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Comparison of radiography and ultrasonography for the diagnosis of osteochondritis dissecans in the equine femoropatellar joint

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Summary

Reasons for performing study: **Osteochondritis dissecans (OCD) lesions of the femoropatellar (FP) joint are diagnosed routinely by radiography, but lesions located in the trochlear groove or without accompanying subchondral bone changes can be difficult to visualise. Ultrasonography allows evaluation of articular cartilage and subchondral bone in the FP joint.**

Objectives: **To document the radiographic and ultrasonographic appearance of OCD lesions in the equine FP joint, grade ultrasonographic lesions and compare their accuracy in the diagnosis of these lesions.**

Methods: **The medical records of all horses diagnosed with FP OCD between 1995 and 2006 were assessed. Inclusion criteria included availability of both radiographic and ultrasonographic images. Lesion characteristics were evaluated in each trochlear ridge and trochlear groove. For assessment of the accuracy (sensitivity and specificity) of both imaging techniques in the diagnosis of OCD, only cases with an arthroscopic or necropsy examination were studied.**

Results: **Twenty-one horses were included. OCD lesions were diagnosed by radiography (30/32 joints) and ultrasound (32/32 joints). The lateral trochlear ridge (LTR, 91%) and the medial trochlear ridge (MTR, 17%) were involved on radiography. The localisation on ultrasound examination was similar (97% LTR, 25% MTR). All but one lesion seen on radiography were also detected with ultrasound; 2 LTR and 3 MTR lesions, not seen on radiography were diagnosed by ultrasound and confirmed at arthroscopy or necropsy. The specificity was 100% regardless of the site and imaging procedure except for the distal third of the MTR (94% for ultrasound). The sensitivity varied, depending on lesion site.**

Conclusion: **Ultrasonography is a valuable diagnostic tool to diagnose OCD lesions in the FP joint and more sensitive than radiography for lesions affecting the MTR of the distal femur.**

Clinical relevance: **Ultrasound should be considered as a useful adjunct to radiography for diagnosing equine FP OCD, especially in cases of high clinical suspicion but equivocal radiographic findings. Images can be generated immediately when digital radiography is not available, permitting an immediate on-site diagnosis.**

Introduction

Osteochondrosis (OC) is a common osteoarticular disease affecting growing animals. OC lesions arise due to a failure of endochondral ossification in the epiphyseal or metaphyseal growth plate of horses (McIlwraith 2002). Cartilage retention and necrosis occur in the basal layers of the thickened cartilage and, following a shear stress, a cartilage flap may form at the articular surface leading to the dissecans form of the lesion (McIlwraith 2002; van Weeren 2006). Osteochondritis dissecans (OCD) of the femoropatellar (FP) joint is relatively common in horses (Foland *et al*. 1992). The lateral trochlear ridge (LTR) is most frequently affected (64–68% of OCD-affected FP joints depending of breeds (Foland *et al*. 1992; McIlwraith 1993; Riley *et al*. 1998) followed by the medial trochlear ridge (MTR). The trochlear groove (TG) and the articular surface of the patella rarely develop OC lesions (Lindsell *et al*. 1983; Wright and Pickles 1991; McIlwraith 1993). Horses suffering from OCD generally present femoropatellar effusion and varying degrees of hindlimb lameness (Sullins 2002). More than 50% of affected horses present bilateral lesions, although the lesions are usually worse in one limb (Sullins 2002). The economic cost of this disease is considerable due to the need for surgical treatment and the significantly decreasing prognosis relative to lesion size (Foland *et al*. 1992).

Radiography is the standard imaging method to diagnose and evaluate OCD. In FP OCD, lateral views allow characterisation of the lesion (McIlwraith 1996) and only very severe lesions are visible on caudocranial views. Lesions are flattened or irregular areas of the subchondral bone, especially in the proximal aspect of the trochlear ridges (TR), and may be accompanied by loose fragment(s). However, no abnormality can be seen on radiographs if the subchondral bone is unaffected (McIlwraith 1996; Vandevelde *et al*. 2006). In one study, OCD lesions were undetected in 40% of 72 FP joints; however, they were found during arthroscopy and more than half were worse than expected (Sullins 2002). On lateral views, the TR are superimposed on the TG and consequently TG lesions cannot be easily detected.

