

<https://doi.org/10.17221/170/2019-VETMED>

## Metacarpophalangeal joint luxation with joint capsule rupture and bone exposure in a horse

LUISA PUCCI BUENO BORGES\*, GABRIELA MELO ALVES DOS SANTOS,  
RENATO ABRANTES OLIVEIRA, LEANDRO OLIVEIRA DA SILVA,  
LOISE ARAUJO DE SOUZA, HUGO HAICK PERDIGAO, MARIO MARTINS  
GUIMARAES, JOSE ALCIDES SILVA DA SILVEIRA, MARCOS DUTRA DUARTE,  
PEDRO PAULO MAIA TEIXEIRA

*Institute of Veterinary Medicine, Veterinary Hospital, Universit Federal do Pará (UFPA),  
Castanhal, PA, Brazil*

*\*Corresponding author: [luisa\\_pucci@hotmail.com](mailto:luisa_pucci@hotmail.com)*

**Citation:** Borges LPB, Santos GMA, Oliveira RA, Silva LO, de Souza LA, Perdigao HH, Guimaraes MM, Silveira JAS, Duarte MD, Teixeira PPM (2020): Metacarpophalangeal joint luxation with joint capsule rupture and bone exposure in a horse. Vet Med-Czech 65, 309–313.

**Abstract:** A 300 kg, 11-month-old quarter horse filly was presented with a joint dislocation in the right anterior limb. The animal was attended at the Federal University of Pará (UFPA) Veterinary Hospital in September 2016, where it was reported that the horse was injured on a fence. On clinical examination, the dislocation of the metacarpophalangeal joint with a rupture of the joint capsule and exposure of bone surfaces was observed, however, with no rupture of the extensor and flexor tendons. Surgery was recommended and the patient was anaesthetised with detomidine (Dormiun V; Agener União, São Paulo, Brazil; 0.04 mg/kg), ketamine (Cetamin; Syntec, São Paulo, Brazil; 0.03 mg/kg/h) and guaicol glyceryl ether (JA Saúde Animal, São Paulo, Brasil, 0.5 ml/kg/h) i.v. The reconstitution of the joint capsule, lateral collateral ligament (LCL) and the other soft tissues around the injury was performed. A chemical arthrodesis was performed, then the tissue approximation and finally the skin suture. Bandages were applied on the wound with hydrophobic cotton and a Robert-Jones dressing. Systemic treatment was performed with enrofloxacin (Zelotril 10%; Agener União, São Paulo, Brazil; 5 mg/kg) i.m., meloxicam (Maxicam 2%; São Paulo, Brasil; 0.6 mg/kg) i.v. during 10 and 20 days, respectively, then replacing the antibiotic with ceftiofur (Cef 50; Agener União, São Paulo, Brasil; 2.2 mg/kg) i.m. for another 22 days. An iodine solution was applied to the joint optimising arthrodesis. After three and a half months, the lesion was entirely healed and with good movement, so the patient was discharged. This case demonstrates that, with adequate treatment and attention, it is possible to recover the patient's quality of life.

**Keywords:** chemical arthrodesis; equine; joint reconstruction; lateral collateral ligament; injury

Locomotor system injuries are the main cause of economic losses in national and international equideoculture (Bailey et al. 1999; Weishaupt 2008). Several factors, such as inadequate management, genetics, age, breed, and feeding may trigger an injury in the locomotor system of horses (Ruohoniemi et al. 1997).

The term “luxation” defines the permanent, transient, or recurrent loss of a junction between two or more bone extremities, and it is most often caused by trauma. It may result in the total loss of the joint surface connection, and rupture of the ligaments and/or capsule with synovial fluid leakage (Davidson 2018).

Treatment of luxation without bone exposure in horses is usually conservative, consisting of immobilisation of the affected structure, depending on the adequacy of the joint facet, and includes a topical and systemic anti-inflammatory application. When bone exposure occurs, surgical treatment is indicated; however, it is usually not attempted due to the low success rate, especially in high-weight patients (Jahromi and Vajdi 2017).

Therefore, we aimed to report a case of the successful treatment of a severe luxation of the metacarpophalangeal joint with an associated joint capsule rupture and bone exposure in a horse.

### Case report

An 11-month-old quarter horse filly weighing 300 kg was admitted to the Federal University of Pará (UFPA) Veterinary Hospital with a severe injury in the right thoracic limb. During examination, dislocation of the metacarpophalangeal joint with joint capsule rupture and bone exposure were noted (Figure 1); additionally, joint surface friction



Figure 1. The open luxation of the right metacarpophalangeal joint with the rupture of the lateral collateral ligament

injuries from contact with the ground were also present. The flexor and extensor tendons, however, were preserved.

