Article title:

The use of intra-articular polyacrylamide hydrogel for management of lameness associated with the distal interphalangeal joint following magnetic resonance imaging in five horses

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Highlights:

- Retrospective case series of 5 horses with lameness of distal interphalangeal joint
- MRI before treatment with intra-articular polyacramide gel and follow up assessments
- No adverse reactions observed in any of the treated horses
- Three horses significantly improved at 8 weeks; two horses remained lame at 5 months

- Polyacrylamide hydrogel is a viable treatment option for OA of the DIPJ in horses

Abstract:

Objective: The objective for this case series is to describe the use of polyacrylamide hydrogel in five horses with lameness associated with the distal interphalangeal joint following investigation with magnetic resonance imaging (MRI) of the front feet.

Study design: A retrospective case series

Methods: Horses treated with intra-articular polyacrylamide hydrogel (ArthramidVet®[1]) of the distal interphalangeal joint (DIPJ) between 2012 and 2021 that underwent MRI were included in the case series. Lameness was localised to the DIPJ by intra-articular (IA) analgesia in three horses and to the distal limb using perineural analgesia in two horses. Four of the horses had previously been treated with IA corticosteroids (triamcinolone acetonide or methylprednisolone). Radiographs and MRI of the front feet were reviewed for all horses.

Results: There were no adverse reactions observed in any of the treated horses. Three horses showed a significant improvement within 8 weeks, with one horse was sound in a straight line at 9 weeks and on sound in a straight line at 13 weeks. The other two horses remained lame at 5 months post treatment and underwent repeat MRI. One showed further progression of the lesion and the other no improvement.

Conclusion: Polyacrylamide hydrogel is a viable and safe treatment option for osteoarthritis of the DIPJ in horses.

Keywords: Osteoarthritis; Horse; Polyacrylamide; Joint; Symptom-Modifying Osteoarthritis Drug; Distal-interphalngeal joint; Lameness; Magnetic Resonance Imaging

Introduction:

Polyacrylamide is increasingly being used as an intra-articular (IA) treatment for horses with osteoarthritis. Osteoarthritis of the distal interphalangeal joint (DIPJ) is common and often career ending for performance horses. Although a number of treatments are available response to treatment vary and return of lameness is common following an initial response to treatment (1,2). Polyacrylamide is a relatively new IA treatment option in horses with osteoarthritis (3,4). In human beings polyacrylamide hydrogel is considered a safe and effective treatment for osteoarthritis (5,6). In horses there is limited evidence for the effect of polyacrylamide hydrogel on lameness in horses suffering from osteoarthritis. A prospective multicentre case series reported a resolution of lameness in 82.5% of horses at two years following treatment of the metacarpo(tarso)phalangeal joint or one of the carpal joints (antebrachiocarpal, middle carpal or carpometacarpal) (4). The long-lasting effect has further been supported by Christensen et al. (2016) in a histopathological study, demonstrating effects in horse joints 2 years post-treatment. MRI is the gold standard imaging modality for the equine foot (7), allowing an accurate diagnosis and improvement of directed treatments. Whilst previous studies have evaluated the use of polyacramide gel in specific joints (3,4,8,9), to our knowledge these have not included specific MRI findings. The purpose of this case series is to describe the medium-term outcome in five horses with lameness localised to the DIPJ following IA polyacrylamide hydrogel treatment, following an MRI scan.

Materials and methods

The study design is a retrospective descriptive case series. Medical records of the Philip Leverhulme Equine Hospital were searched from October 2012 to October 2021 for all horses treated with IA polyacrylamide hydrogel (ArthramidVet®[1]) of the DIPJ. Horses were included if the DIPJ was treated with IA polyacrylamide hydrogen and MRI of the front feet had been performed. Horses with no clinical follow-up after the initial treatment were excluded from the study. For each included case the age, breed, use, grade of lameness (0-10), response to diagnostic analgesia, imaging, treatment and outcome were reviewed and recorded. All five horses had radiographs and MRI performed of both front feet following presentation to the hospital. All imaging studies (MRI and radiographs) were reviewed by a veterinarian experienced in reading equine MRI and radiology.

