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Case Report | **Agronomy and Veterinary**

Chronic Proliferative Osteoarthritis in the Horse - A Case Report

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Abstract

Chronic osteoarthritis of the pastern joint has a significant role in affecting the musculoskeletal system and is a recurrent cause of lameness in the equine athlete manifested by chronic lameness and thorough clinical and radiographic examination. This case report describes the evolution of chronic proliferative ossified osteoarthritis and periarthritis of the proximal interphalangeal joint of the front limb of a 12-year-old gelding. The careful clinical examination aimed to detect the site of the lesion, which is then confirmed by radiography that revealed extensive periarticular new bone formation over the proximal interphalangeal joint. This affection causes progressive deterioration of articular cartilage, accompanied by bone and soft-tissue periarticular changes. Control radiographic examination after a period of 10 months showed the extension of the lesion and the severe appearance of bone evolution and several medical approaches have been undertaken without improvement of the clinical condition of the horse. Several medical therapies are used in synergy with the palliative goal of reducing lameness and relieving pain, but most are of limited duration and do not stop the negative progression of the disease process. Once joint damage is advanced, it is difficult to remedy.

Keywords: Equine, pastern joint, degenerative joint disease, synovitis, cartilage degeneration.

INTRODUCTION

Osteoarthritis (OA), commonly known as degenerative joint disease in the horse is a frequent source of continual lameness in older horses of any discipline. The disease compromises the equine industry, not only due to the costs of treatment, but also as a consequence of delayed return to athletic performance. It is one of the main causes of anticipation horse retirement of pleasure-riding and performance equine.

The exact aetiopathogenesis of the disease is still not well known yet. But, several studies suggest multifactorial causes including osteochondrosis, cystic lesions, micro trauma and conformational defects.

Confirmation of the proximal interphalangial (PIP) joint as a site of lameness usually requires clinical examination, perineural anesthesia and radiographs to confirm the involvement of the joint.

Conservative treatment in advanced cases is non-effective, and repeated intraarticular application of corticosteroids can cause osteoarthropathy which does not respond to any non-steroidal anti-inflammatory and analgesic therapy, therefore necessitating radical treatment with arthrodesis.

We report here an interesting case of osteoarthritis (high ringbone) of the proximal interphalangial joint.

MATERIAL AND METHODS

Case Description

The case concern a 12-year-old gelding Dutch warm blood, with advanced unilateral right front limb pastern joint osteoarthritis.

Clinical Examination

In the lameness examination, both thoracic limbs were evaluated and scored according to the AAEP scale, which ranges from 0 to 5.

At the trot, a visible lameness in a straight line of score 3/5 were detected, with reduction of the cranial phase of the stride, and intermittent stumbling when turned in circles, more pronounced in the corresponding hand. The joints were also palpated and examined for the presence of pain, crepitation and abnormal joint mobility. Then, the joints were subjected to forced flexion for 1 min, followed by trotting. The test was posit if and the lameness accurate, whose level was scored again (AAEP score). The pain did not change after palmar digital nerve, or abaxial sesamoid nerve blocks, except low palmer (low four points) that substantially improved the signs of lameness. After an ineffective systemic treatment, and two local applications of corticosteroids and hyaluronic acid with no response, the horse is put to rest. Meanwhile, heat, swelling and an angular deviation of the first two phalanges was observed (fig 1).

After 10 months, the horse limps at the walk, with difficulties of support on the affected limb.

Fig. 1: Periarticular hard swelling in the proximal inter phalangeal joint and external deviation of the hoof (right hand limb)

Radiographic Examination

A complete series of radiographs are necessary to determine the severity of the disease. A plane sensor scanning system integrating the console with touch screen and the wired plane sensor (Optomed SLATE 3T) were employed for the radiography screening views; dorsopalmar, latéromédial and obliques. The radiographic constants were 76 KVp with an entensity of 1,6mAs.

This disorder causes progressive degradation of articular cartilage, with bone and soft-tissue periarticular remodels (fig 2, 3, 4 and 7). Examination of the images revealed a narrowing of the joint space (typically on the medial aspect) in the dorsopalmar view (fig 5, 8), indicating crucial cartilage loss, an increased subchondral bone radiopacity, thickening of the subchondral bone plate; and joint capsule distension. Osteophytes on the dorsomedial and dorsolateral aspect of the joint margins, enthesiophytes at attachment sites of tendons and ligaments and massive bone reaction around the joint (fig 8, 9, 10).

