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Subjective and quantitative scintigraphic assessment of the equine foot and its relationship with foot pain

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Summary

It was hypothesised that in solar bone images of the front feet of clinically normal horses, or horses with lameness unrelated to the front feet, there would be less than a 10% difference in the ratio of uptake of radiopharmaceutical in either the region of the navicular bone, or the region of insertion of the deep digital flexor tendon (DDFT), compared to the peripheral regions of the distal phalanx. Nuclear scintigraphic examination of the front feet of 15 Grand Prix show jumping horses, all of which were free from detectable lameness, was performed using dorsal, lateral and solar images. The results were compared with the examinations of 53 horses with primary foot pain, 21 with foot pain accompanying another more severe cause of lameness and 49 with lameness or poor performance unrelated to foot pain. None of the horses with foot pain had radiological changes compatible with navicular disease. All the images were evaluated subjectively. The solar views were assessed quantitatively using regions of interest around the navicular bone, the region of insertion of the deep digital flexor tendon and the toe, medial and lateral aspects of the distal phalanx. In 97% of the feet of normal showjumpers, there was <10% variance of uptake of the radiopharmaceutical in the navicular bone, the region of insertion of the DDFT and the peripheral regions of the distal phalanx. There was a significant difference in uptake of radiopharmaceutical in the region of the navicular bone in horses with foot pain compared to normal horses. There was a large incidence of false positive results related to the region of insertion of the DDFT. Lateral pool phase images appeared more sensitive in identifying potentially important DDFT lesions. There was a good correlation between a positive response to intra-articular analgesia of the distal interphalangeal joint and intrathecal analgesia of the navicular bursa and increased uptake of radiopharmaceutical in the region of the navicular bone in the horses with primary foot pain. It is concluded that quantitative scintigraphic assessment of bone phase images of the foot, in combination with local analgesic techniques, can be helpful in the identification of the potential source of pain causing lameness related to the foot, but false positive results can occur, especially in horses with low heel conformation.

Introduction

Nuclear scintigraphy is well accepted as an aid to the diagnosis of equine lameness. Its value in the diagnosis of navicular disease has been well documented (Ueltschi 1977, 1999a,b; Trout *et al.* 1991; Keegan *et al.* 1996). However, it is important to recognise that an area of increased uptake of a bone seeking radiopharmaceutical, while reflecting increased bone turnover, does not necessarily reflect a pathological bone lesion, nor is it synonymous with pain. Therefore, the interpretation of nuclear scintigraphic images in isolation, without reference to other clinical information is potentially misleading.

There are limited published data on the scintigraphic appearance of the equine foot in clinically normal horses that are in full work. Trout *et al.* (1991) described the use of soft tissue and bone phase scintigraphy for the diagnosis of navicular disease in the horse and compared findings in 14 normal horses and 35 horses with suspected navicular disease, or foot pain of unknown origin. The work status of the normal horses was not documented. Keegan *et al.* (1996) compared the results of 7 horses with palmar foot pain and 7 horses free from lameness, but did not describe their work history. Both studies focused on the navicular bone and did not consider the region of insertion of the deep digital flexor tendon (DDFT) on the distal phalanx.

There is limited information correlating the response to intra-articular analgesia of the distal interphalangeal (DIP) joint and intrathecal analgesia of the navicular bursa with nuclear scintigraphic findings. Turner (1996) compared the scintigraphic appearance of the feet of horses which were suspected of having navicular region pain based on a positive response to both analgesia of the navicular bursa and the DIP joint, with horses with palmar heel pain, characterised by a negative response to either, or both, DIP joint and navicular bursa analgesia. There was increased uptake of the radiopharmaceutical in the navicular bone in 80% of the horses with navicular region pain and in 40% of the horses with palmar heel pain.

Several of these studies relied on a subjective evaluation of the scintigraphic images. Since navicular disease is frequently a bilateral condition it is often not possible to rely on comparison of the left and right limbs to identify an abnormality. Interpretation is based upon comparing the uptake of the radiopharmaceutical in the navicular bone to uptake in the distal phalanx. This can be confounded by increased uptake of the radiopharmaceutical in the region of insertion of the DDFT or

[a]This assumes that the solar margin of the distal phalanx is part of the circumference of a circle. If radial lines are drawn from the centre of the circle, the distal phalanx is divided into 'radial segments'.

