Are distal border fragments of the navicular bone of clinical significance?
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Fragments of the distal border of the navicular bone are identified radiologically with low frequency in horses free from lameness. There is higher frequency of occurrence in horses with foot pain, especially navicular disease. The clinical significance of a fragment per se is controversial. There is limited knowledge about the progression of the lesion and/or lameness. The pathogenesis of fragments is not completely clarified; avulsion fracture or pathological fracture of the navicular bone, fracture of an entheseophyte at the origin of the distal sesamoidean impar ligament (DSIL), or dystrophic mineralisation within the DSIL have been proposed.

Radiological identification of fragments is challenging and in a recent study there was only fair agreement between experienced observers (Groth et al. 2009). Fragments are usually positioned at the junction between the distal horizontal and sloping borders of the navicular bone and are easiest to detect on well-positioned dorsoproximal-palmarodistal oblique images. We routinely acquire two projections, obtained with a slightly different angle of the hoof wall, to reduce the risk of missing potentially significant lesions.

In a retrospective study, 71% of radiologically detectable fragments had a concave defect in the adjacent navicular bone; in 58% of the fragments ill-defined or more discrete radiolucencies were identified in the navicular bone proximal to the fragment (Biggi and Dyson 2012). Radiolucencies at the junction between the distal horizontal and sloping borders of the navicular bone were strongly associated with the presence of osseous cyst-like lesions (OCLLS) detectable on magnetic resonance (MR) images and fragments. Histological evaluation of an OCLL revealed enlarged bone lacunae and replacement of the bone by fibrovascular tissue.

Radiology has a relative poor sensitivity (38.5%) for fragment detection compared with high-field MR images (Biggi and Dyson 2010). However large fragments or those with extensive abnormalities in the adjacent navicular bone seen on MR images were more likely to be identified radiologically than smaller fragments or those without associated osseous changes. Horses with fragments detected radiologically had a higher navicular bone grade compared with horses without fragments, suggesting that these lesions are related to navicular disease.

On both MR images and post mortem examinations fragments are embedded in the DSIL and a bed-like defect is usually identified in the distal border of the navicular bone. We have also observed a significant association between the presence of a fragment detected on high-
field MR images and histological abnormalities of the body of the DSIL in horses with foot pain (Blunden et al. 2006; Dyson et al. 2010). This suggests that desmopathy of the DSIL is part of the pathologic process and is likely to contribute to pain, particularly considering its rich sensory innervation. These findings should be kept in mind when a fragment is identified radiologically, particularly in association with changes in radiopacity of the adjacent navicular bone.

The contribution of a fragment to pain and lameness is usually impossible to quantify, because there are generally other concurrent abnormalities of the podotrochlear apparatus. However, occasionally a fragment is identified with focal adjacent abnormalities of the navicular bone, unassociated with any other detectable lesion which might potentially cause pain and lameness. This was verified post mortem in one horse with low-grade unilateral forelimb lameness localised to the foot (Biggi et al. 2012). On both radiographs and MR images there was a distal border fragment and an OCLL in the adjacent navicular bone. There was focal hyperintense signal within the DSIL adjacent to the fragment. No other abnormalities were identified on low-field MR images and post mortem examination. Histology confirmed areas of fibrocartilaginous metaplasia and clefts within the DSIL around the fragment and focal bone loss within the cortex and spongiosa of the navicular bone adjacent to the fragment. We therefore concluded that a distal border fragment of the navicular bone in conjunction with lesions in the adjacent navicular bone and DSIL can be responsible for lameness in some horses.

We suggest that there is enough evidence to support an association between fragments and both navicular bone pathology and DSIL desmopathy. We believe that although some fragments are not associated with adjacent osseous changes in the navicular bone on MR images, most of the fragments visible on radiographs are associated with extensive abnormalities of the navicular bone. It has been suggested that movement between the fragment and navicular bone may cause pain (Schramme et al. 2005). We do not know if these lesions are progressive and how they may evolve. It is not possible to prove categorically which specific abnormality is responsible for pain and lameness, because frequently several co-exist. However, although fragments can be seen occasionally in clinically sound horses, it is suggested that they should not be ignored as potential contributors to pain and lameness.

References

