CLINICAL REPORT

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Tibiotarsal arthropathy in equine: aggravation after intra-articular application of corticosteroids and results of arthroscopic surgical treatment – case report

Artropatia tibio-társica em equino: agravamento após aplicação intra-articular de corticosteroide e resultados ao tratamento cirúrgico via artroscópica – relato de caso

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ABSTRACT: Orthopaedic articular diseases (arthropathies) are among the main causes of equine retirement from sport, and lead to significant costs and losses in equine farming. Synovial effusion is a frequent sign of these diseases and this alteration is commonly treated with intra-articular corticosteroid infiltration. Although corticosteroids have an effective action when used in adequate doses, their misuse can have deleterious effects on the joint tissue with lesions in the chondrocytes, generating an inflammatory and degenerative process. The aim of this paper is to report a case of tibiotarsal arthropathy induced by the application of corticosteroids in a quarter horse, used in vaquejada competitions, treated by video arthroscopy associated with clinical therapy with full recovery and return to sport.

KEYWORDS: anti-inflammatory; arthroscopy; diagnosis; orthopaedics.

RESUMO: As doenças ortopédicas articulares (artropatias) estão entre as principais causas de afastamento de equinos do esporte, e ocasionam custos e perdas significativas à equideocultura. Efusão sinovial é sinal frequente destas enfermidades e esta alteração comumente é tratada com a infiltração de corticosteroides via intra-articular. Embora desempenhem eficaz ação em dose adequada, o mau uso dos corticosteroides pode apresentar efeitos deletérios no tecido articular com lesões nos condrócitos, gerando um processo inflamatório e degenerativo. O objetivo deste trabalho é relatar um caso de artropatia tíbio-társica induzida pela aplicação de corticosteroide em equino quarto de milha, atleta de vaquejada, tratado por videoartroscopia associada à terapia clínica com completa recuperação e retorno ao esporte.

PALAVRAS-CHAVE: anti-inflamatório; artroscopia; diagnóstico; ortopedia.

INTRODUCTION

Orthopaedic affections are the main causes of equines being withdrawn from sporting activities and may hinder their return to the practice. These conditions generate significant expenditure on diagnostic and treatment services, as well as losses due to the presence of genetic correlations in certain diseases (Bourebaba *et al.*, 2019).

Animal athletes subjected to repetitive exercise are more likely to suffer from inflammatory and degenerative joint conditions, especially those with greater mobility, developing osteoarthritis, a common condition among them. Osteochondrosis (OC) and osteochondritis dissecans (OCD) emerge during the development of the foal, according to the ossification process, However, the appearance of clinical signs may be delayed (Semevolos *et al.*, 2017).

Given that the articular cartilage has a low regenerative potential, the early diagnosis and appropriate treatment are essential for recovery. The intra-articular (IA) administration of steroidal anti-inflammatory drugs is part of the recommended therapy for horses with joint diseases, however, it is necessary to measure the potential deleterious effects associated with it and try to minimise them, as well as ensuring that the appropriate dose is administered (Fernandes *et al.*, 2018).

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The objective of this work is to report a case of tibiotarsal arthropathy induced by corticosteroid application in a vaquejada athlete equine.

CASE REPORT

A 12-year-old, Quarter Horse (QH) mare, vaquejada athlete, weighing 450kg, was attended at the Large Animal Clinic of the Federal University of Piauí (CGA-UFPI) with a complaint of claudication. On 10 July, the owner reported swelling in the right pelvic limb (RPL) of the animal. The following day, phenylbutazone (Equipalazone®-Ceva) was administered intravenously for five days (4.4mg/kg), resulting in improvement. Ten days after the initial injury, the animal competed and presented an increase in volume in the hock, without claudication, and rest was recommended. On 11 August, as the increase in volume persisted, the tibiotarsal joint was infiltrated with hyaluronic acid (1mL) (Lacril®-Farmanimal) and intramuscular application of triamcinolone hexacetonide (2.5mL) (Triancil®-APSEN). Twelve days after the infiltration, the animal presented claudication.