In contrast, ultrasound is a noninvasive tool that allows imaging of the cartilage of selected joints (Denoix 1996). It is rapidly performed and well-tolerated by most horses. Ultrasound

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permitted detection of cartilage fibrillation and irregularities of the trochlear surfaces of the femur in an experimental equine model of medial patellar desmotomy (Martins *et al.* 2006). In dogs, it permitted visualisation of the outline of OCD-related femoral subchondral defects in more detail than with radiography, and detected focal cartilage thickening whereas arthrogram and arthroscopy were normal (Vandevelde *et al.* 2006).

We hypothesised that ultrasound would be a valuable diagnostic tool in detecting OCD lesions in equine FP joint and that its sensitivity would exceed that of radiography.

The objectives of this retrospective study were firstly to describe the radiographic and ultrasonographic appearance of typical OCD lesions in the equine FP joint, grade the ultrasonographic lesions, and secondly to compare the accuracy of radiography and ultrasonography in the diagnosis of FP OCD lesions confirmed at arthroscopy and/or necropsy.

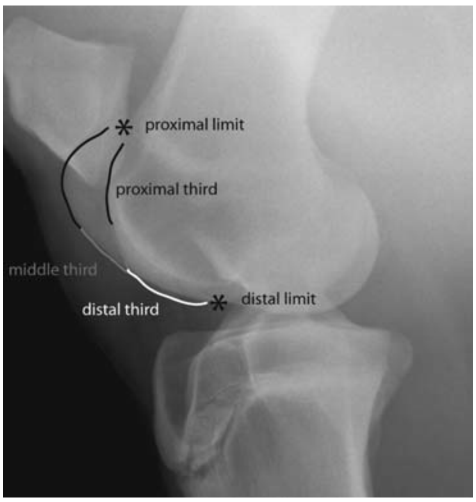

Fig 1: The lateral and medial trochlear ridges were divided into thirds in order to determine more precisely what sites were affected by osteochondrosis dissecans.

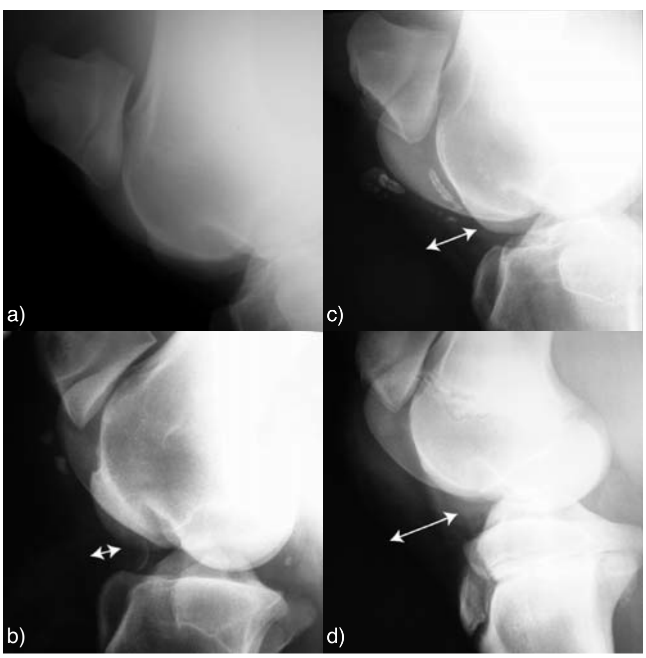

Fig 2: Radiographic grading of synovitis in the equine stifle. The grade is determined subjectively by the amount of fluid cranial to the FP joint. These lesions were scored based on a 4-point grading system: 0 = absent (a), 1 = slight (b), 2 = moderate (c) or 3 = severe (d).

Materials and methods

Case selection

The medical records of all horses diagnosed with FP OCD at the Centre Hospitalier Universitaire Vétérinaire were assessed. The inclusion criteria were an available radiographic examination, including at least a lateral view, and ultrasonographic images of the FP joint. Breed, age, sex and lameness grade (out of 5, based on AAEP guidelines, Anon 1991) were recorded based on information from the medical record. Arthroscopic and necropsy findings were also retrieved.

Radiographic examination

All examinations were reviewed in random order by a board-certified veterinary radiologist on conventional films (prior to 2000), or on printed copies of the computed radiography images. The evaluator was unaware of other examination findings (ultrasonographic, arthroscopic and necropsy). Measurements were made manually with a ruler, to a precision of 1 mm.