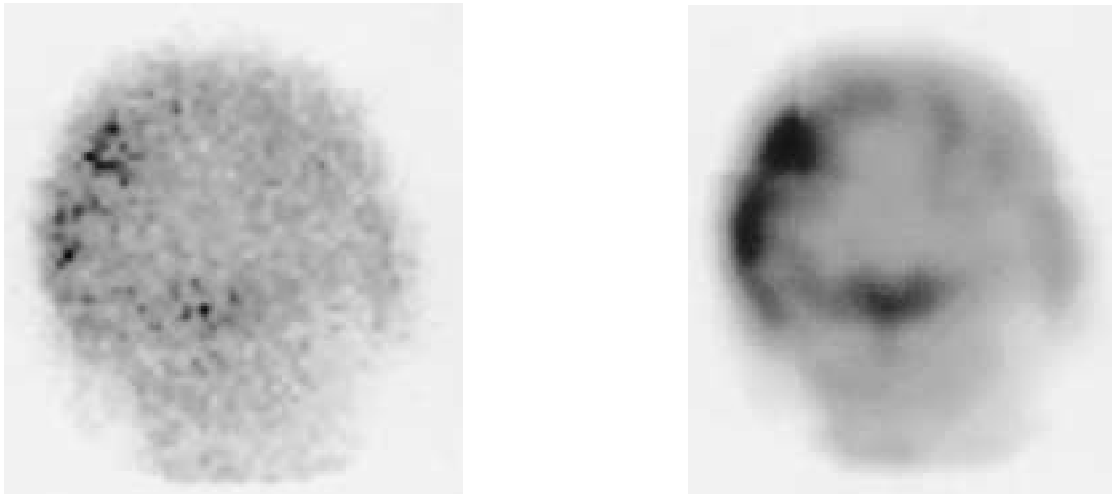

Fig 1: Solar view of the left front foot of a horse with foot pain, before (a) and after (b) application of a high resolution filter.

increased uptake in the medial or lateral aspect of the distal phalanx, possibly reflecting foot imbalance.

Using regions of interest (ROI's) analysis it is possible to obtain quantitative values for uptake of the radiopharmaceutical in bone. Counts per pixel in radial segments[a] of the distal phalanx compared with the navicular bone lie within a normal range of 0.78–1.29 in Standardbred trotters (P. Eksell, personal communication). Ueltschi (1999a,b) compared uptake of the radiopharmaceutical in the palmar processes of the distal phalanx with uptake in the navicular bone. A ratio of 0.65–1.35 was described in normal horses; a ratio of less than 0.5 was considered suspicious of navicular disease. Ueltschi recognised limitations in the method due to variability in uptake of the radiopharmaceutical in the distal phalanx and concluded that there were too many false positive results. In contrast, Lauk and Wanschura (1999) compared uptake of the radiopharmaceutical in the navicular bone with the rest of the solar region and concluded that this was a highly sensitive method for confirming clinical evidence of navicular disease, but did not define the diagnostic criteria employed.

In the current study, the uptakes of radiopharmaceutical in the region of the navicular bone and the region of insertion of the DDFT on the distal phalanx were compared to the mean uptake in the toe region and medial and lateral aspects of the distal phalanx in clinically normal horses, horses with lameness unrelated to the foot and horses with foot pain. It was hypothesised that there would be less than a 10% difference in the ratio of uptake of the radiopharmaceutical in the region of either the navicular bone, or the region of insertion of the DDFT, compared to the peripheral regions of the distal phalanx in clinically normal horses, and horses in which pain causing lameness was localised to somewhere other than the foot.

The purposes of the study were to compare the ratios of uptake of the radiopharmaceutical between both the navicular bone and the region of insertion of the DDFT, and uptake in the peripheral regions of the distal phalanx in i) clinically normal horses in full work, ii) horses with lameness due to pain localised to the foot and iii) horses with lameness unrelated to the foot. In horses with pain localised to the foot the responses to intra-articular analgesia of the DIP joint and intrathecal analgesia of the navicular bursa were compared with the scintigraphic findings.

Materials and methods

Horses included comprised all horses presented for investigation of lameness or poor performance at the Animal Health Trust between January 1999 and July 2000, which were examined scintigraphically and from which dorsal, lateral and solar bone phase images of the front feet were obtained. These were compared with the images of the front feet of 15 clinically normal Grand Prix showjumpers, all of which were in full work.