Angular distortion is also detected in advanced case of OA (fig 6), due to collapse of the joint surface specially on the medial side.

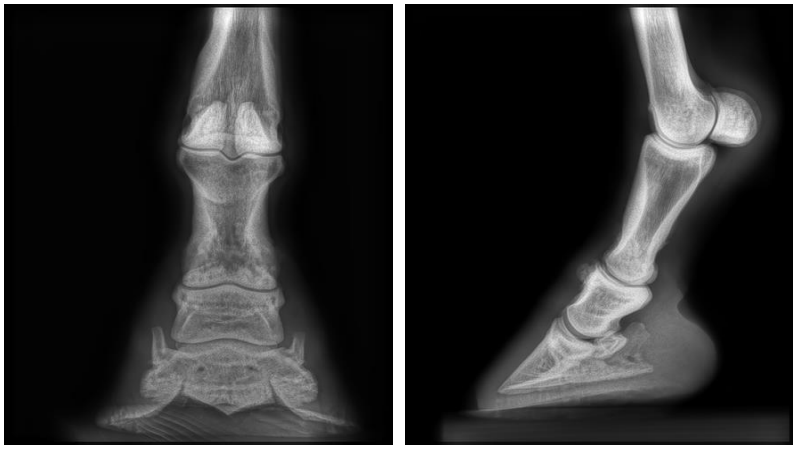

Fig. 2 **Fig. 3**

Fig. 2, 3: Lateral and dorsopalmar radiographs of left front limb pastern (x-rays of November 2021): with new periarticular bone dorsally and medially but not joint space narrowing

Fig. 4 **Fig. 5**

Fig. 4, 5: Lateral view and dorsopalmar view of right front limb: (x-rays of November 2021): A periosteal reaction and small osteophytes on the dorsal aspect of the joint indicative of mild to moderate OA within the joint, subchondral lysis, and asymmetrical joint space

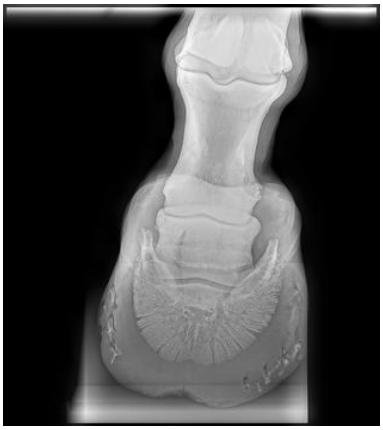

Fig. 6 **Fig. 7**

Fig. 6, 7: Dorsopalmar navicular view: (x-rays November 2021) right and left front limb; Almost the same osseous reaction of the medial P2 cortex, but a deviation of the right anterior limb (angular deformity), and reduction of the articular space medially

Fig. 8 **Fig. 9**

Fig. 10

Fig. 8, 9 & 10: Dorsopalmar, lateral and oblique views of the right front limb (x ray images of August 2022), Radiographic projections demonstrating a severe osteoarthritis with absence of joint space, subchondral sclerosis and massive bone reaction around the joint. Recheck radiographs of the left limb were largely unchanged and there continued to be minimal modifications from the first ones

Treatment/Management

The decision to treat a horse with PIP osteoarthritis depends on the severity of the status, the degree of lameness, the age and intended use of the horse, the expectations and financial constraints of the owner. To assess the severity of PIP joint OA, the defining radiographic sign is narrowing of the joint space, especially when it is asymmetric. Horses with significant periarticular bony neoformations but normal joint space are more likely to respond to conservative treatment, although both groups have severe radiographic changes.

First approche were a systremic nonsteroidal anti-inflammatory drugs (NSAIDs) to improve clinical symptoms, such as pain and lameness by the phenylbutazone PBZ intravenously (IV) at the recommended loading dose of 4.4 mg/kg. Seeing the lameness unchanged after 3 days of treatment combined with rest; an additional anti-inflammatory treatment was administered; by a single intravenous administration of meloxicam (0.6 mg/kg) to relay with oral suspension for the rest of the therapy. Then a combined treatment of a unique intraarticular (IA) corticoid (triamcinolone acetonide with delayed effect) injection to have a local powerful anti-inflammatory action and hyaluronic acid (HA) was done. Dimethylsulfoxide (DMSO) solution with analgesic and anti-inflammatory properties was added too, in percutaneous application to decrease inflammation and lameness locally. After all this synergic treatment, the horse was put to rest in a shelter on sandy soil without any improvement after 10 months.

