SCINTIGRAPHIC EVALUATION OF THE PROXIMAL METACARPAL AND METATARSAL REGIONS OF HORSES WITH PROXIMAL SUSPENSORY DESMITIS

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The aim of the study was to characterize radiopharmaceutical uptake patterns in horses with clinical and ultrasonographic evidence of proximal suspensory desmitis. It was hypothesized that radiopharmaceutical uptake in the proximal palmar (plantar) aspect of the third metacarpal (metatarsal) bone would be greater in lame limbs of horses with proximal suspensory desmitis than in sound limbs and that there would be a positive correlation between the severity of ultrasonographic abnormalities and the degree of radiopharmaceutical uptake. Nuclear scintigraphic evaluation of the proximal metacarpal or metatarsal regions of 126 horses with ultrasonographic evidence of proximal suspensory desmitis was performed. In all horses lameness was substantially improved by perineural analgesia of the palmar metacarpal (subcarpal) or plantar metatarsal (subtarsal) nerves. Scintigraphic images were assessed subjectively, by profile analysis and using region of interest analysis. Associations between the degree of ultrasonographic abnormality and radiopharmaceutical uptake ratios and the presence of radiographic abnormalities and radiopharmaceutical uptake ratios were analyzed. Subjectively, the majority of horses had normal radiopharmaceutical uptake. Profile analysis provided little additional information. However with region of interest analysis there was greater radiopharmaceutical uptake ratios in plantar images in the proximal metatarsal regions of lame limbs compared with nonlame limbs. There was no association between radiological abnormalities and radiopharmaceutical uptake ratios. In forelimbs there was no association between ultrasonographic lesion grade and radiopharmaceutical uptake ratios, however in hindlimbs there was a significant relationship between ultrasonographic grade and radiopharmaceutical uptake ratios. *Veterinary Radiology & Ultrasound, Vol. 48, No. 1, 2007, pp 78–85.*

Key words: equine, nuclear scintigraphy, proximal suspensory desmitis, third metacarpal bone, third metatarsal bone.

Introduction

PAIN ASSOCIATED WITH the proximal metacarpal and metatarsal regions is well recognized as a cause of lameness in the horse, and a variety of etiologies have been identified including proximal suspensory desmitis[1–5], an avulsion fracture at the origin of the suspensory ligament on the third metacarpal (metatarsal) bone[6–8], impingement lesions of the suspensory ligament and the second or fourth metacarpal (metatarsal) bones[9], stress-related bone injury involving either the palmar (plantar)[1,10,11] or dorsoproximal aspects of the third metacarpal (metatarsal) bone[12–14], desmitis of the accessory ligament of the deep digital flexor tendon,[15–17] or superficial digital flexor tendonitis. The scintigraphic appearance of palmar cortical fatigue fractures of the third metacarpal bone[10,11,18] and avulsion fractures at the origin of the suspensory ligament on the third metacarpal (metatarsal) bone[6] have been characterized. However, descriptions of radiopharmaceutical uptake associated with proximal suspensory desmitis have not been well documented. Recently, radiopharmaceutical uptake patterns in the proximal metacarpal and metatarsal regions of clinically normal horses in full work have been described[19]. The aim of the current study was to characterize the radiopharmaceutical uptake patterns in horses with clinical and ultrasonographic evidence of proximal suspensory desmitis.

It was hypothesized that radiopharmaceutical uptake in the proximal palmar (plantar) aspect of the third metacarpal (metatarsal) bone would be greater in lame limbs of horses with proximal suspensory desmitis than in nonlame limbs and that there would be a positive correlation between the severity of ultrasonographic abnormalities and the degree of radiopharmaceutical uptake.

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Materials and Methods

We performed a retrospective analysis of scintigraphic images from 126 horses with proximal suspensory desmitis, examined at the Animal Health Trust between January

1997 and September 2003. All horses were assessed by one experienced clinician (S.J.D), moving in hand on a hard surface, and on the lunge on both soft and hard surfaces in circles of 10–15 m diameter. Some horses were also evaluated ridden if no lameness was otherwise apparent, or if the clinical signs exhibited did not match the rider's perceived problem. Lameness was graded on a scale of 0–8. Horses exhibited unilateral or bilateral forelimb or hindlimb lameness that was substantially improved (to grade 0 or 1) by perineural analgesia of the palmar metacarpal nerves (subcarpal) or plantar metatarsal nerves (subtarsal), but was not influenced by intra-articular analgesia of the middle carpal or tarsometatarsal joints. Ultrasonographic abnormalities consistent with proximal suspensory desmitis were identified in the lame (or lamer limb) in all horses. Horses with both clinical signs and either radiographic or scintigraphic abnormalities consistent with a palmar (plantar) cortical stress fracture of the third metacarpal (metatarsal) bone were excluded. Horses with an avulsion fracture of the third metacarpal (metatarsal) bone at the origin of the suspensory ligament identified radiographically and/or ultrasonographically were also excluded.