Radiographs had been obtained using a portable x-ray generator and a digital radiography system. MRI was performed under standing sedation using a low-field open MRI system designed for distal limb imaging of the standing horse. The following protocols were included for all horses; T1 weighted 3D-gradient-echo (GRE), T2 weighted fast spin echo (FSE), T2* weighted 3D-GRE, T2* weighted FSE and short tau inversion recovery FSE in sagittal, frontal and transverse planes.

Results

Sample population

Eight horses were treated with intra-articular polyacrylamide hydrogel (ArthramidVet®[1]) of the DIPJ between October 2012 and February 2021. Three horses were lost to follow-up and therefore excluded from the case series. Four of the horses were mares and one was a gelding (table 1). Two mares were French Comtios (C1 and C2), one a warmblood (C4), one a thoroughbred cross and the gelding was a

Quarter horse (C3). They had an average age of 11.2 years and an age distribution of 6 to 17 years. All horses were used for general-purpose low-level riding.

Clinical findings

All horses were presented for a primary fore limb (RF) lameness and were referred to our hospital for further lameness investigation and diagnostic imaging. A summary of signalment, lameness, imaging diagnosis, treatment and outcome can be seen in table 1. All horses had a partial improvement to a palmar digital nerve block and complete resolution of lameness following an abaxial sesamoidean nerve block of the lame limb. Two horses (C1, C2 and C5) responded to IA analgesia of the DIPJ of the lame limb. In three horses (C3, C4 and C5) diagnostic analgesia was performed prior to referral and was not repeated in hospital. Lameness was bilateral in three horses (C1, C2 and C4), with the lameness switching to the contralateral fore limb following diagnostic analgesia, and unilateral in two horses (C3 and C5). Duration of lameness varied from 9 weeks to 4 months. Lameness severity varied from 1/10 to 3/10 in a straight line (10).

Four horses had been treated with intra-articular medication of the distal interphalangeal joint before treatment with polyacrylamide hydrogel. One horse (C2) had been treated with intra-articular methylprednisolone (Depo-medrone® 40mg/ml Injection[3]) of the DIPJ of the lame limb 2 months prior to presentation. Three horses (C1, C3 and C5) had been treated with IA triamcinolone acetonide (Kenalog®); one was treated two month prior to presentation (C5) and one treated over 2 years prior to presentation (C1). A third horse (C3) was treated with IA triamcinolone acetonide of the DIPJ of the lame limb following initial presentation. This horse (C3) was re-assessed 4 weeks later and same joint was medicated with IA

polyacrylamide hydrogel (ArthramidVet®[1]) based on a poor response to initial treatment.

Image findings

Details of the image findings have been summarised in table 1 and 2. Two of the horses (C1 and C2) had multiple changes associated with degenerative joint disease of the DIPJ (figure 1 and 2). The third horse (C3) had a single lesion of the distal articulation of the second phalanx (figure 3 and 4). In addition to the lesion of the distal second phalanx this horse had mild bilateral osteoarthritis of the DIPJ. One horse had mild osteochondrosis and secondary osteoarthritis of the DIP joint bilaterally. The final horse had mild osteoarthritis of the DIPJ and PIPJ along with mild collateral ligament desmitis bilaterally, with biaxial desmitis of the non-lame limb and medial desmitis of the affected limb. There were changes associated with the navicular apparatus in the lame and non-lame limb of three horses (C1, C2 and C3) including irregularity of the distal border, enlarged synovial fossae, increase in signal on fat supressed images in the medulla of the navicular bone and effusion of the navicular bursa.

There were changes consistent with bilateral desmitis of the collateral ligament of the DIPJ as well as changes consistent with desmitis of the insertion of the oblique sesamoidean ligament of the less lame limb in one horse (C1). One horse had mild 'bone bruising' noted bilaterally of the third phalanx (P3) (C4). There was bilateral ossification of the cartilages of the feet, and changes consistent with desmitis of the lateral collateral ligament of the DIPJ in the predominantly lame limb in one horse (C2). In the same horse there was a suspected keratoma in the contralateral limb. This horse (C2) also had changes consistent with marked osteoarthritis of the

proximal interphalangeal joint (PIPJ) bilaterally. One horse had mild navicular disease and subtle tendonitis of the deep digital flexor tendon (DDFT) in the proximal recess of the navicular bursa of the contralateral limb (C5).