During the evaluation to diagnose claudication, tibial and fibular nerve blocks were performed, for the confirmation of pain in the tibiotarsal joint, and there was a significant reduction in claudication. On the 9 October, synovial fluid was collected from the affected joint for analysis (Table 1) and a new IA infiltration with 1mL of hyaluronic acid (Lacril®-Farmanimal) associated with 2g of amikacin (amikacin sulphate - Teuto®). However, observing the persistence of the problem, the owner decided to take the animal to UFPI's Large Animal Clinic, where imaging tests were carried out.

During the evaluation, the physiological parameters of the patient were found to be within normal limits, however, grade I claudication (classified from 1 to 5 according to the American Association of Equine Practitioners, 1996) was observed in the RHL, which showed an increase in volume in the dorsal, medial and lateral recesses of the tibiotarsal joint, suggesting capsulitis and synovitis. On the radiographic image obtained using a dorsoplantar (DP) projection of this joint, a bone fragment was seen lateral to the talus (figure 1).

The ultrasound images suggested thickening of the synovial membrane, joint effusion and the presence of a fragment in the tibiotarsal joint in proximity to the lateral short collateral ligament The animal was anaesthetised and the protocol consisted of PAM with detomidine (15mcg/kg/IV) (Dettovet® - JA Saúde animal) and butorphanol (10 mcg/kg/IV) (Butorfin® - Vetnil), induction with ketamine (2mg/kg/IV) (Cetamin®- Syntec) and midazolam (0.05mg/kg/IV) (Midazolam®- Teuto) and was maintained under inhalation anaesthesia with isoflurane (Isoflurane® - Syntec) plus continuous infusion of ketamine (30mcg/kg/IV) and submitted to video arthroscopy using the lateral and medial dorsal triangulation approach to explore the joint. An extensive area of cartilage fibrillation was observed in the trochlea of the talus, especially on the distal surface of the lateral trochlea, cystic lesion on the axial surface and a circumscribed area of erosion on the proximal portion of the latter, indicating an advanced degenerative process. A great quantity of synovium was also visualised throughout the entire joint, making it difficult to evaluate the synovial membrane, showing a high degree of inflammation. The debridement of the cystic area and curettage of the surface of the talus trochlea was carried out using a Shaver blade, attempting to preserve surface areas with healthy cartilage. Joint lavage was performed to remove debris.

The post-surgery period consisted of resting for 20 days, after which the animal was left loose in the paddock for six hours a day. Administration of ketoprofen (Ketofen®-Ceva) (8mL/IV/SID for seven days), dimethyl sulfoxide (DMSO®-Vetnil) (200mL diluted in 2L of lactated ringer's solution, IV/SID for five days) and, 10 days after completing the course of ketoprofen, pentosan polysulphate sodium (Cartrophen vet®-Biopharm) was administered (10mL/IM every five days, totalling four applications). Thirty days after the surgical procedure, infiltration was carried out with

Table 1. Evaluation of the synovial fluid in the tibiotarsal joint of the right hind limb of a horse with claudication due to intra-articular corticosteroid administration, treated at the CGA-UFPI.

Physical Examination	Reference Value	Chemical Examination	Reference Value
Volume: 3mL		pH (tape): 8.0	7.3-7.5
Appearance: Turbid	Clear	Total Protein: 2.2g/dL	<2g/dL
Clot: Absent	Absent	Occult Blood (strip): Positive (+)	Negative
Colour: Yellow	Light yellow	Mucin quality: Poor	Good
Viscosity: Decreased	Normal		
Cytological Examination	**Reference Value**		
Nucleated Cell Count: 15.100/µL	<300/ µL		
Segmented neutrophils: 80%	<10%		
Discrete presence of red blood cells, hypersegmented neutrophils and slide with proteinaceous background			

Reference values according to Nieto and Trela (2018).

Source: Collection of the author.

Figure 1. Radiographic Evaluation of the tibiotarsal and intertarsal joints. A) Dorsoplantar projection: intra-articular bone fragment (arrow); B) Lateromedial projection: bone growth on the dorsal edges of the third tarsal and the central tarsal bone (arrow); C and D) dorsolateral-plantaromedial and dorsomedial-plantarolateral oblique projections, respectively: reduced joint space and bone prominences (arrows).