Radiographic examination of the proximal metacarpal or metatarsal regions was performed using at least dorsopalmar (dorsoplantar) and lateromedial projections. Images were graded retrospectively by one clinician (S.J.D.) who was unaware of the identity of the horse and the lame limb. The presence of increased opacity in the third metacarpal (metatarsal) bone in the dorsopalmar (dorsoplantar) view or endosteal new bone dorsal to the palmar (plantar) cortex in the lateromedial view was recorded. Ultrasonographic examination of the palmar metacarpal or plantar metatarsal soft tissue structures of both forelimbs or both hindlimbs was performed in transverse and sagittal planes using a 10 MHz linear transducer. Ultrasonographic images were graded retrospectively by one clinician (S.J.D.) who was unaware of the identity of the horse and the lame limb(s), and assigned a grade of 0–3 (0 = no abnormality detected; 1 = mild: subtle focal changes in echogenicity; 2 = moderate: enlargement of the suspensory ligament and moderate alteration in echogenicity; 3 = severe: marked enlargement of the suspensory ligament and major disruption of its architecture). Repeatability of grading was assessed by evaluation of the images from 10 horses. The coefficient of variance was calculated. Final gradings were not undertaken until the coefficient of variance was less than 0.02, and no effect of order of evaluation was detected.

Nuclear Scintigraphy Protocol

One hundred and fourteen of the 126 horses were exercised (lunged 15 min) before administration of radiopharmaceutical. All horses received ^{99m}technetium methylene diphosphonate (MDP) IV (10 MBq/kg), injected via a catheter into the left or right jugular vein. Skeletal scintigraphy was performed with the horse sedated using detomidine* (10 mcg/kg IV), commencing 2.5–3 h postinjection. Images were obtained using a low-energy, general-purpose collimator and a 500 mm circular field of view γ camera linked to a dedicated nuclear medicine computer system.† All images (lateral, dorsal and plantar) were acquired dynamically as a series of 35 2-s frames, using a 256×256 matrix, with the gamma camera positioned as close as possible to the area of interest. Care was taken to shield γ radiation from other limbs using a lead rubber sheet. For all images, motion correction software was used to align each frame before producing a final static image. All images were evaluated using a commercial software package.†

All horses underwent scintigraphy of the forelimbs (40 horses), hindlimbs (82 horses) or forelimbs and hindlimbs (2). All images were evaluated subjectively. Images were excluded for qualitative or quantitative analysis if the total counts acquired was less than 150,000; or if there was any movement blur, radioactive contamination, increased radiopharmaceutical uptake associated with a clinically apparent exostosis; or if limb obliquity was present.

Qualitative Image Analysis

All scintigraphic analysis was performed by one experienced assessor (J.S.W.), as previously described.[19] To determine accurately the anatomic locations of the maximum and minimum radiopharmaceutical uptake in each region, lateral, dorsal and plantar scintigraphic images of the proximal metacarpal and proximal metatarsal regions were registered anatomically with and superimposed over lateromedial, dorsopalmar, or dorsoplantar radiographic views, respectively.

The lateral, dorsal, and plantar images were evaluated for location, intensity, definition (whether generalized or focal), and any variation in radiopharmaceutical uptake. Three horizontal line-profiles (width five pixels with a separation of five pixels between them) were positioned from distal to proximal in the proximal metacarpal or proximal metatarsal regions. The most distal profile was positioned with its distal limit at the level where the diaphysis of the proximal aspect of the third metacarpal or metatarsal bone narrows. These profiles were described and inspected visually for the presence of repeatable patterns between limbs.

Quantitative Image Analysis

Region of interest (ROI) analysis was undertaken using lateral, dorsal, and plantar images. Before ROI analysis, ROIs were positioned on lateromedial and dorsopalmar

*Domosedan, Pfizer Ltd., Sandwich, Kent, UK.
†Hermes, Nuclear Diagnostics, Northfleet, Gravesend, Kent, UK.

radiographs of the carpus and on the lateromedial and dorsoplantar radiographs of the tarsus, and saved. Positioning was validated using superimposition of a lateral scintigraphic image of a carpus and tarsus over a lateromedial radiograph (using anatomic registration of the images), and superimposition of a dorsal/plantar scintigraphic image over a dorsopalmar/dorsoplantar radiographic view. Repeatability of ROI measurements was assessed using lateral, dorsal, and plantar images from 10 horses. The coefficient of variance was calculated. Final measurements were not undertaken until the coefficient of variance was less than 0.02, and no effect of measurement order was detected.