Although the prognosis was poor, surgical intervention was chosen. Due to severe stress and pain in the patient, it was decided not to move the horse unnecessarily, and the procedure was performed outside the operation room. A whole field isolation with a sterile tarp was prepared, following all the possible precepts of good surgical techniques.

Pre-anaesthesia was administered with 0.04 mg/kg of detomidine (Dormiun V; Agener União, São Paulo, Brazil) and induction and maintenance were performed with 0.03 mg/kg/h of ketamine (Cetamin; Syntec, São Paulo, Brazil) and 0.5 ml/kg/h of guaicol glyceryl ether (EGG- PPU; JA Saúde Animal, São Paulo, Brazil), intravenous (i.v.). The joint was evaluated and various traumata due to friction with the ground were observed, so it was primarily washed with a 0.9% NaCl solution, removing the relevant contamination and then washed with iodopovidone (Riodeine; Rioquímica, São Paulo, Brazil). After that, an aseptic preparation of the operative field was performed and the joint was flushed with an iodopovidone solution (2% in aqueous solution), diluted in 70% ethyl alcohol, applying approximately 2 ml of the solution with a hypodermic needle and syringe (Figure 2).

For the approximation suture and reconstitution of the injury, 2-0 polyglycolic acid was used, approximating the wound margins that had less tissue destruction, such as the collateral ligament, performing a mattress suture. The other damaged tissues and ligaments were approached through



Figure 2. Cleaning the wound and performing the chemical arthrodesis with a 70% iodine alcohol solution



<https://doi.org/10.17221/170/2019-VETMED>

sutures to try to facilitate regeneration. To suture the joint capsule, 3-0 polyglycolic acid was chosen. Chemical arthrodesis was induced with a 70% iodine alcohol solution intra-articularly. Then, the subcutaneous tissue was reduced with a continuous suture using 2-0 polyglycolic acid, and dermorrhaphy with a simple interrupted suture, using 2-0 nylon. However, in some areas of the wound it was not possible to completely approach the skin, and thus the healing was *per secundam intentionem*.

Bandages with hydrophobic cotton were placed on top of the wound after suturing, which was then covered with a chlorhexidine gluconate solution (Furanil; Vetnil, São Paulo, Brazil) and an adapted Robert-Jones (RJ) dressing, with a splint in the palmar region, to make a slight compression, reducing the oedema and improving the vascularisation of the limb.

The RJ dressing was kept for 20 days to immobilise the joint, being replaced for a new one afterwards. Ten days later, it was replaced again and after that, exchanged every three days, with a total of 45 days of bandaging and immobilisation. Every time the RJ dressing was removed, the wound would be cleaned with chlorhexidine.

The systemic treatment included the administration of enrofloxacin (Zelotril 10%; Agener União, São Paulo, Brazil, 5 mg/kg b.i.d.) i.m., meloxicam (Maxicam 2%; São Paulo, Brasil; 0.6 mg/kg b.i.d.) i.v. during 10 and 20 days, respectively, then the antibiotic was replaced with ceftiofur (Cef 50; Agener União, São Paulo, Brasil; 2.2 mg/kg s.i.d.) i.m., for another 22 days.

The patient would mostly stay in lateral recumbency, only sometimes standing in a quadrupedal position. Due to the lesion severity, the horse would only support the limb in need of locomotion. Eventually, the animal also presented with colic, so an analgesia was performed with tramadol (Tramadon; Cristália, São Paulo, Brazil; 5 mg/kg q.i.d.) i.v. and dipyrone (Finador; Ouro Fino, São Paulo, Brazil; 25 mg/kg b.i.d.) i.v., adding ketamine (Cetamin; Syntec, São Paulo, Brazil; 0.03 mg/kg/h) s.c. for thirty days. After this, only dipyrone was administered for another 30 days.