Treatment and Outcome

All horses were treated with corrective shoeing, a period of rest and rehabilitation and IA medication of the DIPJ of the affected limb. All horses were treated with 1ml of 2.5% IA polyacrylamide hydrogel (ArthramidVet®[1]) and a small dose (2-3mg) of triamcinolone acetonide (Kenalog[2]) was used in combination in two horses (C1 and C2). One horse (C4) initially underwent treatment with chondrogenic induced equine allogeneic peripheral blood-derived mesenchymal stem cells (Arti-Cell® FORTE[4]) followed by 1ml of 2.5% IA polyacrylamide hydrogel approximately 1 month later. Horses were re-assessed between 3 weeks to 6 months following treatment depending on clinician preference and owner availability, and with some cases, continuously every 3-6 weeks thereafter. The horses were followed for between 6 weeks and 10 months.

All horses were initially rested in a small paddock or box for between 3 and 6 weeks followed by a gradual increase in exercise. Three of the horses (C1, C2 and C5) were able to commence ridden exercise after initial re-examination at 3 (C1) and 6 weeks (C2 and C5) respectively. One horse (C1) was sound in a straight line when re-examined at 3- and 9-weeks post treatment, and two horses (C2 and C5) had a significant improvement in lameness at 6-weeks post treatment.

One horse (C3) was unchanged at re-examination 6-weeks post treatment, however was recommended to commence normal turn out (due to the temperament of the

horse). Repeat MRI was performed 6-weeks post treatment, showing an improvement of the lesion, and at 13-weeks post treatment the horse was sound at a trot in a straight line. Following the initial improvement in lameness the lameness returned and a third MRI was performed at 5-months post treatment, revealing further progression of the lesion. The horse was subsequently treated with IA autologous stem cells, however failed to improve to a level where it could return to ridden exercise. The final horse (C4) reportedly showed an improvement initially however deteriorated to a more severe lameness shortly after following polyacrylamide hydrogel treatment. The mare underwent repeat MRI after 6 months which showed no further deterioration of the osteoarthritis of the DIP or PIP joints, however there was an increase fluid signal on fat suppressed sequences signal in the trabecular bone of the navicular bone and P3. She was discharged to continue the in-hand walking and had an alteration in remedial farriery but no further IA treatments.

Discussion

In this case series three out of five horses treated with a single injection of polyacrylamide hydrogel were able to return to ridden exercise within two months of treatment. These horses had previously been treated for osteoarthritis of the DIPJ unsuccessfully. They had multiple pathologies of the distal limb and prognosis for return to ridden exercise was considered poor before treatment with polyacrylamide hydrogel.

In previous studies the success following treatment with other more conventional IA medications in horses with osteoarthritis the results vary greatly (11,12). Response to treatment depends on correct diagnosis, with IA diagnostic analgesia of the DIPJ being non-specific for diagnosing pain of the DIPJ (13,14). Despite this a diagnosis of

osteoarthritis is commonly made based on response to IA analgesia along with radiographic evidence of osteoarthritis. The complex soft tissue structures within the hoof will not be able to be assessed without advanced imaging and may be contributing factors to the lameness.

MRI has improved diagnosis and accurate treatment for horses with lameness originating from the feet. In this case series all horses had MRI, as well as radiographs of the front feet. Lameness was considered to be multifactorial in all of the horses with changes to the navicular apparatus, DIPJ and multiple other lesions detected on MRI. With radiology alone, the most significant finding in all horses were consistent with varying degrees of osteoarthritis of the DIPJ (and PIPJ in two horses).

Osteoarthritis in the DIPJ in horses is commonly managed with IA corticosteroids, along with rest, systemic anti-inflammatory medication and remedial shoeing. Corticosteroids are among the most commonly used intra-synovial treatment in horses, along with other treatments such as hyaluronan, polysulfated glycosaminoglycan (PSGAG), or a combination of these drugs (15). When these treatments fail, treatment of osteoarthritis of the DIPJ can pose a significant challenge to the treating veterinarian.