Lateral images. To reduce operator variability each lateral right carpal/tarsal image was reoriented, with the dorsal aspect to the left of the screen. The left and right images were coregistered with a lateromedial carpal/tarsal radiograph using the multimodality program, to enable identical ROIs to be drawn automatically over each image by the computer.

Once the images were registered, four standard-sized, rectangular or square ROIs were drawn automatically by the computer: Region 1—dorsal metacarpal or metatarsal region, positioned so its proximal limit was at the carpometacarpal/tarsometatarsal joint, length calculated as two times the height of the third carpal/tarsal bone, and half the width of the third metacarpal or metatarsal bone; Region 2—palmar metacarpal or plantar metatarsal region, positioned so its proximal limit was at the carpometacarpal/tarsometatarsal joint, length calculated as two times the height of the third carpal/tarsal bone, and half the width of the third metacarpal or metatarsal bone; Region 3—proximal metacarpal or metatarsal region, positioned so its proximal limit was at the carpometacarpal/tarsometatarsal joint, length calculated as two times the height of the third carpal/tarsal bone, and width extending from the dorsal to palmar/plantar margin of the proximal aspect of the third metacarpal or metatarsal bone and Region 4—reference bone (radius/tibia), positioned so its proximal limit was eight times the height of the third carpal/tarsal bone proximal to the carpometacarpal/tarsometatarsal joint, and dimensions one times the height of the third carpal/tarsal bone by one times the height of the third carpal/tarsal bone. The mean number of counts per pixel and total counts in each ROI were recorded. The ratios between the mean counts per pixel in Regions 1, 2, and 3 and the mean counts per pixel in Region 4 (radiopharmaceutical uptake ratio) were calculated and compared statistically.

Dorsal or plantar images. To reduce operator variability for the dorsal/plantar image analysis, the right carpal/tarsal image was reoriented with the lateral aspect to the right of the screen. The left and right images were coregistered with dorsopalmar or dorsoplantar carpal/tarsal radiographic views using the multimodality programme, to enable identical ROIs to be drawn automatically over each image by the computer.

Once the images were registered, three standard-sized ROIs were drawn automatically by the computer: Region 1—lateral metacarpal or metatarsal region, positioned so its proximal limit was at the carpometacarpal/tarsometatarsal joint, length calculated as two times the height of the third carpal/tarsal bone, and half the width of the third metacarpal or metatarsal bone; Region 2—Medial metacarpal or metatarsal region, positioned so its proximal limit was at the carpometacarpal/tarsometatarsal joint, length calculated as two times the height of the third carpal/tarsal bone, and half the width of the third metacarpal or metatarsal bone and Region 3—proximal metacarpal or metatarsal region, positioned so its proximal limit was at the carpometacarpal/tarsometatarsal joint, length calculated as two times the height of the third carpal/tarsal bone, and extending the width of the third metacarpal or metatarsal bone. The mean number of counts per pixel and total counts in each ROI were recorded.

The ratios between the mean counts per pixel in Regions 1, 2, and 3 for all limbs were calculated and compared statistically. No background subtraction was made on the calculations, as this was found to be minimal (mostly zero). The relative uptake and mean relative uptake between left and right Regions 1, 2, and 3 were also calculated. The relative uptake ratio was defined as the proportion of one ROI compared with the total count for the left and right ROIs expressed as a percentage

$$\text{i.e., Relative uptake (left)} = \frac{\text{Counts per pixel in left ROI}}{\text{Counts in left + right ROI}} \times 100\%$$

The mean relative uptake was the mean value for this ratio for all lame or all nonlame limbs.

Data Analysis

Data were assessed for normality using a Shapiro–Wilks test. A Mann–Witney *U*-test was used to compare lame with nonlame limbs overall, to include data from horses with unilateral and bilateral lameness. A Kruskal–Wallis ANOVA was used to test for a difference in radiopharmaceutical uptake between ultrasonographic grades of the suspensory ligament. Multiple comparisons of the mean were applied when the Kruskal–Wallis test was significant. A Spearman's rank correlation was used to test for an association between ultrasonographic grade and radiopharmaceutical uptake ratio. Statistical analysis was

performed using a statistical software package‡; and statistical significance was set at $P<0.05$.

Results

Sample Population

There were 126 horses, 40 with forelimb lameness, 82 with hindlimb lameness and two with forelimb and hindlimb lameness. Horses were used for a variety of disciplines as follows: show jumping (27), eventing (21), dressage (42), racing (13), and general purpose (23). Age ranged from 2 to 18 years (median = 8.2 years). Thirty-two horses had unilateral forelimb lameness, eight had bilateral forelimb lameness, 53 had unilateral hindlimb lameness, 29 had bilateral hindlimb lameness and two had unilateral forelimb lameness and bilateral hindlimb lameness. Eighty-four lateral forelimb scintigraphic images were suitable for inclusion in the study, 39 dorsal forelimb images, 168 lateral hindlimb images, and 78 plantar hindlimb images.