1% high molecular weight sodium hyaluronate (Lacril®-Farmanimal), and after 30 days synthetic joint lubricant (Noltrex®-Bioform) was infiltrated.

Sixty days after the procedure, and showing no discomfort, the patient underwent a controlled exercise protocol consisting of a five-minute mounted walk for a fortnight, gradually increasing the time. After this, trotting was included for five minutes, gradually increasing the time and intensity. The animal made a satisfactory recovery and after ten months returned to training, performing successfully in competitions.

DISCUSSIONS

Vaquejada animals, the majority of them of the quarter horse breed, generally present a fast growth, and are used for training with repetitive exercises on tracks with 'heavy' sand that demand great biomechanical effort from joint structures as well as tendons and ligaments, as well as supplementation rich in carbohydrates, and are therefore, prone to developmental orthopaedic disorders such as OC and OCD. OCD has been routine in the medical care of equines practising this sport. Numerous aetiological and therapeutic issues surrounding these joint diseases have yet to be fully elucidated and require further study, however, it should be noted that defects in the cartilage with altered biomechanical properties, physical changes in the subchondral bone, as well as traumatic origin secondary to mechanical forces may be the main causes (Caron, 2005; Mcilwraith, 2004).

The formation of osteochondral fragments can be caused by traumatic processes, and in many cases the only clinical sign observed is the presence of an effusion. According to De Grauw *et al.* (2006), the tarsocrural joint is one of the most affected and may only show clinical signs after commencing training, however, the animal in question had not shown any effusion until then. Thus, it corroborates with Bourebaba *et al.* (2019) and Semevolos *et al.* (2017) that animals with OCD can be belatedly diagnosed. However, the lack of previous data does not allow the conclusion of the onset period of a possible OCD.

In a study carried out by Brink *et al.* (2010), 112 out of 134 tibiotarsal joints in horses with OCD showed effusion, but only 29% presented claudication. An evaluation conducted by Cruz (2011) on 75 horses with OCD identified that nine of them carried out high-performance activities and only seven showed clinical signs, one of which was only joint effusion. Also in this study, the author reports that 17 affected horses over the age of six were asymptomatic, corroborating the findings of the present case, since the onset of claudication occurred only after intervention for synovitis.

The increase in intra-articular pressure due to the presence of effusion contributes to the advent of degenerative injuries, since there is impaired blood flow and consequently reduced oxygen tension. This process can culminate in reperfusion lesions and the production of free radicals, and the release of deleterious substances increases the production of inflammatory cytokines causing synovitis (Boniface; Cain; Evans, 1988). In the reported animal, the joint effusion was the factor that initially attracted attention due to the increased volume of the joint, as other clinical signs were absent.

The radiographic examination was of fundamental importance for the diagnosis of OCD, however, in disagreement with Pieramati *et al.* (2003) who came to the conclusion that only two oblique projections are sufficient to screen horses for OCD in the tibiotarsus, in the current report, the DP projection was of greater value for visualising the osteochondral fragment on account of its location. Fragments are commonly found in the malleolus of the tibia, so the projections mentioned by the author may be sufficient, but this did not occur in the present case. However, although radiography is more commonly used for these purposes, ultrasound enabled the assessment of various alterations, including the osteochondral fragment,

the thickening of the joint capsule and synovium, findings that were confirmed in the arthroscopy.

The analysis of synovial fluid helps to differentiate infectious processes and determine the severity of inflammation. The liquid analysed in this report showed a moderate inflammatory process, since severe inflammation has a protein value of > 4g/dL. The total cell count corroborates with the information published by Mcilwraith (2017) in which active synovitis can lead to an increased concentration of leukocytes in the joint, especially neutrophils.