In a multicentre prospective study, the efficiency of triamcinolone was compared with the combination of triamcinolone acetonide and sodium hyaluronate (HA) (1). Out of 80 horses, 36 DIPJ were included in this study with 17 treated with triamcinolone acetonide and 19 treated with triamcinolone acetonide and HA showing a success rate in horses treated with triamcinolone of 87.7% and for horses

treated with triamcinolone + HA of 64.1%. However, at 3-month the difference was minimal with only approximately 50% of horses from both groups returned to previous exercise. Other studies support this short-term effect of corticosteroids, with one retrospective study reporting a short-term improvement in 58% of horses followed by a deterioration of 90% of horses after 56 days (2). Similarly, poor long-term response to intra-articular corticosteroids treatment in horses with a positive response to intra-articular analgesia of the DIPJ have been described in a retrospective study by Kristiansen and Kold (2007). At 12 months follow-up, only 36% of horses treated with methylprednisolone were sound (16). A further study by Travis de Clifford et al (2021) found polyacramide hydrogel to have superior therapeutic effects when compared to corticosteroid in the management of middle carpal joint lameness with only 27% of horses treated triamcinolone acetonide sound at 6 weeks post-medication compared to 83% treated with polyacramide hydrogel. These studies highlight the limitation of current therapies and demonstrate the need for further validation of treatment such as polyacramide hydrogel.

In addition to more conventional therapies intra-lesional or intra-synovial use of biological products have become more popular, such as autologous conditioned serum, platelet rich plasma and mesenchymal stem cells (17). Autologous conditioned serum has been shown to reduce the lameness score in horses with induced osteoarthritis of the middle carpal joint (18). Therapies like stem cells and platelet rich plasma are more commonly used as an intra-lesional treatment, and evidence of the efficiency as an intra-articular therapy to treat osteoarthritis is limited (19,20). In this case series, one of the horses (C3) failed to improve with treatment using both corticosteroids and polyacrylamide hydrogel and was subsequently treated with intra-articular autologous stem cells. However, the horse

failed to improve and was retired from ridden exercise. The other horse (C4) that failed to improve to the polyacrylamide hydrogel had also undergone treatment with intra-articular autologous stem cells, however the treatments had been scheduled close together without allowing time for repeat assessment and improvement in between.

Polyacrylamide hydrogel is a new treatment for horses with osteoarthritis and there is limited scientific evidence for its use. IA polyacrylamide hydrogel treatment in 12 horses with lameness associated with the DIPJ demonstrated an improvement in 10 out of the 12 horses (3). A prospective multi-centre study with horses diagnosed with osteoarthritis of the metacarpo(tarso)phalangeal and carpal joints similarly, showed a significant and long lasting (24 months) improvement in lameness grade (4). Based on an osteoarthritis model in goats is has been suggested that polyacrylamide hydrogel acts on the synovial membrane resulting in a reduced stiffness of the joint capsule and thereby reduce the pain and clinical signs of lameness (4). Histology of horses treated with polyacrylamide hydrogel for osteoarthritis of the DIPJ, metacarpo(tarso)phalangeal and carpal joints have shown that the polyacrylamide hydrogel becomes integrated with the synovial membrane, over a period of up to 24 months (21).

In a preliminary field trial evaluating the efficacy of polyacrylamide hydrogel, horses with more advanced osteoarthritis and lameness grade were considered less likely to responds to treatment (8). However, lameness scores were found to consistently decrease irrespective of initial lameness score. Similarly, the horses in this case series were all given a poor prognosis based on high lameness grades and evidence of osteoarthritis in four of the horses, and the final horse having a substantial articular

injury involving the DIPJ. The response to treatment in the three horses with osteoarthritis as the primary pathology, was good. Two horses in this case series had signs of osteoarthritis, however other pathology was considered significant with one having a severe injury involving the distal articulation of the second phalanx and the other bone bruising to the navicular bone and P3. In both cases that failed to respond to treatment, the severity of concurrent pathologies is likely a major contributing factor, especially given only mild osteoarthritis of the DIPJ was diagnosed based on MRI.

Conclusions

Although scientific evidence is still limited the effect of polyacrylamide hydrogel, it is a promising new treatment for horses with primary distal interphalangeal joint osteoarthritis. The limitations of this case series include a small population of horses, the retrospective nature of this paper, the lack of blinding of the clinicians and the lack of long-term follow up in several of the cases. The multiple pathologies identified in the foot of all horses and the lack of IA diagnsotic analgesia is also a limitation. Further work to investigate the effect of polyacrylamide hydrogel for different conditions is still needed.