Qualitative Image Analysis

Subjective analysis. In the majority of limbs there was a normal pattern of radiopharmaceutical uptake (Figs. 1 and 2). In 4/84 lateral forelimb images (5%) there was focal moderate increased radiopharmaceutical uptake in the proximopalmar aspect of the third metacarpal bone (Fig. 3a). In dorsal forelimb images, in 11 limbs there was mild to moderate increased radiopharmaceutical uptake in the third metacarpal bone centrally (6/78 [8%]) or medially (5/78 [6%]) (Fig. 3b). In 15/168 lateral hindlimb images there was focal moderate to intense, linear or triangular-shaped, increased radiopharmaceutical uptake in the proximoplantar aspect of the third metatarsal bone (Fig. 4a). In plantar hindlimb images there was increased radiopharmaceutical uptake in the central proximal aspect of the third metatarsal bone in 19 of 156 (12%) limbs (Fig. 4b).

Profile analysis of the proximal metacarpal region. In 68 of 84 (81%) lateral forelimb profiles the peak of activity was in the dorsal or central aspect of the metacarpal region as described previously in normal horses.[19] In the majority of limbs (76/84 [91%]), the profiles had a prominent peak whereas a small proportion (8/84 [9%]) had a profile with a broad plateau. In five limbs (5.95%) there was an abnormal palmar peak in the profile located closest to the carpometacarpal joint.

In dorsal profiles of the forelimbs the peak of activity was over the medial to central portion of the proximal metacarpal region, as previously described in normal horses.[19] In the majority of limbs (58/78 [74%]) the profiles had a prominent peak, whereas in some limbs (20/78 [26%]) the profile had a broad plateau.

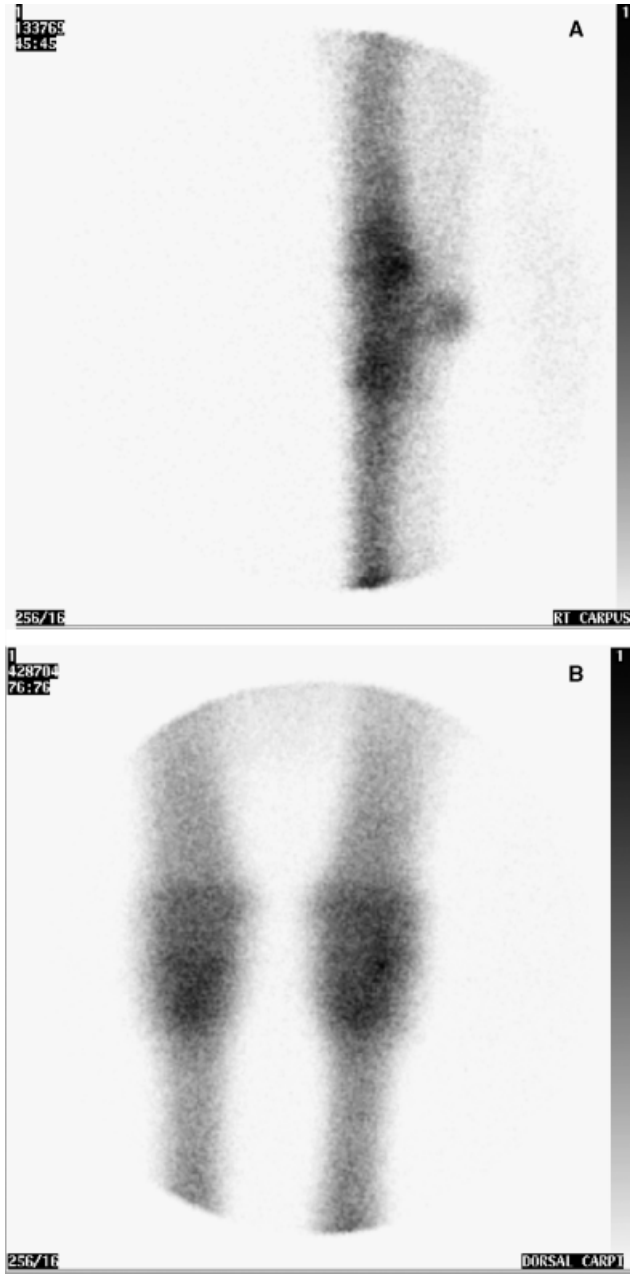

FIG. 1. Lateral (A) and dorsal (B) images of the proximal metacarpal region of a horse with right forelimb lameness with ultrasonographic evidence of proximal suspensory desmitis, but no scintigraphic abnormality. In the dorsal image the right forelimb is to the left.

