Additional Radiographic Views of the Pelvis and Pelvic Limb in Dogs*

Kansas State University
H. T. Meier, DVM
D. S. Biller, DVM, DACVR
M. Lora-Michiels, MV†
J. J. Hoskinson, DVM, DACVR

ABSTRACT: Several studies have described additional radiographic views of the pelvis and pelvic limb that may help diagnose specific osseous abnormalities in dogs. For example, distraction views of the coxofemoral joints have been described in the assessment of hip dysplasia. Veterinarians may find this summary paper useful because it provides a single source of information on selected additional radiographic views of the canine coxofemoral, stifle, and tarsal joints. These views will be applicable when osseous lesions are poorly visualized on routine views.

This article describes routine radiographic views, common indications, and diseases for which radiographic evaluation of the canine pelvic limb and pelvis is necessary. Also provided are written and photographic descriptions of how to obtain many additional radiographic views (Table 1). It is important for practitioners to remember that radiographic lesions may not be visualized even if there are clinical signs present because of the origin or early stage of a disease process.

COXOFEMORAL JOINT

Routine radiography of the coxofemoral joint includes mediolateral and extended ventrodorsal views.¹,² Radiographs help diagnose common coxofemoral joint abnormalities such as fractures, neoplasia, and ligamentous instability leading to osteoarthrosis. A thorough history and physical examination must be ob-

*†A companion article entitled "Additional Radiographic Views of the Thoracic Limb in Dogs" appeared in the September 2001 (Vol. 23, No. 9) issue of Compendium.

¹Dr. Lora-Michiels is now affiliated with North Carolina State University.
tained to determine the region of radiographic interest.

Dogs with hip dysplasia usually present with clinical signs of pelvic limb lameness, reluctance to rise and exercise, and pain on hip extension and flexion. The Orthopedic Foundation for Animals recommends routine extended ventrodorsal views for evaluating hip dysplasia. Additional views used to assess hip dysplasia include distraction and compression of the coxofemoral joint. Only PennHIP®-certified veterinarians are able to perform these techniques; therefore, these techniques are not described in this paper. For veterinarians who are not PennHIP®-certified, a stress ventrodorsal view can be used to evaluate dysplasia because it allows assessment of coxofemoral joint laxity. To obtain this view, the patient should be positioned in dorsal recumbency. The femurs should be placed at a 60° angle from the table, and the stifles should be internally rotated while applying a craniodorsal push (Figure 1). The dorsal acetabular rim may demonstrate evidence of degenerative changes that are secondary to hip dysplasia or trauma. Routine views of the coxofemoral joint are usually inadequate for visualization of the dorsal acetabular rim. Therefore, if assessment of this region is indicated, a dorsal acetabular view should be obtained. This view will allow the best visualization of the acetabular rim and femoral head. To obtain this view, the patient should be placed in sternal recumbency with the hindlimbs pulled cranially. The femurs should be parallel to the long axis of the body. The tarsus should be elevated from the table by a 2-inch spacer to allow the ischium to be more cranial with respect to the sacrum (Figure 2).

Table 1. Radiographic Views for Detecting Various Osseous Abnormalities of the Pelvic Limb

<table>
<thead>
<tr>
<th>Joint</th>
<th>View</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td>PennHip®, stress ventrodorsal view, dorsal acetabular rim view, flexed ventrodorsal view</td>
<td>Fractures, neoplasia, ligamentous instability, osteoarthrosis</td>
</tr>
<tr>
<td></td>
<td>Caudocranial (medial or lateral) stress view, skyline view of the patella</td>
<td>Osteochondrosis, fractures, neoplasia, ligamentous instability</td>
</tr>
<tr>
<td>Stifle</td>
<td>Plantarodorsal oblique view, hyperextended or hyperflexed mediolateral view, dorsoplantar flexed skyline view, plantarodorsal (medial or lateral) bending force view</td>
<td>Osteochondrosis, fractures, neoplasia, ligamentous instability</td>
</tr>
</tbody>
</table>

Figure 1—(A) Demonstration of patient positioning for a stress ventrodorsal view of the coxofemoral joint. The stifles are internally rotated, and a craniodorsal force is applied to the femurs (arrow). (B) Stress ventrodorsal radiographic view of the coxofemoral joint. This radiograph reveals no coxofemoral joint abnormalities. Note the adequate congruency of the femoral head within the acetabulum bilaterally.
Dogs that present with a history of trauma to the proximal femur and have clinical signs of focal swelling, crepitation, and hindlimb lameness should be radiographed to determine the extent of the trauma. Routine radiography may not definitively diagnose femoral neck fractures due to superimposition of osseous structures or inadequate x-ray beam orientation through the fracture site (not tangential to fracture site). Therefore, a flexed ventrodorsal view of the coxofemoral joint may be used to assess femoral head and neck traumatic lesions because it allows a different view of the proximal femoral anatomy (Figure 3).

