The Prevalence of Radiographic Changes in Thoroughbred Yearlings

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Most Thoroughbred yearlings have some radiographic changes visible in the fetlocks, carpi, tarsi, stifles, or forefeet at the time of the yearling sales. Many of the changes suspected to be clinically important are rare. These data can be used by researchers and clinicians to help focus their efforts on the most common problems and identify yearlings with unusual radiographic changes that may need further investigation. Author’s addresses: Equine Orthopaedic Research Laboratory (Kane, McIlwraith, Park), College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80523; P. O. Box 1351, Fallbrook, CA 92028-1351 (Rantanen); Equine Medical Associates, P. O. Box 13116, Lexington, KY 40583 (Morehead); Rood and Riddle Equine Hospital, P. O. Box 12070, Lexington, KY 40511 (Bramlage). © 2000 AAEP.

1. Introduction
Radiographic examination of Thoroughbreds at the time of the yearling sales is common practice in the U.S. Although, it is generally accepted that most yearlings have some radiographic changes (judged as normal variation or otherwise), there is little data to estimate the prevalence of these changes in Thoroughbred yearlings at the time of the sales. Howard et al. reported on the occurrence of radiographic abnormalities in 582 yearlings offered for sale over a six-year period.1 They reported that fore and hind fetlocks were most commonly affected followed by the tarsi, stifles, feet, and carpi. McIntosh et al. followed the development of over 300 yearlings and documented the occurrence of femoropatellar osteochondrosis.2 The occurrence of selected radiographic changes in clinically normal young horses of other breeds has been investigated in several studies.3–10 A better understanding of the prevalence of radiographic changes in Thoroughbred yearlings at the time of the sales will help practitioners and researchers focus their work on the most commonly affected sites. These data will also help practitioners identify unusual changes that may need further investigation for the complete evaluation of a sale yearling.

The objective of this portion of the Yearling Radiograph Study was to describe the distribution of radiographic changes in yearlings sold at the Keeneland and Fasig-Tipton July and September sales from 1993–1996. Changes that tend to be bilateral or biaxial are noted.

2. Materials and Methods
Radiographs from 1162 pre- and post-sale purchase examinations conducted at the 1993–1996 Keeneland and Fasig-Tipton yearling sales were obtained
from a private practice (Morehead) serving buyers and consignors at these sales. Joint examinations included fore fetlocks (DP, flexed LM, DLPMO, and DMPLO views), hind fetlocks (DP, LM, DLPMO, and DMPLO views), carpi (LM, DLPMO, and DMPLO views), tarsi (DP, DLPMO, and DMPLO views), stifles (LM view), and forefeet (DP and LM views). Joint series with missing or non-diagnostic films for any view of a left and right pair were not included in the analysis.

All of the films were evaluated independently by two authors (Kane and Rantanen) and radiographic changes present were categorized by location and the type of lesion (e.g., flattening, lucency, fragment, etc.). Discrepancies between these two interpretations were resolved using a third assessment (Park) and the consensus opinion to decide the final categorization of changes. Yearlings were then classified as having a radiographic change if they were present in either the left or right limb. If both limbs were affected, the higher (more severe) category was used to classify the horse.

Fore fetlocks and proximal sesamoid bones were analyzed separately from hind fetlocks and sesamoid bones. Linear defects in the proximal sesamoid bones, discussed here as vascular channels, were categorized as regular (≤ 2 mm in width with parallel sides) or irregular (> 2 mm in width or having non-parallel sides) based on their size and shape. Often a vascular channel ≤ 2 mm in width had parallel sides until it widened into a “V” shape 3–4 mm from the abaxial surface. These were categorized as irregular. Radiopacities “flakes” < 1 mm in size with no corresponding defect associated in a joint margin were not categorized as fragments in any joint. Articular fragments must have had a visible defect in the corresponding joint margin or joint surface. The diameter of subchondral cysts was recorded. Cysts were defined as any lucent areas that extended through the subchondral bone. Flat regions were recorded on several joint surfaces (e.g., condyles or sagittal ridge of the distal third metacarpus, lateral and medial trochlea of the talus, etc.). These areas had to have good radiographic alignment to be categorized as flat, because obliquity often makes two partially superimposed curved surfaces seem flattened. Osteophytes in the carpus were measured; in other joints their presence was simply recorded as yes/no. Unless otherwise indicated, percentages reported here are the number of affected yearlings/number of yearlings examined.

3. Results

The 1162 yearlings included in the study represent 7% of all yearlings sold at the same sales during this time. Six hundred seventy-three (58%) were colts and 489 (42%) were fillies. Most (1074, 92%) of the yearlings were actually sold with only 80 (7%) not reaching their reserve price and eight (1%) being withdrawn prior to entering the sale ring. The typical price of yearlings included in the study (median $40,000; mean $70,474 ± 2584 SEM) was higher than that for all other yearlings sold at the same sales but not included in the study (median $20,000; mean $45,596 ± 676).

There were 1127 fore fetlock, 1102 hind fetlock, 1130 carpal, 1101 tarsal, 660 stifle, and 300 forefoot series that were complete and included in the analyses.