Profile analysis of the proximal metatarsal region. In the majority of the lateral profiles of the hindlimbs (128/168 [76%]) the peak of activity was over the central to plantar aspect of the proximal metatarsal region as described previously in normal horses.[19] In the majority of limbs

‡Analyse-it Software Ltd., Leeds, UK.

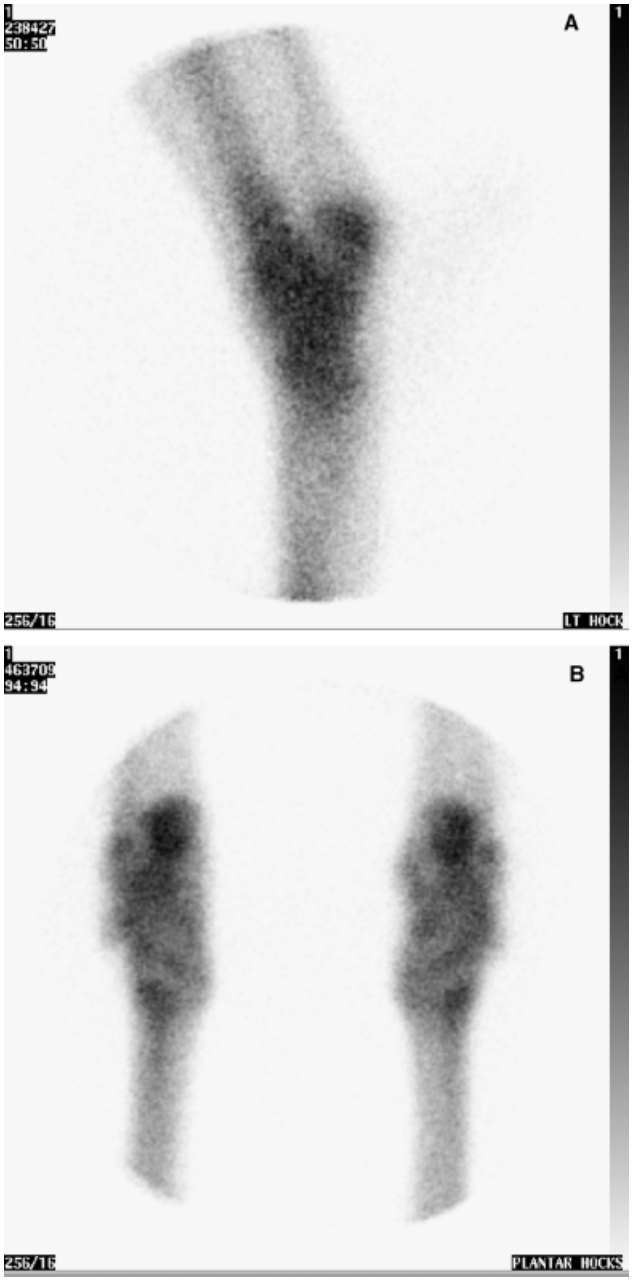

FIG. 2. Lateral (A) and plantar (B) images of the proximal metatarsal region of a horse with left hindlimb lameness with ultrasonographic evidence of proximal suspensory desmitis, but no scintigraphic abnormality. In the plantar image the left hindlimb is to the left.