For the purposes of this study, the TR were divided into thirds (proximal, middle and distal; Fig 1) to facilitate comparisons between the imaging modalities and arthroscopic or necropsy findings.

For each TR and TG, the location (proximal, middle or distal third), the depth and length (in cm and % of affected total length) of subchondral bone defects, along with presence of sclerosis, and the number and size of fragments were evaluated. A site was considered positive for a lesion when fragmentation, a subchondral bone defect and/or sclerosis were present. Joint effusion was scored as 0 (absent), 1 (slight), 2 (moderate) or 3 (severe) (Fig 2).

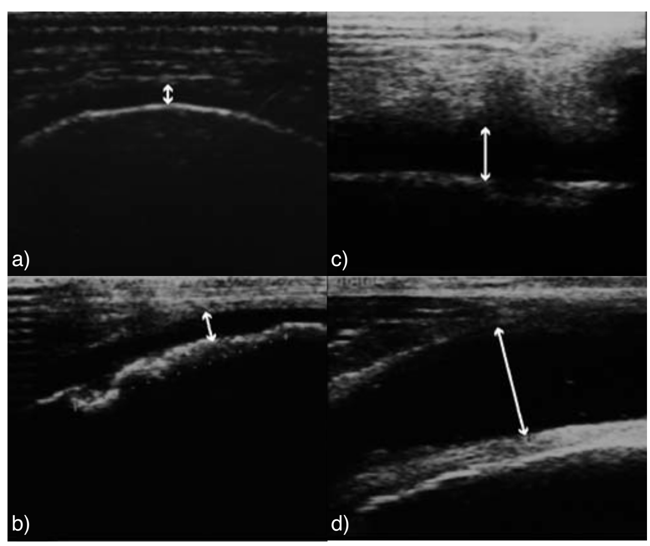

Fig 3: Ultrasonographic grading of synovitis in the equine stifle. The severity of synovitis determined by the amount of fluid between the soft tissue and the surface of the cartilage, and scored subjectively as 0 = absent (a), 1 = slight (b), 2 = moderate (c) or 3 = severe, with severe joint effusion and synovial hyperplasia (d).

Ultrasonography

All ultrasound examinations had been performed by a single examiner (Y.R.). All images from these evaluations were reviewed for the following parameters on each TR and TG: the location (proximal, middle or distal third), depth and length (in cm and % of affected total length) of subchondral bone defects, and the number and size of fragments. A site was considered positive for a lesion when fragmentation and/or a subchondral bone defect were present. The severity of synovitis (joint effusion and synovial hyperplasia) was scored (Fig 3) as 0 (absent), 1 (slight), 2 (moderate) or 3 (severe). When information could not be completed based on retrospective image evaluation alone, information from the ultrasound report was used.

Images were again reviewed and lesions scored retrospectively using a 4-point system, based on lesion description in a study of the dog (Vandevelde *et al*. 2006), where 0 = no lesion, 1 = cartilage irregularity with a visible superficial echogenic articular surface that shows concave deviation but is continuous, 2 = a hyperechoic subchondral bone surface with moderate irregularity and discontinuity, and 3 = complete disruption of the echogenic articular surface and a hyperechoic subchondral bone surface with severe irregularity and stair like discontinuity overlaid by heterogeneously echoic material (Fig 4). Disruption of subchondral bone was deemed to be a fragment.

Arthroscopic and post mortem *examinations*

All surgery reports and videos were reviewed and the following parameters retrieved for each TR and the TG: articular cartilage lesion type (fibrillation, osteochondral flap or fragment) and location. All articular cartilage lesions were considered to be positive for FP OCD.

All necropsy reports and available images were reviewed and similar parameters to the arthroscopic assessment were assessed for each TR and the TG.