Manufacturer's Addresses

1. Arthramid Vet: Contura, 2860 Soeburg, Denmark.
2. Kenalog: Bristol Myers Squibb, Pharmaceuticals Unlimited Company, Plaza 254, Blanchardstown Corporate Park 2, Dublin 15, Dublin, D15 T867
3. Depo-medrone: Pfizer Limited, Ramsgate Road, Sandwich, Kent CT13 9NJ, United Kingdom
4. Arti-cell® forte: Boehringer Ingelheim International GmbH, Binger Strasse 173 , 55216 Ingelheim am Rhein, Germany

Author Contributions

Hattie Barnes: Methodology, Validation, Writing- review and editing.

Alison Talbot: Image interpretation, Validation, Writing- review and editing.

Nadine Ogden: Conceptualization, Methodology, Validation, Formal analysis, Writing – original draft & editing & supervision.

Figures

Figure 1. Dorsopalmar and latromedial radiographs of C2. Demonstrating marked osteophyte formation associated with the DIPJ and PIPJ, lateromedial imbalance, as well as ossification of the cartilages of the hoof.

Figure 2a and b.
MRI images of C2 in sagital; T1W 3D demontrating osteophytes of the dorsodistal and dorsoproximal aspect of the second phalanx and dorsoproximal third phalanx, as well as dorsodistal first phalanx. Mild effusion of the navicular bursa and moderate effusion of the DIPJ can be seen in the STIR FSE.

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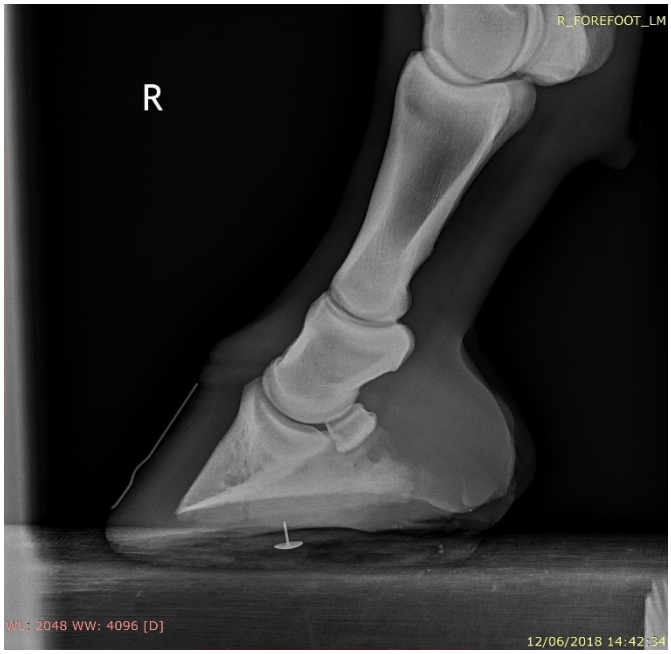

Figure 3. Dorsopalmar and latromedial radiographs of C3. Demonstrating mild osteophyte formation associated with the DIPJ and lateromedial imbalance.

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318 **Figure 4a and b**

319 MRI images of C3 in sagital; T1W 3D demontrating moderate modelling of the DIPJ
320 with osteophytosis of the distal P2 and proximal P3 and moderate distal border
321 changes to the navicular bone. Note the alterations in the subchondral bone signal
322 and irregular outline of the articular surface. Mild effusion of the navicular bursa can
323 be seen in the STIR FSE.
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325 **Tables**

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Table 1. Signalment, imaging diagnosis, treatment and outcome

	Case 1	Case 2	Case 3	Case 4
Signalment and History	▪ 17 year old ▪ French Comtois ▪ Mare ▪ Chronic (<2 years) bilateral fore limb lameness ▪ Acute bilateral, predominantly RF limb lameness of 2 weeks duration ▪ Treated with IA triamcinolone and hyaluronic acid of the DIPJ <2 years	▪ 14 year old ▪ French Comtois ▪ Mare ▪ 4 months history of right fore lameness localised to the DIPJ with IA analgesia ▪ Treated with IA methylprednisolone 2 months before presentation of the lame limb	▪ 6 year old ▪ Quarter Horse ▪ Gelding ▪ 9 week history of right fore limb lameness ▪ Diagnostic analgesia before presentation; no change in lameness following PDNB and resolution in lameness following ASNB	▪ ▪ ▪ ▪ ▪