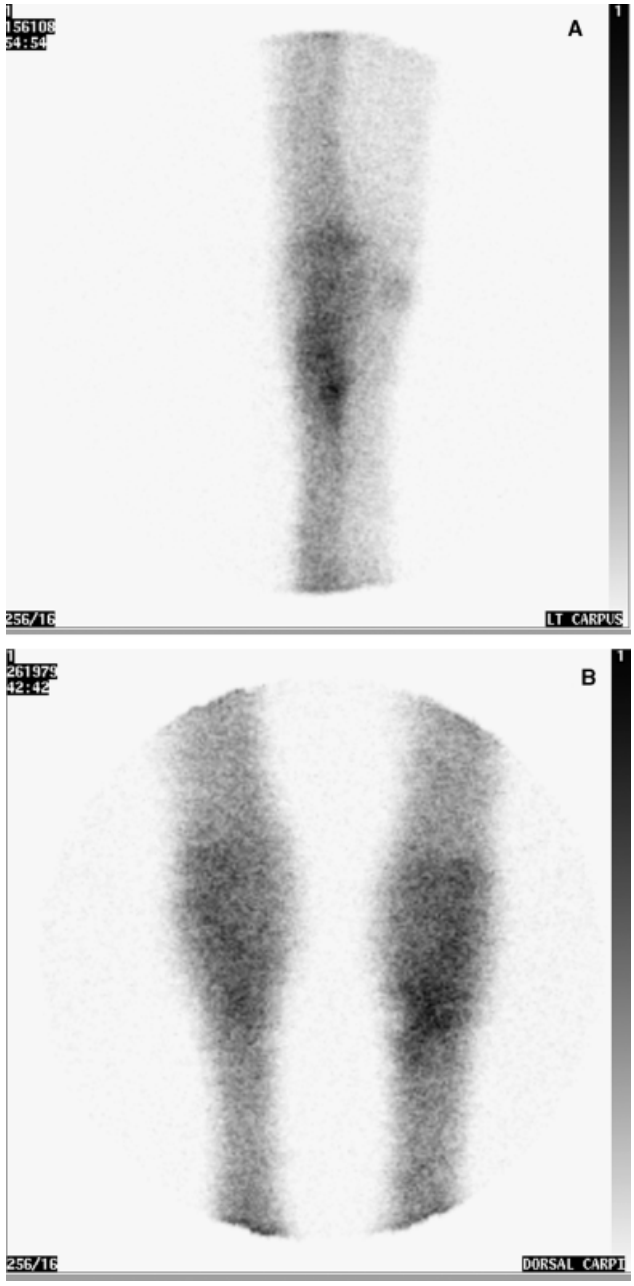

FIG. 3. Lateral (A) and dorsal (B) images of the proximal metacarpal region of a horse with left forelimb lameness associated with proximal suspensory desmitis. In the dorsal image the left forelimb is to the right. There is moderate focal increased radiopharmaceutical uptake in the proximopalmar aspect of the third metacarpal bone in the lateral image. In the dorsal image there is more diffuse increased radiopharmaceutical uptake, most marked medially.

(118/168 [70%]) the profiles had a prominent peak, whereas in 50/168 limbs (30%) the profiles had a broad plateau. In 17/168 [10%] limbs there was an abnormal plantar peak in the profile located closest to the tarsometatarsal joint.

In the plantar profiles of the majority of limbs (129/156 [83%]) the peak of activity was over the lateral aspect of the proximal metatarsal region, as described previously in normal horses.[19] In the majority of limbs (114/156 [73%]) the profiles had a prominent peak, whereas in 42/156 limbs (27%) the profile had a broad plateau. In 17/156 [11%] limbs there was an abnormal peak centrally in the profile closest to the tarsometatarsal joint.

Quantitative Image Analysis

Proximal metacarpal region. No significant difference in radiopharmaceutical uptake ratio was detected in any