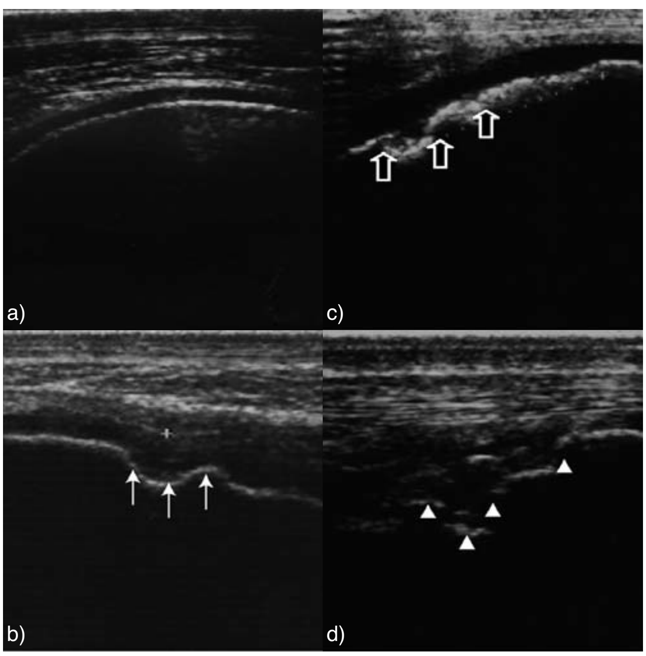

Fig 4: Ultrasonographic grading of OCD lesions affecting the femoral trochlea in the horse. These lesions were scored based on a 4 point system: 0 = no lesion (a); 1 = cartilage irregularity with a visible superficial echogenic articular surface (closed arrows) that shows concave deviation but is continuous (b); 2 = a hyperechoic subchondral bone surface (open arrows) with moderate irregularity and discontinuity (c); and 3 = complete disruption of the echogenic articular surface and a hyperechoic subchondral bone surface with severe irregularity and stair like discontinuity overlaid by heterogeneously echoic materiel (arrowheads) (d).

Statistical analysis

A nonparametric Mann-Whitney-Wilcoxon test was used to compare mean LTR vs. mean MTR lesion length (cm and %) on radiographic examination. A Chi-squared test was used to assess the association between radiographic presence of subchondral sclerosis and lesion grade on ultrasonographic examination and the age of horse, as it was further hypothesised that older horses would be more likely to have sclerosis associated with FP OCD. Spearman's correlation was used to assess a relation between synovitis grade and lesion length (cm and %) and depth for each TR on radiographic and ultrasound examinations. A P value <0.05 was considered to represent statistical significance. The sensitivity and specificity of radiography and ultrasonography for identifying OCD lesions confirmed by arthroscopic or *post mortem* examination were calculated at each site (9 per joint).

Results

Case details

Eighty-three case records from January 1995 to December 2006 were retrieved. Twenty-six horses met the inclusion criteria but 5 were excluded because of poor diagnostic quality of the radiographs. Thirty-two FP joints from 21 cases met the inclusion criteria. Details of the horses and of the lameness at the time of examination are shown in Table 1.

TABLE 1: Details of 21 Cases including the affected limb and severity of lameness

Case No.	Age (months)	Breed	Sex	Affected leg	Grade of lameness
1	9	QH	M	R	3
2	12	X	F	R, L	1,3
3	24	STB	F	R, L	1
4	6	STB	M	R, L	Unknown
5	42	Haflinger	G	R, L	2
6	12	WB	F	R, L	3
7	84	STB	H	R	1
8	24	Belgian	F	R	3
9	24	STB	M	R	0
10	7	STB	M	R	1
11	7	X	F	R, L	Unknown
12	14	Holsteiner	F	R, L	0
13	60	X	H	R, L	2
14	50	Canadian	H	R	2
15	18	Arab	M	R, L	0
16	18	Frisian	H	R, L	2
17	6	Holsteiner	M	L	2
18	7	Oldenbourg	M	L	2
19	9	STB	F	R, L	5
20	36	QH	H	L	Unknown
21	8	STB	F	L	3

Breed: QH = Quarter Horse; X = Cross; STB = Standardbred; WB = Warmblood. Affected limb: R = right; L = left. Grade of lameness: scale 0 (sound) to 5 (nonweightbearing lame) as classified in the AAEP lameness grading system (Anon 1991).

Radiographic findings

Thirty-two radiographic examinations were reviewed. Seven were conventional films and 25 printed computed radiography films. The radiographic examination results are summarised in Table 2. Twenty-one horses had radiographic abnormalities. Both uni- (8/21) and bilateral (11/21) lesions were identified. There were no radiographic abnormalities in 2/32 joints. The LTR alone was involved in 24/30 affected joints and the MTR alone in 1/30 joints. In 4/30 joints, both the LTR and the MTR had lesions. In 1/30 joints, a TG lesion was suspected, superimposed on a LTR lesion.

