How to Interpret Radiographs of the Stifle Joint of the Young Performance Horse

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1. Introduction

Routine radiographic evaluation of young performance horses has become commonplace in Thoroughbreds (TB) but also occurs in other performance breeds. This practice has resulted in the frequent discovery of radiographic abnormalities (RA) that are often clinically silent but can cause concern for buyers and sellers of young performance stock. The prevalence of radiographic developmental orthopedic abnormalities with or without clinical significance in 6-month-old horses has been reported to be 25% in Warmbloods, 41% in Standardbreds, and 34% in TB.1 In TB yearlings intended for racing, 86.3% exhibit RA2; in young Standardbreds, 42%;3 in yearling Warmblood horses, 69.5%;4 and in 1- and 2-year-old Quarter Horses intended for cutting, 89%.5 Predicting the significance of these RA to later performance can be challenging and frustrating for buyers and sellers, which is further complicated by the possibility of treatment, including surgery, on prognosis.

2. Identifying RA

Because radiographic images are generally reviewed in sets of projections of a joint, this paper will discuss abnormalities by projection. Examiners are of course responsible for reading the entire image; however, there are areas that are more commonly affected, and they should receive the closest scrutiny. RA best detected on a projection are listed in bold but should be confirmed on other projections when possible. Finally, readers should always consider three general factors when reviewing radiographic images:

1) Make sure that the films are of the correct horse.
2) Make sure the date is appropriate and consistent.
3) Make sure all required views are present and of acceptable quality.

Standard radiographic projections of the stifle joint (3 views)

Lateral to medial, 20° caudoproximal-craniodistal (CC20°), and caudolateral to craniomedial 20° oblique

Lateral to medial projection (Fig. 1).

Areas of greatest concern in the lateral projection of the juvenile stifle include the trochlear ridges, the
articular surface of the patella, and the cranial proximal surface of the tibia. The caudal aspect of the stifle joint is often not included on the lateral to medial projection, which is acceptable if it is well projected on other views (Fig. 1).

Abnormalities best assessed on the stifle lateral to medial projection are listed below. If the RA is in bold type, it is the best projection to detect that RA.

(1) **Osteochondral fragments or lucencies in the lateral trochlear ridge (LTR)**
(2) **Osteochondral fragments or lucencies in the medial trochlear ridge**

**Twenty-Degree Caudoproximal-Craniodistal Projection of the Stifle Joint** (Fig. 2)

The areas of greatest concern on the 20° caudo proximal-craniodistal projection of the juvenile stifle are the medial femoral condyle, the proximal medial tibial plateau, the medial intercondylar eminence of the tibia including the attachment of the cranial menisco-tibial ligament, the proximal lateral tibial plateau, and the lateral femoral condyle.

Abnormalities best assessed on the stifle 20° caudoproximal-craniodistal projection are listed below. If the RA is in bold type, it is the best projection to detect that RA.

**Case Prognosis Summary**

<table>
<thead>
<tr>
<th>Performance Goal</th>
<th>Surgery</th>
<th>Excellent</th>
<th>Good</th>
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</table>
(1) **Lucencies and sclerosis in the medial femoral condyle (MFC)**
(2) **Osteophytes on the medial intercondylar eminence, proximal medial tibial plateau, or proximal abaxial articular margin of the MFC**
(3) Lucencies and sclerosis in the medial tibial plateau
(4) Lucencies and sclerosis in the lateral tibial plateau
(5) Lucencies and sclerosis in the lateral femoral condyle
(6) Sclerosis at the attachment of cranial menisco-tibial ligament

**Case Prognosis Summary**

**Case 3. Large Irregular Lucency in the Proximal Tibia**

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**Case 4. Lucencies of the Lateral Trochlear Ridge and Patella**

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**Caudolateral to Craniomedial 20° Oblique Projection of the Stifle Joint** (Fig. 3)

The areas of greatest concern on this view include the medial femoral condyle, the medial tibial plateau, the proximal lateral tibial plateau, and the LTR.

Abnormalities best assessed on the caudolateral to craniomedial 20° oblique projection are listed below. If the RA is in bold type, it is the best projection to detect that RA.

(1) **Lucencies and sclerosis in the medial femoral condyle**
(2) **Osteochondral fragments or lucencies in the LTR**
(3) Lucencies and sclerosis in the medial tibial plateau
(4) Lucencies and sclerosis in the lateral tibial plateau

Fig. 3. Caudolateral to craniomedial 20° oblique projection. This horse has a large irregular lucency in the proximal-lateral tibial plateau (white circle and arrows). This radiograph will be discussed by the panel as Case 3.

Case 4. Lucencies of the lateral trochlear ridge and patella.
Stifle radiographic abnormalities are common in young performance stock and have been reported to have a prevalence as high as 45% in 1- to 2-year-old Quarter Horses at auction. Table 1 summarizes the reported prevalence by breed.