Horses with mild to moderate radiographic abnormalities of the PIP joint may respond well to conservative treatment, depending on the horse's intended use. Horses with severe lameness and advanced radiographic abnormalities are generally not eligible for non-surgical treatment. Confinement and rest is rarely effective in this case. The trimming of the farrier should aim to correct any balance defect of the hoof with a squaring of the toe to decrease the forces subjected to the front of the joint that can complicate the condition of the animal.

Corrective shoeing should provide pain relief, reduction of joint pressure that accentuates ischemic and degenerative phenomena, and a complete rolling to facilitate the movement of the foot.

DISCUSSION

Osteoarthritis of the PIP joint (high ringbone) is a relatively common disorder affecting multiple breeds, especially those with short upright pastern conformation, incrising concussion to the PIP joint. Older horses appear to be at greater risk, but can also develop in young horses and foals (McIIwraith, 1982; Kawcak *et al.,* 2001, Garcia *et al.,* 2009), and the forelimbs are more frequently affected than the hindlimbs. In addition, horses that makes quick stops and hard turns with rapid twisting, such as Western type activities, show jumpers and dressage have a high incidence of pastern osteoarthritis. It can also be a consequence of articular fracture, infection, or osteochondrosis.

Chronic repetitive trauma to the periarticular soft tissues and the PIP joint is thought to be the most common cause of PIP joint (Baxter, 2020). The PIP joint is considered a low-motion and a high- load joint, the articular cartilage and subchondral bone are placed under a greater workload, making these structures more susceptible to injury from nonphysiologic loading. Overloading the PIP may cause direct articular cartilage damage and/or subchondral bone bruising that may contribute to the development of subchondral cystic lesions (SCLs) or OA.

Pulling or tearing May also cause injury of the periosteal attachments of the extensor tendons, ligaments, and joint capsule, resulting in periostitis and new bone formation, or joint instability or subluxation leading to secondary cartilage damage and OA (Baxter, 2020). It is due, in many cases, to the premature start of horse training during the early stages of musculoskeletal system development or due to excessive and/or prolonged mechanical loads on immature articular cartilage, with periarticular tissues inadequately developed to support intense loads (Garcia *et al.,* 2009). The OA may also result from an imbalance between repetitive microtrauma sustained during athletic performance and the adaptive repair mechanism of the skeletal tissue. The elapsed time between initial formation and radiographic visibility can be weeks- to-months to-years because rates of progression are variable (Dyson, 2011, Janeczeka *et al.,* 2017).

The best possible therapy must be able to relieve pain, reduce lameness and modify the evolution of the degenerative process, according to McIIwraith *et al.,* (2012). Generally, pain associated with musculoskeletal lesions can be mechanical or inflammatory. However, in clinical situations, both types of pain frequently occur together. Inflammatory hurt often accompanied by mechanical injury, and this latter occurs when an inflammatory process causes structural changes (Cribb *et al.,* 2017).

Non-steroidal anti-inflammatory drugs are used as a first line of treatment of pain and lameness (Baccarin *et al.,* 2022), and as suggested in a study, PBZ is more efficient in controlling mainly mechanical pain than meloxicam, which is more effective in clinical conditions with a significant inflammatory component (Cribb *et al.,* 2017). It has been shown an improvement of lameness parameters such as joint swelling and circumference, range of motion and lameness score for PBZ (4.4 mg/kg by mouth every 24 hours) (Doucet *et al.,* 2008).

However, PBZ must be carefully evaluated to avoid side effects (irritating perivascular effects, gastrointestinal ulceration, renal papillary necrosis, and vascular thrombosis).

Rather than meloxicam who has a superior gastrointestinal safety profile. Meloxicam (0.6 mg/kg by mouth every 24 hours for 7 days) is effective in the treatment of acute synovitis, reduce lameness and effusion and decreased synovial fluid biomarkers of inflammation, cartilage turnover (De Grauw *et al.,* 2009).