Lesions on the LTR were located exclusively on the proximal third of the TR in 8/29 LTR-affected joints, on the middle third in 8/29 joints, and on the distal third in one joint. They spanned the proximal and middle thirds in 5/29 joints, the middle and distal thirds in 2/29 joints, and all 3 areas in 5/29 joints. Lesions on the MTR were exclusively located on the proximal third in 2/5 joints, on the middle third in 2/5 joints, and the distal third in 1/5 joint. When horses were affected bilaterally, lesions were observed on the same trochlea and third in both joints in 10/11 horses. There was no significant difference between LTR and MTR lesion length in cm ($P = 0.6$), LTR and MTR lesion depth ($P = 0.8$) but the lesion length in percentage was significantly higher in LTR-affected joints ($P = 0.05$).

Ultrasonographic findings

Ultrasonography results are summarised in Table 2. All 21 horses had lesions diagnosed by ultrasound. Eleven out of 21 horses had bilateral lesions and these lesions were the same as those diagnosed by radiography. Only the LTR was involved in 23/32 affected joints and only the MTR in 1/32 joints. Both the LTR and the MTR were involved in 7/32 joints. A TG lesion was diagnosed in one joint, associated with a LTR lesion and was suspected on the radiographic examination.

Lesion location was noted in 15/32 joints. LTR lesions were exclusively located on the proximal third in 2/14 joints, and in the middle third for 5/14 joints. Lesions spanned the proximal and middle thirds in 1/14 joints, and all 3 areas in 6/14 joints. The proximal third was affected in the joint with MTR involvement.

Lateral trochlear ridge lesions were *grade 1* in 5/31 joints, *grade 2* in 9/31 joints and *grade 3* in 17/31 joints. Lesions on the MTR were *grade 1* in 4/8 joints, *grade 2* in 3/8 joints and *grade 3* in 1/8 joints. The lesion on the TG was *grade 2*. When horses were bilaterally affected, lesion severity was the same in both joints in 9/11 cases. Lesion location for both joints could be assessed in only 5/11 cases and the same portions of trochlea were affected in all these cases. However, in one of them, the lesion was longer in one side and also affected another portion.

Lesion length could be evaluated for 15/32 joints (Table 2). In the other cases lesion length exceeded image length (lesion was longer than probe length (3 cm) and could not be measured with accuracy). The width of the lesions was evaluated: 4/9 LTR lesions were restricted to the summit of the trochlear ridge, 4/9 lesions extended medially and 1/9 laterally. The lesion extended medially in the one MTR-affected joint.

Arthroscopic and post mortem *findings*

The results are summarised in Table 2. Arthroscopy was performed in 10/21 horses (15 joints) and *post mortem* examination in 2/21 horses (3 joints). The LTR was involved in all 18 joints and a TG lesion was present in one. The MTR was affected in 3 joints. Six horses were affected bilaterally.

Lateral trochlear ridge lesions were confined to the proximal and/or middle thirds in 12/18 joints, the distal third in 1/18 joints, the middle and distal thirds in 1/18 joints, and all 3 areas in 3/15 joints. The lesions covered the proximal and middle thirds in 3/3 MTR-affected joints.

Lesions in joints with LTR involvement included cartilage fibrillation ($n = 6$) cartilaginous flap ($n = 10$), fragments ($n = 6$) and chondromalacia ($n = 1$). Lesions in joints with MTR involvement included fragmentation ($n = 1$), fibrillation ($n = 1$) and cartilaginous flap ($n = 1$). The lesion on the TG was a cartilaginous crack. Lesions were identical in the both joints for bilaterally affected horses.

