat horses with severe, complex limb deformities. Obviously the successful outcome of this case is in part due to the filly’s size and the owner’s acceptance of an animal that is considered pasture sound. Cases such as this are not unique, as miniature horses commonly present with angular limb deformities. Early recognition in these cases is particularly important since overall their growth potential is less than that of full sized horses and, if identification is delayed or the deformity is severe, correction via growth retardation techniques may not be possible. However, their small size and decreased athletic demands make them ideal candidates for these types of innovative procedures.

References