Image acquisition and processing

All horses received 1 GBq/100 kg bwt 99^{m} technetium methylene diphosphonate, injected via a catheter into the left or right jugular vein. Horses were sedated with detomidine (Domosedan)[1] (10 µg/kg i.v.) for image acquisition. All images were obtained using a 500 mm circular field of view GE gamma camera, and a low energy, general purpose collimator. Dorsal and lateral pool phase images were obtained in all horses up to November 1999 as part of another study (Dyson *et al.* 2002), but only in horses with suspected foot pain thereafter. Dorsal, lateral and solar static bone phase acquisitions were obtained 3 h after injection of the radiopharmaceutical, over at least 2 min, using a 256 x 256 matrix. Images were transferred via an analogue to digital converter to a SunSparc work station and analysed using nuclear medicine software[2].

For solar images, the foot being examined was placed on the gamma camera, which lay on the floor. The digit was extended to avoid superimposition of the proximal interphalangeal joint over the region of the navicular bone. In addition, 2 lead thyroid collars were wrapped around the pastern as a shield.

The solar images, were enlarged and a region of interest was drawn around the periphery. Counts outside the foot were deleted. The final images were saved for further analysis.

Subjective image analysis

All images were viewed blind by a single observer, without knowledge of the identity and clinical history of the horse. A subjective assessment of all pool and bone phase images was made. The solar views were evaluated both before and after application of a high resolution filter (Fig 1).

Quantitative image analysis

The unfiltered solar views of each front foot were analysed quantitatively. Each foot was orientated with the medial aspect to the left of the screen. The left and right images were co-registered using the multimodality programme, so that identical regions of interest (ROI's) could be drawn over each, around the region of the navicular bone (*region 1*), the region of insertion of the deep digital flexor tendon (DDFT) on the distal phalanx (*region 2*), the toe region of the distal phalanx (*region 3*), the medial aspect of the distal phalanx (*region 4*) and the lateral aspect of the distal phalanx (*region 5*) (Fig 2). The mean number of counts per cell in each ROI was recorded. This technique was performed 5 times in each of 10 horses in order to assess the repeatability of the results.

The mean counts per cell for *regions 3*, *4* and *5* was calculated. If this figure was less than 20, the result was recorded as 'cold' and the foot was excluded from further analysis. If there was an area of uptake of radiopharmaceutical in the distal phalanx considered likely to reflect the presence of an active osseous lesion (e.g. a fracture or an active osseous cyst-like lesion) the foot was excluded from further analysis. The ratios between the mean count per cell in each of *regions 1* and *2* and the mean value for regions *3*, *4* and *5* were calculated. Increased uptake in the navicular bone, or the region of insertion of the DDFT, compared to the peripheral regions of the distal phalanx was recorded as <10% (*Group 1*), >10<20% (*Group 2*), >20<30% (*Group 3*), >30<40% (*Group 4*) and >40% (*Group 5*). In the Discussion a result is referred to as a false positive if the foot was classified in *Groups 2–5* in the absence of foot related lameness.

Normal horses

The Grand Prix show jumping horses were evaluated moving in straight lines and in 15 m diameter circles on the lunge, on both soft and hard surfaces. Distal limb forelimb flexion tests and proximal limb hindlimb flexion tests were performed. Lameness was not observed at any time in the 15 horses selected for this study.

Local analgesia

Intra-articular analgesia of the DIP joint, with or without analgesia of the navicular bursa, were performed in 35 of the horses with primary foot pain. These techniques were not used if a conclusive diagnosis had already been reached (e.g. fracture of the distal phalanx), or if the temperament of the horse dictated that it was too dangerous.

Intra-articular analgesia of the DIP joint and intra-thecal analgesia of the navicular bursa (under fluoroscopic control) were performed using 6 ml and 2.5–3 ml 2% mepivacaine (Intra-Epicaine)[3] respectively. Each horse stood still until the lameness was re-assessed, in both straight lines and circles, 5 min after injection. The response was regarded as positive if there was significant improvement in lameness, even if it was not alleviated fully. Later responses were not assessed. At least 3 hours separated each technique. At least 7 days elapsed between performing these blocks and carrying out scintigraphic evaluation or, more frequently, the blocks were carried out after scintigraphy.