TABLE 2: Characteristics of OCD lesions from radiographic, ultrasonographic, arthroscopic or *post mortem* examination in 21 horses

Procedure	Radiography	Ultrasound	Arthroscopy	Necropsy
a) Lateral trochlear ridge				
Number of joints examined	32	32	15	3
Number of joints with LTR lesion	29	31	15	3
Lesion length: cm	4.3 ± 1.9	2.0 ± 1.1 (13 joints)*	NA	5–7 (2 joints)
%	39.1 ± 21.7	NE		NA
Lesion depth: cm	0.8 ± 0.8	0.9 ± 0.4 (12 joints)	NA	NA
Number of joints with fragments	10	10	6	3
Number of fragments per joint, (range)	4 ± 6 (1–18+)	2 ± 1 (1–3+)	(1–2)	(1–4)
Fragment length: cm (range)	1.8 ± 1.5 (0.8–6.6)	1.2 ± 0.3 (0.7–>P)	4 (1 joint)	NA
Number of joints with bone sclerosis	21	NE	NE	NE
b) Medial trochlear ridge				
Number of joints examined	32	32	15	3
Number of joints with MTR lesion	5	8	3	0
Lesion length: cm (%)	3.0 ± 1.6 (20.0 ± 13.7)	1.1 ± 0.8 (5 joints)	NA	0
Lesion depth: cm	0.6 ± 0.5	1.23 (2 joints)	NA	0
Number of joints with fragments	0	2	2	0
Number of fragments per joint, (range)	0	1	1	0
Fragment length: cm		1.6–3.0	1.5 (1 joint)	0
Number of joints with bone sclerosis	5	NE	NE	NE

a) NA = not available; NE = not evaluated; P = probe; * lesion length > the ultrasound probe in 17/31 joints, not available in one joint; % = lesion length/trochlea total length. b) Synovitis was diagnosed radiographically in 25/32 joints (79%) and *grade 1* in 8/25 (32%), *grade 2* in 8/25 (32%) and *grade 3* in 9/25 (36%) respectively, and in 30/32 joints. It was graded as 1 in 6/32 joints (20%), 2 in 7/32 joints (23%) and 3 in 17/32 joints (57%) with ultrasound.

TABLE 3: Sensitivities and specificities of radiography and ultrasonography for the diagnosis of OCD involving different sites of the lateral and the medial trochleas of the femur

		Radiography		Ultrasonography	
Trochlea	Sites	Sensitivity	Specificity	Sensitivity	Specificity
Lateral	Proximal	100% (12/12)	100% (6/6)	100% (10/10)	100% (6/6)
	Middle	80% (12/15)	100% (3/3)	100% (12/12)	100% (4/4)
	Distal	80% (4/5)	100% (13/13)	100% (5/5)	100% (11/11)
Medial	Proximal	33% (1/3)	100% (15/15)	33% (1/3)	100% (13/13)
	Middle	0% (0/1)	100% (17/17)	100% (2/2)	100% (14/14)
	Distal	NA (0/0)	100% (18/18)	NA (0/0)	94% (15/16)

Ratios provided between brackets correspond to true positives out of total confirmed positive sites and true negatives out of negative sites for sensitivity and specificity respectively.

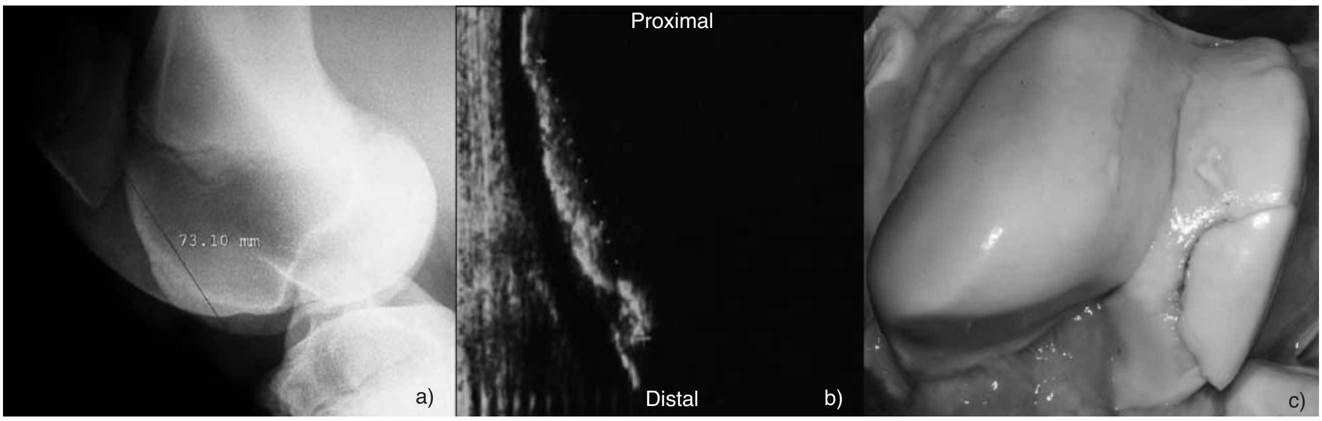

Fig 5: OCD lesion affecting the lateral trochlear ridge of a right femur on radiographic (a), ultrasonographic (b) and post mortem *examination (c). The ultrasonogram shows only part of the lesion as the lesion is longer than the probe.*