Although the use of IA and systemic corticosteroids shows satisfactory results, its use can lead to serious lesions leading to a reactive condition with inflammation and degeneration called steroid exacerbation. Corticosteroids have the ability to stabilise lysosomal membranes, inhibit the entry of inflammatory cells into the injured site and the arachidonic acid chain, however, inappropriate volume and frequency of administration can lead to deleterious effects, which are dose-dependent (Wernecke *et al.*, 2015). In order to minimise such impacts and improve joint lubrication, the application of hyaluronic acid is commonly associated, and comparative studies have shown better responses than the administration of triamcinolone alone (De Grauw *et al.*, 2016).

Triamcinolone hexacetonide is one of the most widely used steroidal anti-inflammatory drugs in humans. It is insoluble in water and is effective for around 21 days in the joint. The acetonide form of triamcinolone has been more widely used by veterinarians, as it has a shorter duration of action, around 14 days (Wernecke *et al.*, 2015). Alves *et al.* (2021), using 20 mg of intra-articular triamcinolone hexacetonide in dogs with hip osteoarthritis, followed them up for 90 days and observed improvements in weight bearing and pain scores. Dragoo *et al.* (2012), when evaluating the use of triamcinolone acetonide (5mg) in human chondrocyte culture, observed significant toxicity with reduced cell viability after 14 days. Corroborating with these findings, Syed *et al.* (2011) observed the detrimental effect of triamcinolone on chondrocytes, comparing the use of this corticosteroid with the association of bupivacaine.

Studies have suggested the possibility that the tendency toward agglutination by triamcinolone via AI is responsible for cartilage damage. Side effects such as synovitis, calcification and steroid arthropathy, although rarer, can be induced by the crystals of the drug (Bellamy *et al.*, 2006). There are also reports of the abnormal development of organelles, a decrease in the size of chondrocytes and the synthesis of proteoglycans, as well as inducing an increase in the aggrecanase activity (Busschers *et al.*, 2010; Silberman *et al.*, 1980). It is therefore possible that the use of a larger volume of triamcinolone hexacetonide than recommended, in the animal subject of this report could have caused severe synovitis, as it was only after the infiltration that the patient began to claudicate, worsening its condition, however, not disregarding the fact that the effusion and other alterations caused by the OC may have contributed to the development of the degenerative process of the joint.

Lesions in the synovial membrane culminate in enzyme production by synoviocytes in response to IL-1. The release of proteinases in the joint results in the degradation of the extracellular matrix and, therefore, the synovectomy is an important procedure for the removal of excess affected tissue that causes inflammatory stimuli, as well as the debridement of altered cartilaginous areas and joint lavage. Therefore, arthroscopy is fundamental in the treatment of these diseases with the aim of withdrawing the affected tissues that act as pro-inflammatory agents. (Brink *et al.*, 2010).

Post-surgical management aims to reduce the already established inflammatory process and provides components that help lubricate and form the extracellular matrix. Therefore, the administration of non-steroidal anti-inflammatory drugs is important, as is hyaluronic acid, which helps to improve the viscosity of the synovial fluid and minimise the effects of inflammatory mediators (Frisbie *et al.*, 2009). The administration of pentosan polysulphate promotes the synthesis and preservation of proteoglycans and inhibitors of metalloproteinases, as well as inhibiting collagen-degrading enzymes (Ghosh; Smith, 2002). De Grauw *et al.* (2015) when evaluating 80 animals naturally affected by OA, found that the group treated with triamcinolone IA underperformed when compared to those treated with triamcinolone and hyaluronic acid, whose success rate was 64.1 per cent and 87.8 per cent respectively. According to Nedergaard, Carlsson and Lindegaard (2024), the treatments available on the market provide relief from clinical signs, but there is no ideal drug for treating the disease.

CONCLUSIONS

The ultrasonographic findings contributed more significantly than the radiographic ones, although both were important so that, together with the clinical assessment, they could signal the joint lesions in the patient. Surgical intervention using arthroscopy, and the combination of anti-inflammatory and chondroprotective drugs were effective and the animal showed a satisfactory response to the established treatment. It is also concluded that the use of corticosteroids should be carried out with caution, and preferably associated with chondroprotective medication in order to avoid further deleterious effects.

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