A. Fore Fetlocks and Proximal Sesamoid Bones

Proximal dorsal P1 fragments were present in 18 (1.6%) yearlings and were usually unilateral. Unilateral proximal palmar P1 fragments were found in five (0.5%) yearlings (1 articular, 4 non-articular). Distal third metacarpal or proximal P1 cysts were found in eight (0.7%) yearlings, one of which had bilateral cysts. Three of the cysts recorded were 5 mm in diameter; the others were 2, 6, 7, 10, and 11 mm in diameter. Changes were recorded in the distal dorsal region of the third metacarpus (includes proximal third of the dorsal sagittal ridge) in 380 (33.8%) yearlings. Most of these were a semicircular notch with a well defined border at the proximal aspect of the dorsal sagittal ridge. Often bilateral, these are usually about 3 mm across (this is often regarded as a “normal” change). However, 22 yearlings (2.0%) had an irregularly shaped lucency (Type I lesion) in this location that was often bilateral. Eight horses (0.7%) had fragments (Type II lesion) and one horse (0.1%) had a loose body (Type III Lesion) in this location. These lesions were all unilateral. Flattening of the distal sagittal ridge of the third metacarpus was noted in 110 (9.8%) yearlings and a lucency was recorded in this location on 196 (17.4%). The lucencies were visible on the DP and/or LM views and were most often bilateral. Flattening of the distal palmar third metacarpal condyles was present on 461 (40.9%) yearlings, but lucencies in this location (often referred to as palmar metacarpal disease or traumatic osteochondrosis) were only found in four horses (0.4%). Palmar supracondylar lysis of the third metacarpus was present in 54 (4.8%) yearlings with 30 (2.7%) classified as slight and 24 (2.1%) as moderate or extreme. These changes were also usually bilateral. All of the radiographic changes that tended to be unilateral in the fore fetlocks seemed equally distributed between left and right limbs.

Twenty-nine (2.6%) yearlings had elongated proximal sesamoid bones in the forelimbs. Elongation was defined as a greater than 2 mm difference in length between biaxial sesamoids in an attempt to account for the lateral sesamoid which tends be slightly longer than the medial. Still, elongation of the lateral sesamoid was recorded slightly more frequently than elongation of the medial sesamoid. Independent of sesamoid length, abnormally shaped (proximal, distal, abaxial, or overall enlargement) fore sesamoids were recorded for 34 (3.0%) yearlings and were found almost twice as often on the medial sesamoid compared with the lateral. Forelimb ses-
amoid fractures (apical, abaxial, basal) were found in 11 (1.0%) yearlings. Only one fracture was of a lateral sesamoid, and two yearlings had bilateral medial sesamoid fractures. Osteophytes were not recorded on any fore sesamoids, however entheseophytes at the attachments of the suspensory or distal sesamoidean ligaments to the proximal sesamoid bones were recorded on 14 (1.2%) yearlings. Circular lucencies in the sesamoids were found in 164 (14.6%) yearlings. These were usually only found in one fore sesamoid per animal and were almost twice as common on the medial sesamoid compared with the lateral.

Less than half of all the fore proximal sesamoid bones examined had regular vascular channels and less than 10% had more than three. Regular vascular channels were evenly distributed between limbs and between biaxial pairs of sesamoids. More than half of the fore proximal sesamoid bones examined had irregular vascular channels. (Note that regular and irregular here refers to size and shape, not how frequently the changes occur.) Irregular vascular channels were more common in the medial sesamoid bone. Overall, 26 (2.3%) yearlings were categorized as not having vascular channels in a fore sesamoid, because most had at least one vascular channel in at least one sesamoid.

B. Hind Fetlocks and Proximal Sesamoid Bones
Proximal dorsal P1 fragments were more common on the hind limbs compared with the forelimbs. Thirty-six (3.3%) yearlings had these fragments, and one yearling had bilateral fragments in this location. Proximal plantar fragments were also more common on the hind limbs. Sixty-five yearlings (5.9%) were affected; 20 (1.8%) had non-articular fragments and 45 (4.1%) had articular fragments. Four yearlings had bilateral proximal plantar P1 fragments (2 non-articular and 2 articular). Only two (0.2%) yearlings had distal third metatarsal or proximal P1 cysts in the hind fetlocks. Three hundred thirty-four (30%) yearlings had some vascular channels in at least one sesamoid. Most had at least one vascular channel in a hind sesamoid. Many had more than one vascular channel in at least one sesamoid.

Seventy-seven (7.0%) yearlings were categorized as not having any vascular channels in a hind sesamoid. Most had at least one vascular channel in at least one sesamoid. Less than 30% of all hind proximal sesamoid bones examined had regular vascular channels and less than 1% had more than three. Regular vascular channels were evenly distributed between limbs and between biaxial pairs of sesamoids. Irregular vascular channels were more common in the medial sesamoid bone. Overall, 26 (2.3%) yearlings were categorized as not having vascular channels in a hind sesamoid. Most had at least one vascular channel in at least one sesamoid.