3. Determining the Significance of an RA to Performance

There are several studies of young stock that have examined associations between stifle RA and performance. These studies can be challenging to interpret by strict statistical methods because they have many confounding factors, including varying definitions of RA and incomplete outcome information, usually racing data only.

Because of the low numbers of affected horses, subclassifying lesions (size, severity, number of limbs affected, etc) to determine prognosis is usually not possible. However, these studies do have important information to help guide veterinarians examining young performance horses. Some stifle RA in these studies have been associated with poorer racing outcomes ($P \leq 0.05$): debrided MFC subchondral bone cyst (SBC) (versus sibling controls) and large articular communication of MFC SBC after debridement and osteochondrosis (OCD) of LTR and MFC SBC $>6 \text{ mm in depth}$. RA in the stifle associated with a tendency ($P < 0.2$) for poorer racing performance include changes in the LTR of the femur and fragmentation of the distal patella.

### Case Prognosis Summary

**Case 5. Large Calciosis Circumscripta, Proximal Tibia, Dorso-Lateral**

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**Case Prognosis Summary**

**Case 6. Large LTR Lucency With Fragments**

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Many publications focus on the treatment of a specific stifle lesion, and some of these studies have been able to grade lesions and document an effect of severity or size on prognosis. Clinicians must apply clinical judgment on the basis of their experience with RA in young horses, carefully interpret available studies, and closely evaluate the appearance and clinical presentation of a specific RA.

Table 1. Prevalence of Stifle Radiographic Abnormalities in Young Performance Horses

<table>
<thead>
<tr>
<th>Stifle Radiographic Abnormality</th>
<th>Breed</th>
<th>Prevalence</th>
<th>References</th>
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<tbody>
<tr>
<td>Lateral trochlear ridge RA</td>
<td>Thoroughbred</td>
<td>36%</td>
<td>6</td>
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<tr>
<td>Lateral trochlear ridge OCD</td>
<td>Thoroughbred</td>
<td>0–4%</td>
<td>2, 7–9</td>
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<tr>
<td>Lateral trochlear ridge OCD</td>
<td>Standardbred</td>
<td>10%</td>
<td>10</td>
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<tr>
<td>Femoropatellar joint RA</td>
<td>Warmblood</td>
<td>39%</td>
<td>4</td>
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<tr>
<td>Lucencies in medial femoral condyle</td>
<td>Thoroughbred</td>
<td>16%</td>
<td>9</td>
</tr>
<tr>
<td>RA in medial femoral condyle</td>
<td>Quarter Horse</td>
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<tr>
<td>Subchondral bone cyst medial femoral condyle</td>
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<td>1.7–3.6%</td>
<td>2, 8, 9</td>
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<td>OCD any location</td>
<td>Thoroughbred</td>
<td>3.8–8.0%</td>
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<tr>
<td>RA any location</td>
<td>Quarter Horse</td>
<td>43%</td>
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Case Prognosis Summary

Case 7. Flattened Proximal LTR

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Case 8. Shallow and Wide MFC Lucency With Deeper Sclerosis

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<td>General purpose</td>
<td>No</td>
<td>owner/</td>
<td>buyer</td>
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4. Prognosis for Stifle RA After Rest or Surgery

Prognoses include the following:

- Femoropatellar OCD after arthroscopic debridement (multiple breeds): 64% returned to intended use, higher success rate was achieved with lesions <20 mm, higher success rate achieved if operated as 3-year-old versus yearling.\(^{16}\) Warmbloods had 66% full return, 83% if a return to lesser activity was included; deeper lesions led to a worse prognosis.\(^{17}\)
- Femoropatellar OCD after debridement of loose pieces and reattaching loose osteochondral flaps with absorbable pins, 95% were successful.\(^{18}\)
- Subchondral bone cysts of the medial femoral condyle after 6 months’ rest, 50% full recovery, with an additional 20% improved.\(^{19}\)
- Subchondral cystic lesions of medial femoral condyle after debridement: 64% to 74% returned to soundness.\(^{20,21}\) Articular openings >15 mm had a worse prognosis.\(^{21}\)
- Subchondral bone cyst injected with corticosteroids: 67% successful. Unilaterally affected horses had higher success (90%) and those without DJD also had a better rate of success (87%).\(^{22}\)
- Subchondral bone cysts debrided and filled with bone substitute, growth factors, and chondrocytes: 74% were successful.\(^{23}\)

5. Cases

The summary prognosis charts (cases 1–10) with each image are predicated on the lesion being detected in a yearling intended for one of the four disciplines. The focus is on performance and not resale blemishes. The prognosis given to a horse owner and the prognosis given to a potential buyer, if different, is indicated.

<table>
<thead>
<tr>
<th>Case Prognosis Summary</th>
<th>Case 9. Large MFC Subchondral Bone Cyst</th>
<th>Case 10. Fragment Between Intercondylar Eminences</th>
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