Case records

The clinical case records of all horses were reviewed and the following data recorded: case number, age, breed, sex, lame limb(s), any obvious clinical abnormalities, the response to local analgesic techniques, and the results of radiography and ultrasonography.

The horses presented for lameness or poor performance were divided into 3 categories based upon the results of a clinical examination and the response to perineural analgesia: a) Primary foot pain, unilateral or bilateral; b) Foot pain in conjunction with a more severe cause of lameness, unrelated to foot pain (referred to as secondary foot pain); c) No foot pain.

In horses with primary foot pain the results of the local analgesic techniques were compared to the scintigraphic findings.

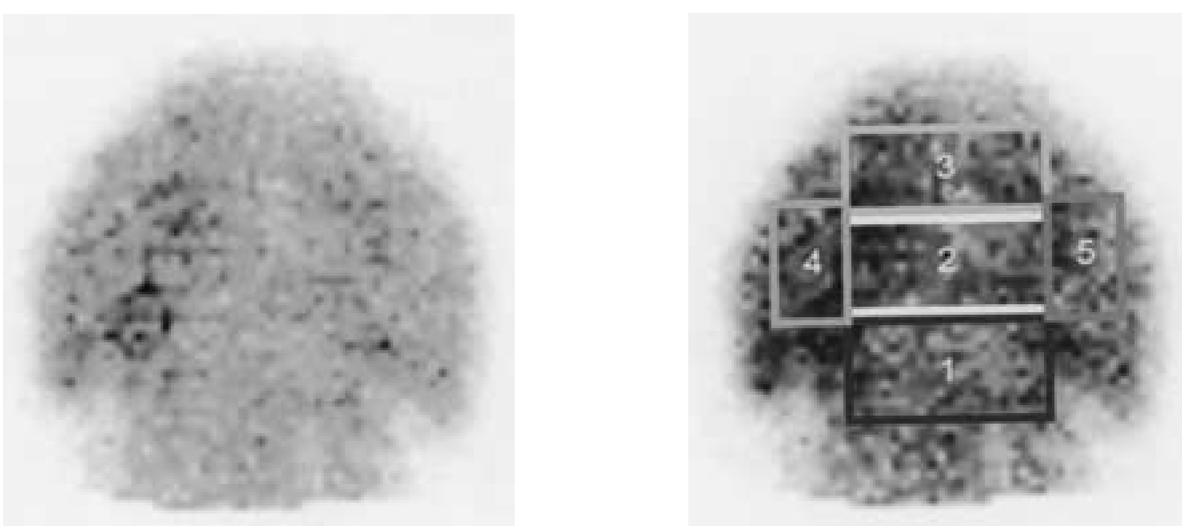

Fig 2: Solar views of the left front foot of a normal horse with ROI's drawn in the region of 1) the navicular bone, 2) the region of insertion of the DDFT, 3) the toe region of the distal phalanx and the 4) medial and 5) lateral aspects of the distal phalanx. Mean counts/cell in each region were 1) 42; 2) 44; 3) 42; 4) 48 and 5) 42.

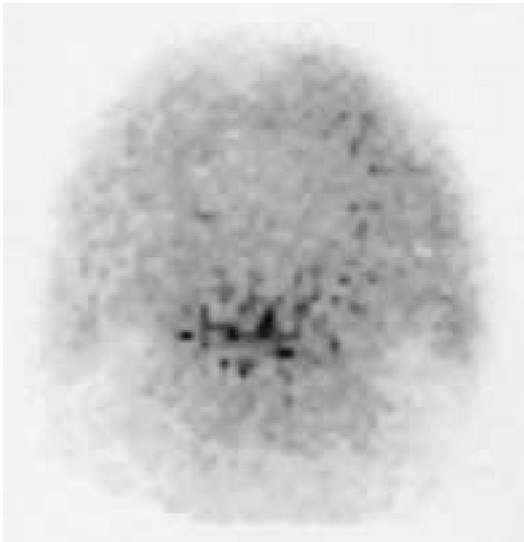

*Fig 3: Solar view of the left front foot of a horse with primary foot pain. The navicular bone had 21% greater uptake of the radiopharmaceutical compared to the peripheral regions of the distal phalanx (*Group 3).