	ago with poor response			
Lameness	▪ 2/10 left fore (LF) lame ▪ Circles on soft ground ▪ To the left; 1/10 LF lame ▪ To the right; 1/10 LF lame ▪ Circles on hard ground ▪ To the left; 5/10 LF lame ▪ To the right; 3/10 RF lame ▪ Blocked partially to palmar digital nerve block on the LF and RF. ▪ Blocked completely to abaxial sesamoidean nerve block on the LF limb ▪ Blocked completely to IA analgesia of the LF DIPJ	▪ 3/10 right fore lame ▪ Circles on soft ground. To the left; 6/10 RF lame To the right; 5/10 RF lame ▪ Circles on hard ground. To the left; 5/10 LF lame To the right; 3/10 RF lame ▪ Blocked partially to palmar digital nerve block on the LF and RF ▪ Blocked completely to abaxial sesamoidean nerve block on the LF limb ▪ Blocked completely to IA analgesia of the RF DIPJ	▪ 1/10 RF lame ▪ Circles on hard ground ▪ To the left; short cranial stride in both fore limbs ▪ To the right; 2/10 RF lame	▪
Imaging diagnosis (MRI findings)	▪ Bilateral desmitis of the collateral ligaments of the DIPJ ▪ Bilateral mild OA of the DIPJ ▪ Moderate OA of the PIP joint ▪ Bilateral navicular disease ▪ Desmitis of the oblique sesamoidean ligament of the LF limb	▪ Moderate desmitis of the collateral ligaments of the DIPJ of the RF limb ▪ Ossification of the hoof cartilages bilaterally ▪ Bilateral marked OA of the DIP and PIP joints ▪ Suspected keratoma in the lateral part of the dorsal hoof wall of the LF limb	▪ Subchondral bone injury to the second phalanx and the articular surface in the mid weight bearing aspect of the articulation in the DIPJ ▪ Mild OA of the DIPJ bilaterally ▪ Moderate bilateral modelling of the navicular bones	▪ ▪ ▪ ▪

Treatment	▪ IA 1ml of 2.5% polyacrylamide of the DIP of the LF limb ▪ IA 2mg triamcinolone acetonide of the DIP of the LF limb ▪ Remedial shoeing with heart bar shoes on front feet ▪ In-hand walking for 3 weeks ▪ Gradual return to ridden exercise after 3 weeks ▪ Gradual return to turn out 24 hours after treatment, commencing with small paddock	▪ IA 1ml of 2.5% polyacrylamide of the DIP of the RF limb ▪ IA 3mg triamcinolone acetonide of the DIP of the RF limb ▪ Remedial shoeing with heart bar shoes on front feet ▪ In-hand walking for 6 weeks ▪ Gradual return to ridden exercise after 6 weeks ▪ Gradual return to turn out 24 hours after treatment, commencing with small paddock	▪ IA 6mg triamcinolone acetonide of the DIPJ in both fore limbs ▪ Stall rest and in-hand walking for 4 weeks ▪ No improvement of lameness after 4 weeks rest ▪ IA 1ml of 2.5% polyacrylamide of the DIP of the RF limb ▪ Stall rest and in-hand walking for 6 weeks ▪ Turn out commenced after 6 weeks	▪ ▪ ▪ ▪
Outcome	▪ Sound at a trot in a straight line at 9 weeks	▪ 1/10 RF limb lameness at a trot in a straight line at 6 weeks	▪ Sound at a trot in a straight line at 13 weeks after treatment with polyacrylamide hydrogel ▪ At 21 weeks post treatment repeat MRI showed	▪

			deterioration of MRI findings ▪ At 26 weeks post medication the horse was showing a 3/10 lameness of the right fore in a straight line and the joint was medicated with autologous stem cells ▪ 10 months after medication with polyacrylamide remained RF limb lame	

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Table 2. Radiographic findings

	Case 1	Case 2	Case 3	Case 4	Case 5
Osteophyte formation of the DIP joint of the primary lame limb	Moderate	Marked	Mild	Mild	Mild
Osteophyte formation of the DIP joint of the contralateral limb	Moderate	Moderate	Mild	Mild	Mild
Osteophyte formation of the PIP joint of the primary lame limb	Moderate	Marked	None	Mild	None
Osteophyte formation of the PIP joint of the contralateral limb	Moderate	Marked	None	Mild	None