The results of a study showed that corticosteroids can potentially inhibit many of the damagin molecules that result from inflammation without adverse impacts on the transcription of extracellular matrix genes (Richardson and Dodge, 2003, De Souza, 2016). Thereby (6–12 mg) of triamcinolone per joint should be an adequate dose for anti- inflammatory effects (Goodrich and Nixon, 2006). Gingerich *et al.,* (1981) reported that IA injection of HA (40 mg) notably minimized lameness and rised weight bearing on the treated limb in several cases of OA in horses. HA is especially sensible for mild to moderate levels of synovitis with equine OA (Gupta *et al.,* 2019). However, it has limitations in managing severe synovitis or OA. It has been suggested that when HA is used in combination with corticosteroids, HA not only enhances beneficial effects of corticosteroids, but it can placate the side effects of some corticosteroids (Gupta *et al.,* 2019).

Through multiple biological and pharmacological mechanisms, HA in different forms, improve OA and other joint disorders by analgesic, anti-inflammatory antioxidative, and cartilage repair effects (Gingerich *et al.,* 1979; 1981, Gupta *et al.,* 2019).

The anti-inflammatory broad spectrum effects of corticosteroids are transient and provides only a short term relief of joint pain as intra articular administration (Levings *et al.,* 2020) and recurrent intraarticular administrations as frequent repeated needle sticks are painful, have increased risk of infection and aggravate joint pathology (Evans *et al.,* 2014).

Treatment of PIP osteoarthritis is usually surgical fusion of the damaged joint. Early phases of osteoarthritis, with minimal joint-space collapse, and solitary subchondral erosive lesions can respond to intraarticular medication with corticosteroids, but is usually temporary, or occasionally be improved by intraarticular mesenchymal stem cell therapy. However, progression to aggressive osteoarthritis generally continues and arthrodesis is required.

One of the major issues associated to the low efficacy of the several therapeutics convenient for OA in horses are that the pathophysiology of the disease is still not completely clarified. Although pathologists define the condition structurally (Pritzker *et al.,* 2006), epidemiologists consider physical pain in their studies (Dray and Read 2007).

Surgical arthrodesis remains the best alternative, when it is possible. It's a surgical fusion of the damaged joint, aimed at eliminating motion within the joint, thereby reducing pain and lameness. The principles of the surgeon are to delete the remaining articular cartilage; internal fixation of the first and second phalanges with screws, plates, or a combination of both; compression over the joint surface; correct alignment of the phalanges; and variable periods of external immobilization with a half-limb cast (Baxter, 2020). When surgical intervention is early, its improve the comfort of horses, specially with the reduction of immediate postoperative complications like lasting pain, soft tissue damage, and surgical site infection (De Souza *et al.*, 2021) . Although intrusive and expensive, surgery is typically regarded as a longer-term better option. The PIP joint can naturally ankylose, but it is a painful, slow process that is not always complete. The surgical procedure is invasive and expensive but is generally considered a better solution over the long term.

Despite the multitude of medical therapeutic strategies put in place, as well as the prescribed rest, the horse unfortunately did not respond to the medical treatment, although the chosen therapies gave positive results on other cases, but with less joint damages. As mentioned, the more advanced the joint changes and cartilage damage, the lower the percentage of relief for the horse, the only approach to reduce pain and lameness is arthrodesis. No surgical approach was carried out, due to the lack of means, but also due to the value of the horse and its service, which do not justify such a great expense. The approach has always been a quality but economical medicine. In order to remedy this situation, a system of periodic radiographic follow-up is established for each competition horse. The aim is to detect early changes in the joints at risk, to treat these cases and to obtain conclusive results. In fact, early diagnosis and fast recognition of injury signs are imperative, and survey must be a commune effort between veterinarians, riders and handlers.

CONCLUSION

Osteoarthritis is a very common injury that affects performance and welfare of athletic horses. In general, conventional therapies used for osteoarthritis in horses are palliative, and aimed at reducing joint inflammation, stabilizing the process and relieving pain and lameness. However, this cannot be achieved with a single treatment, so a combination of therapies is required to achieve an additive, or even synergistic, response to joint damage, though they are not effective in advanced cases of osteoarthritis, where the articular cartilage is well deteriorated, and cannot slow or reverse the disease progression. However, chirurgical alternative exist, and arthrodesis is necessary to eliminate pain while difficult to restore the use of the horse

New alternative therapies as Polysulfated polysaccharides, Regenerative therapy, Polyacrylamide hydrogel, Bisphosphonates are great and multiple alternatives whose knowledge of the mechanism of action in the treatment of OA is imperative.

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