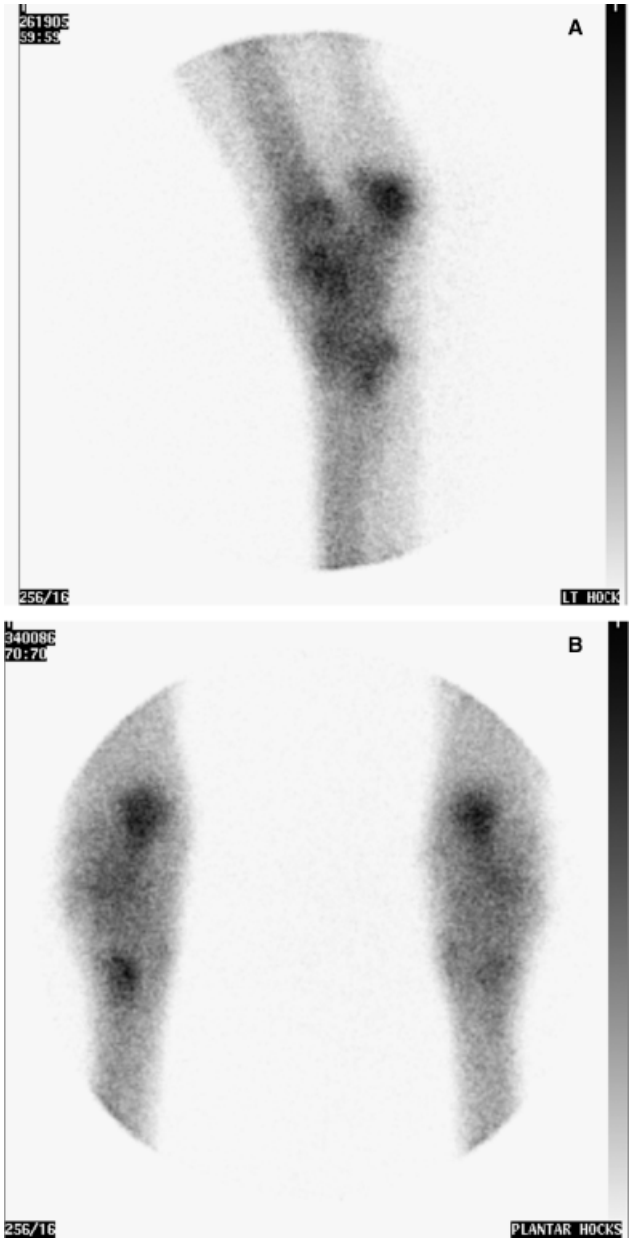

FIG. 4. Lateral (A) and plantar (B) images of the proximal metatarsal region of a horse with left hindlimb lameness associated with proximal suspensory desmitis. In the plantar images the left hindlimb is to the left. There is focal mild increased radiopharmaceutical uptake in the proximoplantar aspect of the third metatarsal bone in the lateral image. In the plantar image the increased radiopharmaceutical uptake is located centrally.

location in either the lateral or dorsal forelimb images. However, when comparing the relative uptake between the lame and nonlame limbs in dorsal images there was a significant difference, with greater radiopharmaceutical uptake in the medial ($P = 0.0013$), lateral ($P = 0.0022$), and proximal ($P = 0.0004$) metacarpal regions in the lame limbs.

Proximal metatarsal region. No significant difference in radiopharmaceutical uptake ratio between the nonlame and lame limbs was detected at any location in the lateral hindlimb images. In the plantar images there was a greater radiopharmaceutical uptake ratio in the medial metatarsal region of the lame limbs compared with the nonlame limbs ($P = 0.0397$). When relative uptake between the lame and nonlame limbs was compared on plantar images there was a significant difference, with greater radiopharmaceutical uptake in the medial ($P < 0.0001$), lateral ($P < 0.0001$), and proximal ($P < 0.0001$) metatarsal regions in the lame limbs.

Comparison of Radiopharmaceutical Uptake and Radiographic Grading

There was a low prevalence of radiological abnormalities in both forelimbs (3%) and hindlimbs (15%) and no association between the presence of radiological abnormality and radiopharmaceutical uptake.

Comparison of Radiopharmaceutical Uptake with Ultrasonographic Grading

In both forelimbs (59.5%) and hindlimbs (61.1%) grade 2 ultrasonographic abnormalities occurred most frequently, followed by grade 3 lesions (29.7% and 25.7%, respectively) and grade 1 lesions (10.8% and 13.3%). In the forelimbs there was no difference in radiopharmaceutical uptake ratios between the limbs and different ultrasonographic grades. However in the hindlimbs there was a significant difference in the radiopharmaceutical uptake ratios between different ultrasonographic grades, in both plantar ($P = 0.016$) and lateral images ($P = 0.048$), and specifically at a plantar location ($P = 0.008$). Limbs with grade 3 ultrasonographic abnormalities had greater radiopharmaceutical ratios than limbs with lower grades. There was a significant positive correlation between radiopharmaceutical uptake ratio and ultrasonographic grade for the proximal metatarsal total area ($P = 0.023$) and plantar region ($P = 0.0012$), but no association for the dorsal metatarsal region or for any proximal metacarpal region.

Discussion

Contrary to our hypothesis there was no significant association between forelimb proximal suspensory desmitis and increased radiopharmaceutical uptake in the proximopalmar aspect of the third metacarpal bone, although there was a generalized increased radiopharmaceutical uptake in the proximal metacarpal regions in lame limbs, detected only in dorsal images using ROI analysis. However, in hindlimbs there was both significant increased radiopharmaceutical uptake in the third metatarsal bone in lame limbs compared with sound limbs and a positive associa-

tion between ultrasonographic lesion grade and radiopharmaceutical uptake. Nonetheless in a high proportion of horses with proximal suspensory desmitis subjective evaluation of the images, or the use of profile analysis did not allow identification of any abnormality and differences were only detected using ROI analysis. These results are consistent with previous and current clinical observations in our hospital population. However, there was more variability in the shape of the profiles in lame horses compared with profiles generated previously for sound horses,[19] with a small proportion of horses having a broad plateau of maximum radiopharmaceutical uptake rather than a prominent peak.

The profiles and ROIs were positioned according to strict anatomic criteria. The profiles invariably coincided with the area of maximum increased radiopharmaceutical uptake. The area of increased radiopharmaceutical uptake was generally contained within a ROI, but did not necessarily fill the ROI. This could potentially dampen the results, but despite this the ROI analysis was the most sensitive method of detection of increased radiopharmaceutical uptake.

The majority of horses in the current study were mature sports horses. In a previous study of clinically normal horses ranging from 2 to 16 years of age no correlation was seen between age and radiopharmaceutical uptake. There were too few skeletally immature horses in the current study to determine whether such horses with proximal suspensory desmitis are at increased risk of associated osseous trauma compared with older horses. Determination of lameness grade in horses with bilateral lameness can be misleading; therefore no attempt was made to correlate lameness grade and radiopharmaceutical uptake, because of the large proportion of horses with lameness in two or more limbs.