Another iodine solution application was performed in the joint the same way as the first application, to optimise arthrodesis as seen in X-ray image (Figure 3). The technique was performed with local anaesthesia with 12 ml of lidocaine



Figure 3. The dorsopalmar radiograph of the right metacarpophalangeal joint showing an area of radiopacity bridging the joint space indicating the presence of cartilage destruction and the development of ankylosis



Figure 4. The healed wound 3 months after being discharged from the Veterinary Hospital

(Anestt; Syntec, São Paulo, Brazil) and sedation with 0.04 mg/kg of detomidine. Initially, the injury healed very well; however, granulation tissue overgrowth and an oedema appeared. Both gradually regressed with the topical application of chlorhexidine. Considering the severity of the case, the lesion was healed in 3.5 months, and the patient presented with good movement. The horse was then discharged from the hospital. After another 3 months, the patient had a follow up at the owner's property, where the horse could be seen walking and galloping, presenting with a full limb recovery with no noticeable motion sequelae (Figure 4).

## DISCUSSION

Injuries to the locomotor system are common in equines, especially in young animals, due to a phase of major structural development and adaptation to new managements. In addition, many fillies and colts are improperly handled with a lack of qualified manpower or in poor facilities, which causes accidents at work (Ruohoniemi et al. 1997; Bailey et al. 1999; Weishaup 2008). This was evidenced in our patient, who even at the young age of 11 months, suffered a traumatic luxation of the metacarpophalangeal joint with a capsule rupture and bone exposure, due to management failure and inadequate containment.

Dislocations without bone exposure usually have a better prognosis than those with exposure, because, in addition to ruptures being more severe, there is serious contamination of the joint, aggravated by friction injuries in the articular surface due to contact with the ground (Jahromi and Vajdi 2017).

In the literature, there are only a few successful cases of surgeries performed in non-sterile environments when bone exposure is present (Brommer et al. 2010). We know that the place where the surgery was performed, in this case, was not the most appropriate, but the impossibility of moving the animal to the operation room required this intervention. However, the field isolation and adequate asepsis resulted in a successful surgery.

Other possible treatments described in the literature include two stainless steel baskets implanting in the MCP joint (Crawley et al. 1988), application of an extra-articular cerclage wire (Brommer et al.

2010) and a dynamic compression plate (Zamos and Honnas 1993), making it clear that depending on the severity of the trauma, the prognosis to the athletic performance is usually guarded to poor (Jahromi and Vajdi 2017).

The non-ruptured tendons favoured the future joint stability. The application of chemical arthrodesis also favoured the success of the case, mainly in the pain relief and decreasing the contamination of the surgical wound and joint (Bischofberger et al. 2009; Brommer et al. 2010).

The antibiotic therapy protocol was fundamental for infection control, together with the anti-inflammatory treatment to manage and reduce the pain (Muir 2005; Bischofberger et al. 2009; Ahern et al. 2010). The pain control was essential in the present case, especially in the first 30 days of the treatment, due to the intensity of the pain in this period. The failure of pain management is described as being aggravating to the recovery and contraindicates the success of similar cases; however, the established protocol was extremely efficient (Mama and Hector 2019).

The reliable and objective recognition of pain is essential for developing analgesic protocols that can be adapted according to the individual animals (Bussieres et al. 2008; Wagner 2010; Sanchez and Robertson 2014). The proper pain control also avoids afflictions related to pain, such as colic, caused by alterations in the cortisol circadian rhythm (Leal et al. 2011), which occur even with the employment of a proper analgesia.

The analgesic protocol with dipyrone, opioid (tramadol), and the underdose of subcutaneous ketamine was found to be efficient in this case. Ketamine acts by potentiating the effect of tramadol and also agonising the opioid receptor and modulating the NMDA receptor (N-methyl-D-aspartate) as an antagonist (Javery et al. 1996; Clutton 2010; Guedes et al. 2012; Gao et al. 2016). Dipyrone and its metabolites cross the blood-brain barrier and can achieve a central nervous system associated analgesia, as well as have antipyretic effects not related to anti-inflammatory activity (Morrese et al. 2019). Therefore, a combination of these different modes of action provides the optimal analgesia, called multimodal analgesia, especially in equines (Muir 2005).

Even with poor prognosis and adverse conditions due to dislocation with a bone exposure and an unfavourable surgical environment, this successful report leads us to believe that the clinical case is

<https://doi.org/10.17221/170/2019-VETMED>

unique in that the authors of the article managed to heal such a serious trauma of the joint. When the correct surgical technique is employed, together with the appropriate postoperative therapy, highlighting the efficient pain protocol, there is a possibility of recovery of a horse with minimal sequelae.

## Acknowledgement

The authors would like to thank the UFPA Veterinary Hospital team for all their cooperation in solving the case. The authors would also like to thank PhD Professor Cássia Maria Molinaro Coelho for supporting the case.

## Conflict of interest

The authors declare no conflict of interest.