C. Carpi
Dorsal medial intercarpal joint disease (characterized by a rounded appearance to the radial carpal bone and/or a thickened dorsal cortex, proliferative change, entheseophyte, or fragment involving the radial carpal or third carpal bones) was found in 30 (2.7%) of the yearlings examined. These changes were most often unilateral and affected left and right limbs equally. Palmar lucencies in the ulnar carpal bone were detected in 227 (20.1%) yearlings, were usually unilateral, and affected left and right limbs equally. Nine (0.8%) yearlings had carpal fragments that ranged in size from 2 to 10 mm. Nineteen (1.7%) had carpal osteophytes ranging in size from 1 to 4 mm, and three (0.3%) had subchondral cysts in a carpal bone ranging in size from 4 to 10 mm. Carpal fragments, osteophytes, and subchondral cysts tended to be evenly distributed between left and right limbs. Accessory carpal fractures affected four (0.4%) yearlings.
D. Hocks

Five (0.5%) yearlings had articular lucent areas in the medial malleolus. Fragments or concavities of the distal intermediate ridge of the tibia were found in 48 (4.4%) yearlings and were evenly distributed between left and right limbs. Most of the intermediate ridge lesions were unilateral. One yearling had a flattened lateral trochlear ridge of the talus and 14 (1.3%) had luencies and/or fragmentation in this location. Flattening of the medial trochlear ridge was more common (12 yearlings, 1.1%), but only seven (0.6%) yearlings had luencies or fragments on the medial trochlear ridge. “Dewdrop lesions” on the distal medial trochlear ridge were found in 39 (3.5%) of the yearlings examined, and fragments at this location were found in eight (0.7%) yearlings. Osteophytes or enthesophytes at the distal intertarsal or tarsal metatarsal joint margins were found in 193 (17.5%) of the yearlings, and subchondral luencies in these joints were found in 80 (7.3%) yearlings. Wedging or collapse of a distal tarsal bone was present in 13 (1.2%) of the yearlings examined and was usually unilateral.

E. Stifles

Thirty-eight (5.8%) yearlings had changes on the lateral trochlear ridge of the femur. Flattening was present in four (0.6%) yearlings and luencies and/or fragmentation was detected in 34 yearlings (5.1%). Two (0.3%) yearlings had a lucent area with or without a fragment on the medial trochlear ridge. These femoral trochlear ridge lesions tended to be unilateral, but also occurred bilaterally. One (0.2%) yearling had a lucent area in the trochlear groove of the femoropatellar joint, two (0.3%) had luencies in the patella, and one (0.2%) had fragmentation of the distal patella. The medial femoral condyle and proximal tibia could only be visualized in 170 yearlings. No subchondral cysts were detected in these animals.

F. Forefeet

Signs of pedal osteitis (proliferation on the dorsal surface of P3, remodeling of the tip of P3) were detected in 33 (11%) of the yearlings with radiographs of the forefeet. Other changes in the forefeet were found in 45 (15%) yearlings. These included 18 (6%) animals with prominent synovial fossae in the navicular bone, 15 (5%) with palmar process fragments, two (0.6%) with spurs on the extensor process of P3, and one (0.3%) with an extensor process fragment.

4. Discussion

Most yearlings examined in this study had some radiographic changes noted in the fetlocks, proximal sesamoid bones, carpi, tarsi, stifles, or forefeet. Some of the changes recorded are commonly thought to be incidental findings. They were included in this survey for a complete and unbiased assessment of what a practitioner can expect to find when reviewing sale radiographs.

Comparison of the prevalence of changes found in this study with other published work is difficult. Most studies have grouped many specific changes under one broad diagnosis (e.g., OCD of the fetlock). In this study we have kept as much detail as possible in the classification system used to categorize each horse. Another survey of Thoroughbred yearlings in central Kentucky by Howard et al. used the number of joints examined as a denominator without accounting for the number of horses (e.g., number of fetlocks diagnosed with OCD/number of fore fetlocks examined). Because of this and the rarity of most specific changes, comparisons between these studies should be interpreted with caution. Apical fractures of the fore proximal sesamoid (2/2254 joints examined in this study vs. 5/1018 in Howard et al.) seem less common in this study. Proximal dorsal P1 fragments in the hind fetlocks (37/2204 joints examined in this study vs. 24/700 in Howard et al.), basal fractures of a hind sesamoid bone (5/2204 joints examined in this study vs. 4/700 in Howard et al.), and medial malleolus lesions in the tarsi (5/2202 joints examined in this study vs. 5/710 in Howard et al.) all seem to be less common in this study. On the other hand, osteophytes at the joint margins of the distal intertarsal and tarsometatarsal joints (263/2202 joints examined in this study vs. 16/710 in Howard et al.) seem more common in this study. It is unlikely that the differences noted above would be statistically significant if appropriate variance estimates could be included.

Most of the specific radiographic changes observed in this study are rare. This presents unique challenges to clinicians and researchers trying to identify changes that are clinically significant. With thousands of Thoroughbred yearlings sold at auction every year in this country alone, however, even rare changes can present a problem for the sale veterinarian. This study provides data that can be used by researchers and clinicians to help focus their efforts on the most common problem areas and identify yearlings with unusual radiographic changes that may need further investigation.

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References and Notes