A smaller proportion of horses with forelimb proximal suspensory desmitis is examined using nuclear scintigraphy at the Animal Health Trust compared with horses with hindlimb proximal suspensory desmitis. This is because horses with hindlimb lameness are often referred mainly for scintigraphic examination, with other diagnostic investigations following. The horses with hindlimb lameness often have a less well defined duration of lameness, some presenting because of insidious onset of poor performance, whereas others have acute onset lameness. It was therefore not possible to determine whether there was any relationship between the duration of lameness and the presence of increased radiopharmaceutical uptake.

Relative radiopharmaceutical uptake between lame and nonlame limbs in lateral images could not be assessed, because the images were not obtained simultaneously and there may have been slight differences in the distance between the gamma camera and the limb, which may have influenced results. It is anticipated that plantar images of the hindlimbs would be more sensitive to the detection of increased radiopharmaceutical uptake compared with dorsal images of the forelimbs, because the gamma camera can be positioned closer to the hindlimbs and the plantar aspect of the third metatarsal bone is shielded only by the plantar metatarsal soft tissue structures.

Horses with palmar (plantar) cortical stress fractures of the third metacarpal (metatarsal) bone were excluded from this study because this is believed to be a condition unrelated to proximal suspensory desmitis and represents a primary stress-related bone injury.[4] A stress fracture may result in some similar imaging findings, with increased opacity of the third metacarpal bone and/or increased radiopharmaceutical uptake, but affected horses have a different clinical presentation. In our clinical population these injuries occur most commonly in the forelimb of young horses with a recent increase in work intensity, particularly in racehorses (flat and National Hunt), and less commonly in dressage, showjumping, event and endurance horses. They are rare in general purpose riding horses. Lameness is sudden in onset and often more severe than that associated with proximal suspensory desmitis, and tends to persist longer, despite rest. Typically lameness deteriorates the further the horse trots on each occasion, whereas lameness associated with proximal suspensory desmitis is more consistent. Lameness associated with proximal suspensory desmitis is usually worse when the horse trots on a soft surface with the affected limb on the outside of a circle, whereas a stress fracture results in lameness being most pronounced on a hard surface. Horses with primary stress-induced bone injury have no detectable ultrasonographic abnormalities of the suspensory ligament. Increased radiopharmaceutical uptake associated with a palmar cortical stress fracture is usually much more intense than that associated with proximal suspensory desmitis, and may extend further proximodistally.

In three horses with bilateral hindlimb lameness ultrasonographic abnormalities were only identified in the lamer limb. In no horse with unilateral lameness were ultrasonographic abnormalities identified in the nonlame limb. Although there was a positive correlation between ultrasonographic lesion grade in hindlimbs and radiopharmaceutical uptake in the third metatarsal bone, there were two horses with focal, intense increased radiopharmaceutical uptake with grade 1 lesions. It is presumed that this relates to a primary enthesopathy at the origin of the ligament, which has subsequently been documented using magnetic resonance imaging in a small number of horses (Dyson and Murray, unpublished data 2005). Recognition of these different patterns of ultrasonographic grading and degree of increased radiopharmaceutical uptake is considered important because it may influence management and prognosis.

Ultrasonographic grading did not take into account the presence of enthesious new bone on the palmar (plantar)

aspect of the third metacarpal (metatarsal) bone. In our experience ultrasonographic evaluation is potentially more sensitive than radiography for detection of such bone, but its presence is better determined during dynamic imaging than from static, previously captured, ultrasonographic images. There was no relationship between the presence of radiographic abnormalities and radiopharmaceutical uptake. Moreover, in hindlimbs the site of increased radiopharmaceutical uptake, immediately distal to the tarsometatarsal joint, was often proximal to the site of endosteal new bone seen in lateromedial radiographic views. However, the site of increased radiopharmaceutical uptake correlates well with osseous changes identified using magnetic resonance imaging in association with proximal suspensory desmitis[4]. Increased opacity of the proximal aspect of the third metatarsal bone, or less commonly the third metacarpal bone, seen in dorsoplantar (dorsopalmar) radiographic views, can be an incidental finding unassociated with lameness, although it may reflect previous stress at the origin of the suspensory ligament.[20]

A combination of radiographic, ultrasonographic, and scintigraphic images potentially gives the most information about the pathologic processes associated with proximal suspensory desmitis, compared with ultrasonography alone and this is particularly recommended if the degree of lameness is not consistent with the grade of the ultrasonographic lesion. Magnetic resonance imaging also has the potential to add additional information.

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