Radiographic visualization of microstructural features that predispose proximal sesamoid bones to fracture in racehorses
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In California, one Thoroughbred racehorse dies from a musculoskeletal injury for every 24 Thoroughbred racehorses that participate in a race. Catastrophic racehorse injuries most commonly involve structures that support the fetlock joint, including fractures of the proximal sesamoid bones (PSBs). A focal osteolytic lesion present on the palmar flexor surface of PSBs has been suggested to predispose PSBs to fracture, but this lesion has not been reported using standard clinical radiographic projections. Therefore, we hypothesized a new radiographic technique will allow detection of the lesion that predisposes fetlock proximal sesamoid bones (PSBs) to fracture because a unique radiographic projection will minimize superimposition of other bones over the radiolucent defect. Two groups of intact cadaveric forelimb PSBs were studied: 1) PSBs likely to have the lesion (PSBs from the intact, contralateral limb of 15 case horses with a complete simple transverse fracture of the medial PSB), and 2) PSBs unlikely to have the lesion (from limbs of 15 control horses without a fetlock injury). Selected bones were examined using specific radiographic projections (D80Pr80L-PDiM oblique and modified dorsopalmar views), and microcomputed tomography (microCT) was used as the gold standard for the true presence or absence of the lesion.

One set of PSBs with a complete simple transverse fracture of the medial PSB of one limb and known lesion of the contralateral PSB displayed a 1 cm long region of hyperemia at the fracture margin on the palmar surface, which correlated with the supposed location of the lesion. Using microcomputed tomography, 2 case horses, and none of the control horses, had a single focal osteolytic lesion in the intact (contralateral or matched, respectively) PSB. Both lesions were in the hypothesized anatomic location. A radiographic projection (PL30-DM oblique) was developed to visualize this lesion.

Because of the unexpected low prevalence of lesions in intact PSBs from case horses, an additional objective was added to the study. The new objective was to determine if radiographic features of the intact PSBs were different between case and control horses. The number and width of vascular channels were quantified by analyzing PD radiographs on OsiriX software. Analysis of PD radiographs found statistically significant differences using a Wilcoxon-Mann-Whitney U test among groups regarding vascular channels. Medial PSBs had significantly more vascular channels than lateral PSBs. PSBs from horses with PSB fracture had significantly wider vascular channels than PSBs from control horses. These findings are consistent with the higher prevalence of PSB fractures in the medial PSB and remodeling in bones susceptible to PSB fracture.

In summary, a radiographic projection was determined for one lesion that predisposes to PSB fracture in racehorses and vascular channel radiographic features were found to be associated with horses that incurred PSB fractures. The determination of a novel radiographic projection is important for early detection of mild injuries and prevention of catastrophic PSB fracture in racehorses.