## REFERENCES

- Ahern BJ, Richardson DW, Boston RC, Schaer TP. Orthopedic infections in equine long bone fractures and arthrodeses treated by internal fixation: 192 cases (1990–2006). *Vet Surg.* 2010 Jul;39(5):588–93.
- Jahromi AR, Vajdi N. Successful management of severe open metacarpophalangeal joint dorsal luxation in a horse. *J Equine Vet Sci.* 2017 Jan 1;48:48–51.
- Bailey CJ, Reid SW, Hodgson DR, Rose RJ. Impact of injuries and disease on a cohort of two- and three-year-old thoroughbreds in training. *Vet Rec.* 1999 Oct 23;145(17):487–93.
- Bischofberger AS, Furst A, Auer J, Lischer C. Surgical management of complete diaphyseal third metacarpal and metatarsal bone fractures: Clinical outcome in 10 mature horses and 11 foals. *Equine Vet J.* 2009 May;41(5):465–73.
- Brommer H, Weisler S, Tatz AJ. Facilitated ankylosis of a juvenile, flexurally deformed, open, luxated and infected metacarpophalangeal joint using an alternative approach. *Equine Vet Educ.* 2010 Aug;22(8):412–9.
- Bussières G, Jacques C, Lainay O, Beauchamp G, Leblond A, Cadore JL, Desmaizieres LM, Cuvelliez SG, Troncy E. Development of a composite orthopaedic pain scale in horses. *Res Vet Sci.* 2008 Oct;85(2):294–306.
- Crawley GR, Grant BD, White KK, Barbee DD, Gallina AM, Ratzlaff MH. A modified Cloward's technique for arthrodesis of the normal metacarpophalangeal joint in the horse. *Vet Surg.* 1988 May-Jun;17(3):117–27.
- Clutton RE. Opioid analgesia in horses. *Vet Clin North Am Equine Pract.* 2010 Dec;26(3):493–514.
- Davidson EJ. Lameness evaluation of the athletic horse. *Vet Clin North Am Equine Pract.* 2018 Aug;34(2):181–91.
- Gao M, Rejaei D, Liu H. Ketamine use in current clinical practice. *Acta Pharmacol Sin.* 2016 Jul;37(7):865–72.
- Guedes AG, Matthews NS, Hood DM. Effect of ketamine hydrochloride on the analgesic effects of tramadol hydrochloride in horses with signs of chronic laminitis-associated pain. *Am J Vet Res.* 2012 May;73(5):610–9.
- Javery KB, Ussery TW, Steger HG, Colclough GW. Comparison of morphine and morphine with ketamine for postoperative analgesia. *Can J Anaesth.* 1996 Mar;43(3):212–5.
- Leal BB, Alves GE, Douglas RH, Bringel B, Young RJ, Haddad JP, Viana WS, Faleiros RR. Cortisol circadian rhythm ratio: A simple method to detect stressed horses at higher risk of colic? *J Equine Vet Sci.* 2011 Apr 1;31(4):188–90.
- Mama KR, Hector RC. Therapeutic developments in equine pain management. *Vet J.* 2019 May;247:50–6.
- Morresey PR, White GW, Poole HM, Hu T, Yin M, Sundman EA. Randomized blinded controlled trial of dipyron as a treatment for pyrexia in horses. *Am J Vet Res.* 2019 Mar; 80(3):294–99.
- Muir WW. Pain therapy in horses. *Equine Vet J.* 2005 Mar; 37(2):98–100.
- Ruohoniemi M, Laukkanen H, Ojala M, Kangasniemi A, Tulamo RM. Effects of sex and age on the ossification of the collateral cartilages of the distal phalanx of the Finnhorse and the relationships between ossification and body size and type of horse. *Res Vet Sci.* 1997 Jan-Feb; 62(1):34–8.
- Sanchez LC, Robertson SA. Pain control in horses: What do we really know? *Equine Vet J.* 2014 Jul;46(4):517–23.
- Wagner AE. Effects of stress on pain in horses and incorporating pain scales for equine practice. *Vet Clin North Am Equine Pract.* 2010 Dec;26(3):481–92.
- Weishaupt MA. Adaptation strategies of horses with lameness. *Vet Clin North Am Equine Pract.* 2008 Apr;24(1): 79–100.
- Zamos DT, Honnas CM. Principles and applications of arthrodesis in horses. *Compend Cont Educ Pract Vet.* 1993; 15(11):1533–40.

Received: November 26, 2019

Accepted: April 27, 2020