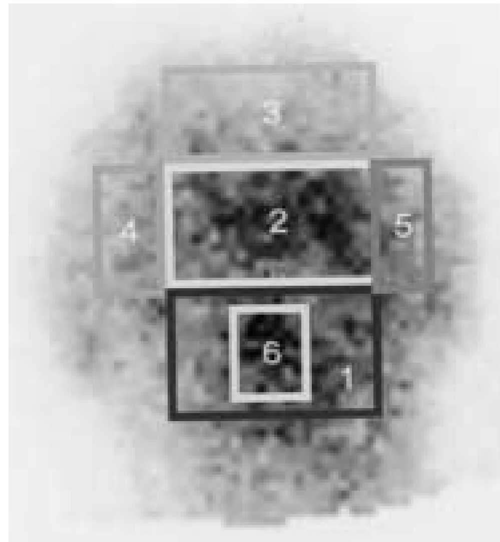

Fig 4: Solar view of the left front foot of a horse with primary foot pain. Note that region 6 within the navicular bone has a mean counts/cell of 68, compared to 60 for the whole navicular bone region.

Statistics

Ratios of radiopharmaceutical uptake were compared between clinical groups by the nonparametric Kruskal-Wallis test, using Minitab. Statistical significance was set at $P<0.05$.

Results

There were 53 horses with primary foot pain, 21 with foot pain accompanying another more severe cause of lameness, and 49 with lameness, poor performance or difficult behaviour not attributable to foot pain. None of the horses with foot pain had radiographic abnormalities compatible with a diagnosis of navicular disease (Butler *et al.* 2000). Following elimination of 'cold' feet (20) and feet in which a pathological lesion in the distal phalanx was suspected (7), this left 219 feet for quantitative scintigraphic analysis (Table 1).

Subjective image analysis

A variety of patterns of uptake of the radiopharmaceutical were identified in the horses with foot pain which were not seen in other horses. In 4 horses uptake in the region of the DDFT was identified in the pool phase image of the lame or lamer limb. One horse had markedly increased uptake in the toe region of the distal phalanx in the pool phase image and mildly increased uptake in a similar region of the distal phalanx in the bone phase image. One horse had increased uptake associated with the DIP joint. Seven horses had a marked focal area of increased uptake of the radiopharmaceutical in the distal phalanx compatible with an active osseous lesion (e.g. a fracture, or an osseous cyst-like lesion). Increased uptake of the radiopharmaceutical in one or both of the palmar processes of the distal phalanx was seen in 3 horses with low heels, flat soles and a horizontal orientation of the solar surface of the distal phalanx. Three horses had increased uptake of the radiopharmaceutical around the solar margin of the distal phalanx.

Application of a high resolution filter to the solar images tended to make areas of increased uptake of the radiopharmaceutical more obvious (Fig 1).

Quantitative image analysis

The repeatability study of mean counts/cell within the 5 ROI's showed a very low variance (<2%) between repeated measurements.

Navicular bone: The median ratios of uptake of the radiopharmaceutical in the region of the navicular bone compared to the peripheral regions of the distal phalanx are shown in Table 1.

TABLE 1: Median ratios (%) of radiopharmaceutical uptake in the region of the navicular bone compared to the uptake in the peripheral regions of the distal phalanx, by lameness group

		Navicular bone: peripheral uptake		DDFT: peripheral uptake	
	No. limbs	Median ratio	5–95 percentiles	Median ratio	5–95 percentiles
Clinically normal Grand Prix showjumpers	30	103	99–108	103	100–106
Foot with primary pain	69	114	85–147	115	93–134
Foot with pain; major pain elsewhere	33	121	93–130	112	103–129
Lame, but no foot pain	89	105	88–141	109	96–134
Opposite foot to that with 1° foot pain	21	112	91–139	112	95–122
Opposite foot to that with foot pain; major pain elsewhere	7	109	94–123*	115	111–129*

*Full range of ratios.