Comparison between radiography, ultrasonography, arthroscopy and post mortem *examination*

A total of 18 joints had complete examinations (radiography, ultrasonography, arthroscopy or *post mortem* examination) and were included for this part of the study. All but one of the lesions, detected by radiographic examination, were visible on ultrasound examination. The nondetected lesion was a fragment of 0.9 x 0.4 cm. Ultrasound detected 2 LTR lesions and 3 MTR lesions that were undetected with radiography. The length of these LTR lesions were 0.7 cm and >probe length. One was located on the proximal third but information on the extent of the other was missing. Lesions on the MTR unidentified on radiographs were >probe length, 0.3 and 0.4 cm long, and 0.7 and 0.2 cm deep, respectively. Depth information was missing for the last one. Two were located on the axial aspect of the MTR and information was missing for the third one. Also, ultrasound revealed fragments in 2 joints with MTR involvement that were not visible using radiography. Arthroscopic or *post mortem* examination, available for 18/32 joints, confirmed the ultrasound results in all cases. No false positives were observed. However, an LTR lesion was diagnosed in one joint during the arthroscopic procedure but was not seen during either radiographic or ultrasonographic examination.

The division of the femoral trochlea into thirds (6 sites per joint) allowed the calculation of sensitivity and specificity based on 108 sites for radiography (n = 18) and 96 sites for ultrasound (n = 16 joints, as ultrasound information was missing for 2 joints). Each modality was compared with arthroscopy/necropsy as the gold standard. The results are summarised in Table 3. Radiographic sensitivity for LTR lesions was 80–100% and ultrasound sensitivity was 100%. Radiographic sensitivity for the MTR ranged from 0–33%, and ultrasound sensitivity from 33–100%. Radiographic and ultrasonographic specificities were 100% for all sites on the femoral trochlea, except for the distal third of the MTR, where the ultrasound specificity was 94%.

Figure 5 illustrates a representative OCD lesion on radiographic, ultrasonographic and *post mortem* examination. Spearman's correlations assessing the relationship between synovitis grade and lesion length and depth were not significant for both of the TR on radiographic and ultrasound examinations. A positive correlation was found between the radiographic and ultrasonographic grades of joint effusion (r = 66%, $P<0.001$).

Discussion

Ultrasonography of equine femoral trochleas provided valuable information on the extent of OCD lesions at these sites. Cartilage lesions were identified and the subchondral extent of lesions was visible. Radiographic assessment does not permit evaluation of the femoral trochleas in a lateromedial axis because of the superimposition of bony structures (McIlwraith 1993) but ultrasound enables multiple views in both longitudinal and transverse plans. Consequently, it is an adjunct in the diagnosis of OCD, providing a more complete characterisation of the extent of the problem. On the other hand, because of the absence of easily detectable anatomical landmarks on the femoral trochlea, it is difficult to evaluate OCD lesion length accurately when lesions are longer than the ultrasound probe. Both imaging methods therefore provide complementary information.

The LTR and the MTR were involved in 91 and 17% of cases on radiographic, and in 97 and 25% of cases on ultrasound examinations. The predilection sites reported herein are very similar to those of a previous study in which arthroscopy confirmed radiographically-visible LTR and MTR involvement in 89% and 19% of cases, respectively (Foland *et al*. 1992). Furthermore the proximal and middle thirds of the LTR were most frequently affected. This finding is in agreement with a previous report describing an irregularity or flattening in the subchondral bone of the proximal half of the LTR as the most common defect in the stifle joint (Wright and Pickles 1991). The small number of MTR-affected joints prevented the identification of a predilection site on this ridge. Eleven out of 21 horses (50%) were bilaterally affected in this study. This percentage has found to be as high as 66% of affected horses in some studies (Bohanon 1995). The lower percentage in our study may be due to a smaller sample size or because of a different breed distribution of horses in our region. Nonetheless, this finding underlines the importance of investigating the opposite joint in what is frequently a bilateral condition.