*Mediolateral imbalance of the primary lame limb	0.14	0.77	0.51	0.18	0.03
*Mediolateral imbalance of the contralateral limb	0.46	0.6	0.00	0.38	0.32
Ossification of the collateral cartilages of the primary lame limb	None	Marked	None	None	None
Ossification of the collateral cartilages of the contralateral limb	None	Marked	None	None	None

*Difference between the most distal lateral aspect of the pedal bone to the ground compared to the most distal medial aspect of the pedal bone to the ground (cm)

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Table 3. MRI findings

	Case 1	**Case 2**	**Case 3**	**Case 4**
Osteophyte formation of the margins of the DIPJ of the primary lame limb	Mild	Moderate	Mild	Mild
Osteophyte formation of the margins of the DIPJ of the contralateral limb	Mild	Marked	Mild	Mild
Effusion of the DIPJ of the primary lame limb	Marked	Moderate	Mild	Mild
Effusion of the DIPJ of the contralateral limb	Marked	Moderate	Mild	None
Osteophyte formation of the margins of the PIPJ of the primary lame limb	Moderate	Marked	None	None
Osteophyte formation of the margins of the PIPJ of the contralateral limb	Moderate	Moderate	None	None
Effusion of the PIPJ of the primary lame limb	None	Moderate	None	None
Effusion of the PIPJ of the contralateral limb	None	Moderate	None	None
Collateral ligament of the DIPJ of the primary lame limb	Medial collateral ligament enlargement, enthesiophytes at origin and	Mild lateral collateral ligament enlargement	None	None

	insertion of the medial and lateral collateral ligaments			
Collateral ligament of the DIPJ of the contralateral limb	Medial and lateral collateral ligament enlargement, with enthesiophytes at origin and insertion	None	None	None
Collateral ligament of the PIPJ of the primary lame limb	None	Marked new bone formation on the dorsolateral and dorsomedial aspect of the PIP joint and proximal P2 at the site of insertion of the medial and lateral collateral ligaments	None	None
Collateral ligament of the PIPJ of the contralateral limb	None	None	None	None
Navicular changes of the primary lame limb	Irregular distal border, enlarged synovial fossae, mild diffuse increase in signal on fat supressed images in the medulla	Mild effusion of the navicular bursa	Moderate distal border changes	Mild diffuse increase in signal on fa supressed images in medulla of navicular bone.
Navicular changes of the contralateral limb	Multiple enlarged synovial	Mild effusion of the	Moderate distal border changes	None

	fossae, mild increase in signal intensity of fat supressed images in the medulla	navicular bursa		
Other findings in the primary lame limb	The distal part of the lateral sesamoidean oblique ligament was poorly defined and there was new bone formation at the site of insertion of the medial and lateral oblique sesamoidean ligaments	Marked ossification of the hoof cartilages	Alteration to the subchondral bone signal and irregular outline of the articular surface associated with the distal articulation of the second phalanx. On the frontal scans this appears like an indentation of the cartilage/subchondral bone. There is mild increase in signal intensity associated with this finding.	Slight invagination of the articular bone surface of distal P2 at the midline and mild thickening of the subchondral bone of distal P2 at this site. Subtle decrease in signal on T1 and T2* images in the summative cartilage layers at the midline. Slightly poor definition of the borders of the distal sesamoidean impar ligament (DSIL. Mild irregularity of the dorsal surface of the medial lobe of the DDFT in the proximal recess of the navicular bursa

Other findings in the contralateral limb	None	A discrete wedge-shaped low signal intensity area in the lateral part of the laminar layers of the dorsal hoof wall. There is a corresponding underlying concavity in the margin of P3 at this location. Ossification of the hoof cartilages	Irregular slightly pointed contour to the distal condyle of P2 in the mid line an irregularity of the subchondra bone at this site. The proximal articular margin of the mid P3 is also slightly irregular and has a focal discrete are of increased T1 and T2 signal in th cortex at th mid line. There is als focal decreased signal intensity in the summative cartilage layers in the midpoint of the joint consistent with focal cartilage loss. Poor definition o the DSIL Mild increase in signal on fa supressed images in

the dorsal part of P3.

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