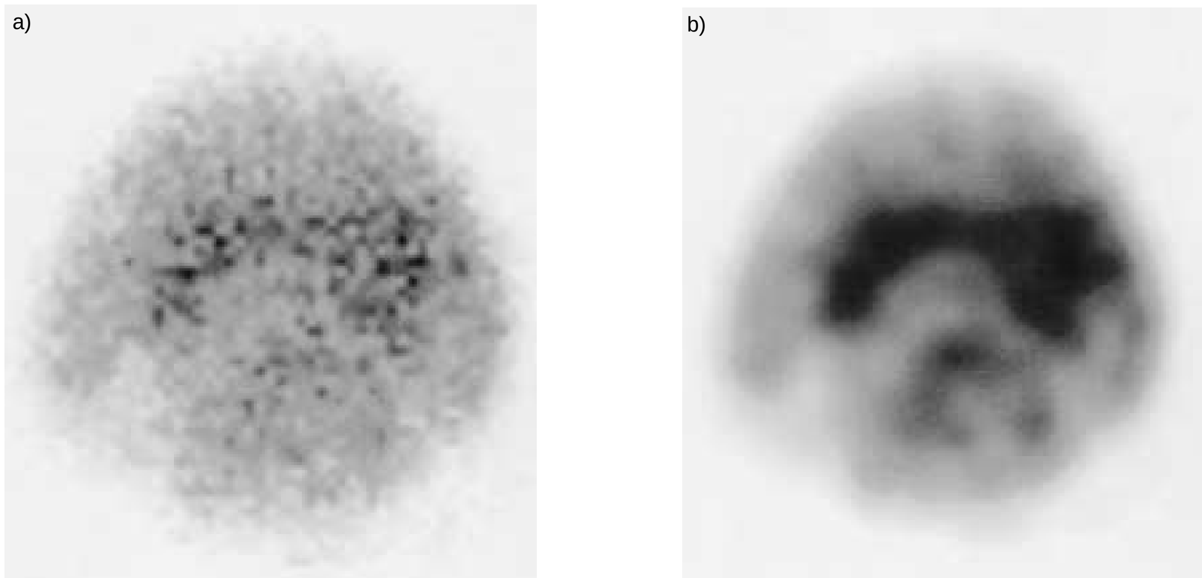

Fig 5: Solar view of the left front foot of a lame horse without foot pain, showing increased uptake of the radiopharmaceutical in the region of insertion of the DDFT. This is more obvious in the filtered (b) than the unfiltered view (a).

The ratios were lowest for the normal Grand Prix showjumpers (Fig 2) and for the horses with no foot pain. They were highest for horses with foot pain (Fig 3), whether primary or secondary. The ratios of uptake also appeared higher in the limbs of those horses with secondary foot pain, than in the contralateral limb.

These raw results were not compared statistically due to lack of independence between front feet from the same horse. Median values for each group of horses were compared statistically, first for left and then for right limbs. There was significant variation between the groups with and without foot pain (Kruskal-Wallis H = 11.8, P = 0.037 for left and H = 15.9, P = 0.007 for right feet).

In horses with primary foot pain, there was often a focal area, central or peripheral, within the navicular bone which had up to 15% more mean counts per cell compared to the entire navicular bone (Fig 4).

DDFT: The median ratios of uptake of radiopharmaceutical in the region of insertion of the DDFT compared to the peripheral regions of the distal phalanx (Table 1) were lowest for the normal Grand Prix showjumpers and for the lame horses with no foot pain. They were equally high in the lame and less lame or nonlame limbs of horses with either primary or secondary foot pain (Fig 5).

When the values for left and right limbs were compared statistically, the differences between the groups with or without foot pain were highly significant (Kruskal-Wallis H = 17.6, P = 0.003 for left and H = 15.7, P = 0.008 for right feet).

In the 4 horses with foot pain that had increased uptake of the radiopharmaceutical in the region of the DDFT in lateral pool phase images of the lame (or lamer) limb, the region of insertion of the DDFT was in either *Group 1* (n = 2) or *2* (n = 2).

Within the group of horses presented with lameness unrelated to the foot or poor performance, there were 12 horses in which neither lameness, nor any other detectable clinical problem could be identified, and the problem was assumed to be of behavioural origin. In 3 of these horses the regions of both the navicular bone and the DDFT insertion were in *Groups 4* or *5*. All these horses had markedly low heel conformation, whereas the remaining 9 horses had adequate dorsopalmar foot balance (Emery *et al.* 1977) and the regions of the navicular bone and the DDFT insertion were in *Groups 1* (64% and 50%), *2* (9% and 14%) or *3* (4% and 14%).