The OCD lesion length in the LTR and the MTR on radiography was not significantly different, although MTR lesions have been reported previously to be less extensive than those of the LTR (McIlwraith 1993). The number with lesions on both trochleas were small (n = 7) and differences may have been observed if a larger number of cases were studied. Lesion length was difficult to assess on ultrasound examination as most lesions were longer than the probe and the exact length was not reported in many cases.

Ultrasound detected 5 TR lesions (3/5 were small lesions) and 2 fragments that were undetected by radiography. They are probably of limited clinical significance because of their small size, although detection of dislodged fragments would be of clinical relevance.

There was a good correlation between synovitis grades on radiographic and ultrasonographic examinations, but surprisingly the grade of synovitis did not correlate with the length of the lesion. Subjectively, OCD lesion grades on ultrasound did not allow the prediction of lesion type on arthroscopy or necropsy. This is attributed to the ability of ultrasound to image the subchondral bone-cartilage interface, which would not always be visible on arthroscopy.

Although ultrasound examination of equine joints has been reported previously (Penninck *et al*. 1990; Dik 1995; Denoix 2003; Koneberg and Edinger 2007), assessment of the sensitivity and specificity of ultrasound for detecting OCD lesions of the femoral trochleas, has not been reported to our knowledge. The radiographic sensitivity for LTR OCD lesions was 80–100%, and ultrasound sensitivity was 100%, both excellent. The sensitivity of ultrasound for lesion detection was better than radiographs for sites in the MTR, and several MTR lesions were detected by ultrasonography but not by radiography. Therefore, ultrasound appears more sensitive for MTR OCD, although the number of cases (n = 16 confirmed by arthroscopy or necropsy) was very small. For this reason, the sensitivity of the 2 imaging techniques at these sites was not compared statistically. The insensitivity of radiographs for OCD lesions of the MTR is also further highlighted by the findings of a previous study in which radiographs detected <50% of arthroscopically-confirmed MTR lesions (Steinheimer *et al*. 1995). Because OCD lesions are not always accompanied by subchondral bone sclerosis and/or heterogeneity, lesions limited to the articular cartilage may go undetected with radiography.

Radiographic and ultrasound sensitivities, in the proximal third of the MTR, were poor and 2/3 joints had false negative results (33% sensitivity for each modality). It is important to note that this case series included only a small number of joints with lesions at the proximal third of the MTR (n = 3) preventing a robust conclusion. In the standing horse, the patella partially limits access to the cranioproximal portion of the femoral trochlea (Penninck *et al*. 1990) and, consequently, proximal trochlear lesions could be missed. The radiographic sensitivity for the middle third of the MTR was 0% and ultrasound sensitivity was 100%. However, only one lesion was diagnosed arthroscopically at this site (0.7 cm) and was not observed on the radiographic examination.

Globally, the specificity was excellent for both the radiographic and ultrasound examinations. The ultrasound specificity of 94% for the distal third of the MTR can be explained by the presence of a fragment trapped in the synovium beside the MTR although the bed of the fragment was identified on the LTR during arthroscopic examination but not during ultrasound.

A limitation of this study is that it was retrospective. In several cases, ultrasound arthroscopic and *post mortem* data were incomplete. The lack of real time recordings on ultrasound examination prevented accurate data assessment. Also, in order to collect data on a larger number of horses, inclusion criteria were broadened, such that not all of the joints were assessed by a gold standard examination. A prospective study with defined parameters would provide more robust data.

In conclusion, ultrasound appears to have some advantages over radiography when evaluating OCD lesions affecting the MTR of the distal femoral trochlea. It allows the early detection of cartilage or discrete subchondral bone change and provides useful adjunct information about lesion extent. It compensates for the lack of sensitivity in radiography, but requires experience in image interpretation, and its value in accurately assessing lesion length, because of probe length, is limited in comparison to radiography. Therefore, as ultrasound and radiography are complementary examinations, it is probably preferable that ultrasound continue to be used in conjunction with radiography in OCD diagnosis in the equine stifle, especially in cases of high clinical suspicion but equivocal radiographic findings.

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