Comparison of the results of local analgesia and scintigraphy

Analgesia of the DIP joint and navicular bursa was performed in 27 of the 53 horses with primary foot pain. Analgesia of the DIP joint alone was performed in a further 8 horses. Eleven of 13 horses (85%), with a positive response to analgesia of the navicular bursa, had greater than 10% increased uptake of the radiopharmaceutical in the navicular bone compared to the distal phalanx. Twenty-four horses had a positive response to intra-articular analgesia of the DIP joint, 2 of which had a fracture of the medial palmar process of the distal phalanx. One additional horse had increased uptake of the radiopharmaceutical associated with the DIP joint. The navicular bones of 17 of the remaining 21 horses (81%) were in *Groups 2–5*. In 3 of these horses the region of insertion of the DDFT was also in *Groups 3* or *4*.

Nine horses had a positive response to analgesia of both the DIP joint and the navicular bursa, the navicular bones of 8 of which (89 %) were in *Groups 2* (4), *3* (3) and *4* (1). Three of these horses had increased uptake in the region of the DDFT in lateral pool phase images of the lame (or lamer) limb.

Seven horses had a negative response to analgesia of both the DIP joint and the navicular bursa, 2 of which had scintigraphic evidence suggestive of a focal incomplete fracture of the body of the distal phalanx. Of the remaining 5 horses, the navicular bones of 4 (80%) were in *Group 1*. The region of insertion of the DDFT was in *Group 1* for all horses with a negative response to both analgesia of the DIP joint and the navicular bursa.

Discussion

In the current study, in the majority (97% of feet) of clinically normal horses, there was less than a 10% difference in the ratios of uptake of the radiopharmaceutical in the region of either the navicular bone or the region of insertion of the DDFT, compared to the peripheral regions of the distal phalanx, therefore proving the hypothesis for clinically normal horses. However the results were less consistent in horses with lameness unrelated to the foot. In the abnormal horses without foot pain that had increased activity in either the navicular bone or the DDFT this increase tended to be bilaterally symmetrical.

The solar views were selected for quantitative analysis since these tend to be more sensitive for detection of abnormalities of the navicular bone (Keegan *et al.* 1996). The selection of the ROI's in the distal phalanx was based on observations in previous clinical cases. The region of insertion of the DDFT was an area of specific clinical interest. Inclusion of the palmar processes in a region of interest was avoided, since increased uptake had been observed in this region in horses with flat feet and low collapsed heels and radiographic evidence of modelling changes of the palmar processes (S. Dyson, unpublished data). The size of each ROI was determined by the foot size and shape. The measurements made in each ROI were accurately repeatable.

If the mean number of counts/cell was less than 20 in *regions 3, 4* and *5* of the distal phalanx, the foot was eliminated from the quantitative analysis. This was usually the result of poor blood flow to the foot and subsequent generalised low uptake of the radiopharmaceutical into bone (Dyson *et al.* 2002). Although acquisition times were increased in these horses it was often not possible to acquire the desired minimum of 150,000 counts. This problem could be mitigated by lunging the horse for 15 min prior to injection of the radiopharmaceutical (Dyson *et al.* 2002). This was not possible for all the horses included in this study, since horses examined prior to December 1999 were in another study looking at the effects of bandaging and exercise on radiopharmaceutical uptake. Although generalised low uptake of the radiopharmaceutical into bone should not have resulted in any differences in the ratios of the ROI's, errors would potentially have been magnified, therefore these horses were excluded. It is possible that in some horses there was a pathological reason for reduced uptake of the radiopharmaceutical in one or more regions of the distal phalanx.

It is difficult to compare the clinically normal high level competition horses in this study, with the normal horses reported by Trout *et al.* (1991) and Keegan *et al.* (1996) since the work history of those horses was not recorded. The 2 clinically normal horses which had increased uptake of the radiopharmaceutical in the region of the navicular bone in one foot (*Group 2*) both developed lameness associated with palmar foot pain within 12 months of examination.

In the horses that presented with lameness or poor performance with no clinical evidence of foot pain, there were 19% of feet in *Groups 3, 4* and *5,* i.e. with greater than 20% increased uptake of the radiopharmaceutical in the navicular bone compared to the distal phalanx. It is possible that lameness due to a more proximal source of pain in the ipsilateral limb, or lameness in another limb may cause abnormal foot placement or relative overload, resulting in abnormal modelling of the navicular bone and or the distal phalanx. A low heel conformation may result in relatively increased modelling of the navicular bone. Alternatively, some of these spurious results may be due to relatively reduced uptake of the radiopharmaceutical in the distal phalanx, despite the elimination of 'cold' feet.

In all of the normal horses the region of insertion of the DDFT was in *Group 1*. However, there was a significantly higher incidence of horses without lameness related to the foot (41%) with increased uptake at the region of insertion of the DDFT. The incidence of false positive results was higher for the DDFT insertion than for the navicular bone. Increased uptake of the radiopharmaceutical in this region may also reflect increased modelling of the subchondral bone of the DIP joint (M. Ross, personal communication). It is clear that scintigraphic images cannot be interpreted in isolation and must be evaluated in conjunction with all other clinical information.

In this study none of the horses with foot pain had radiographic evidence of navicular disease. A high positive correlation between radiographic signs of navicular disease and positive results of nuclear scintigraphy has previously been recorded (Trout *et al.* 1991; Ueltschi 1999a). In the recent study by Ueltschi (1999a), 80% of horses with clinical signs of navicular disease had radiological abnormalities consistent with navicular disease.

Four horses with primary foot pain had increased uptake of the radiopharmaceutical in lateral pool phase images of the lame, or lamer, limb. The regions of the navicular bone and DDFT insertion were in *Groups 1* or *2*. Superimposition of a lateromedial radiographic view of the foot over the pool phase image helped anatomical localisation. Two previous cases with a similar pattern of uptake were confirmed as having DDFT core lesions using magnetic resonance imaging (MRI) and *postmortem* examination (S. Dyson, unpublished data). Increased uptake of the radiopharmaceutical in the DDFT in the pool phase was not correlated with increased uptake at its insertion in the bone phase images, therefore the pool phase image appears to be more sensitive. Nonetheless, focal areas of increased uptake of the radiopharmaceutical in the region of the DDFT insertion, in a bone phase solar image, have been correlated *postmortem* with localised bone necrosis (C. Whitton, personal communication). Magnetic resonance imaging (MRI) and computerised tomography (CT) scanning (M. Nowak, personal communication) are potentially more accurate methods of identifying DDFT lesions, although both techniques require general anaesthesia of the horse.

There was a fairly good comparison between the results of local analgesic techniques and scintigraphy in the horses with primary foot pain. A negative response to both analgesia of the DIP joint and the navicular bursa was usually associated with normal uptake of the radiopharmaceutical in the regions of the navicular bone and insertion of the DDFT. A positive response to analgesia of the navicular bursa was usually associated with evidence of increased modelling in the navicular bone, or increased uptake in the DDFT in pool phase images. A positive response to analgesia of the DIP joint was less specific and sometimes associated with increased modelling in the palmar processes of the distal phalanx, but was more frequently associated with increased modelling of the navicular bone and, in some cases, the site of insertion of the DDFT. All horses with increased uptake of the radiopharmaceutical in the DDFT in pool phase images responded to DIP joint analgesia. One horse with uptake of the radiopharmaceutical localised to the DIP joint also had a positive response to analgesia of the DIP joint.

The specificity of analgesia of the DIP joint and the navicular bursa has previously been questioned (Dyson and Kidd 1993; Dyson 1995). Even when pain has apparently been well localised and correlated with areas of increased bone modelling, in the absence of radiological abnormalities, it currently remains impossible to define specifically the cause of associated lameness without *postmortem* examination. The use of CT scanning and

MRI may help to provide more answers in the living horse.

Based upon the current study it appears that in the majority of clinically normal horses in full work there is similar uptake of radiopharmaceutical in the navicular bone and the distal phalanx. Increased uptake of the radiopharmaceutical may be seen in the region of the navicular bone or the area of insertion of the DDFT in horses free from lameness related to the foot, especially in those with a low collapsed heel conformation. These false positive results are more likely to occur in the region of insertion of the DDFT than in the region of the navicular bone. Increased uptake of the radiopharmaceutical in the region of the navicular bone seen in association with a positive response to either intra-articular analgesia of the DIP joint or intra-thecal analgesia of the navicular bursa may reflect pathological remodelling and associated pain. Lateral pool phase images may be a more sensitive indicator of DDF tendonitis within the hoof capsule, compared to bone phase images.

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Manufacturers' addresses

[1]Pfizer Ltd., Sandwich, Kent, UK.
[2]Hermes, Nuclear Diagnostics, Gravesend, Kent, UK.
[3]Arnolds Veterinary Products Ltd., Harlescott, Shrewsbury, UK.

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