**STIFLE**

Routine radiography of the stifle includes mediolateral and caudocranial views.\(^1\,^2\) Stifle radiography is helpful when diagnosing common lesions such as osteochondrosis, fractures, neoplasia, and ligamentous instability leading to osteoarthritis.

Common clinical signs of ligamentous instability or avulsion fractures include weight-bearing to non-weight-bearing lameness, joint effusion, pain on palpation, and joint laxity (cranial cruciate rupture or collateral ligament rupture). Routine stifle radiography usually will not adequately diagnose these lesions. Therefore, stress radiography should be used to assess ligamentous instability or small avulsion fractures.\(^9\) To obtain these views, the patient should be placed in sternal recumbency. The stifle

---

**Figure 2**—(A) Demonstration of patient positioning for a dorsal acetabular rim view. A restricting device has been used to allow the femurs to be parallel with the long axis of the body. Note how the tarsus is slightly elevated with the use of a sandbag (arrow). (B) Dorsal acetabular rim radiographic view of the coxofemoral joint. This view allows visualization of the dorsal acetabular rim without superimposition of other osseous structures (arrows). (A = sacrum; B = wing of the ilium; C = femoral head.)

**Figure 3**—(A) Routine ventrodorsal radiographic view of the coxofemoral joint. The left femoral neck has radiolucent defects when compared with the contralateral neck. (B) Flexed ventrodorsal radiographic view of the coxofemoral joint. Note how a fracture of the left femoral neck (arrows) is better visualized when compared with the routine ventrodorsal view seen in Figure 3A. This is because the x-ray beam is now tangential to the femoral neck.
should be gently pushed laterally with a wooden spoon to evaluate the medial region. This same technique can be performed to evaluate the lateral region of the stifle (Figure 4). In a recent report, mediolateral radiography of the stifle in neutral and compression positions were obtained to assess the degree of tibial displacement with respect to the femur. Significant differences were not found between normal stifles and joints with partial cranial cruciate ligament rupture. This report concluded that tibial displacement could not be used to assess the degree of cranial cruciate damage.

Fractures, inflammatory disease, or patella luxation can be visualized using a nonroutine skyline view. The skyline view allows transverse and articular visualization of the patella and trochlear ridges of the femur. To obtain this view, the patient should be placed in sternal recumbency. The affected pelvic limb should be flexed while the femur is positioned perpendicular to the tabletop. The x-ray beam should be vertically centered over the patella (Figure 5).

TARSUS

Routine radiography of the tarsus includes mediolateral and plantarodorsal views. Tarsal radiography can be used to diagnose common abnormalities such as osteochondrosis, trauma (e.g., luxations, fractures), neoplasia, and ligamentous instability leading to osteoarthrosis.

Dogs that present with historical tarsal trauma usually have clinical signs of non-weight-bearing lameness and tarsal joint effusion as well as possible crepitation and joint laxity. Fractures of individual tarsal bones (e.g., central tarsal bone fractures) that are seen in racing greyhounds are usually challenging to diagnose because of osseous superimposition on standard routine views. These and other osteochondral lesions can be diagnosed by using oblique views.

To obtain a dorsomedial to plantarolateral oblique view, the patient should be placed in sternal recumbency. The distal limb should be internally rotated and the x-ray beam centered.
vertically on the tarsus. This view will allow adequate visualization of the dorsolateral and plantaromedial margins of the tarsal bones. To obtain a dorsolateral to plantaromedial oblique view, the patient should be placed in sternal recumbency and the distal limb externally rotated (Figure 6). This view will allow adequate visualization of the dorsomedial and plantarolateral margins of the tarsal bones. We have made these oblique views routine practice when evaluating fractures.

We use oblique views to identify osteochondral lesions because they allow better visualization of view-dependent osseous margins. Additionally, other nonroutine views have been described to further assess osteochondrosis. Hyperextended and hyperflexed lateral views can be obtained for the affected region of the condyle.17,20 A flexed dorsoplantar skyline view of the talocrural joint can also be obtained to visualize the articular margin of the distal tibia, the lateral malleolus, and the nonsuperimposed articular surface of the trochlear ridges of the talus.21 To obtain a dorsoplanatar skyline view, the patient should be placed in dorsal recumbency and the tarsal joints placed on a cassette elevated from the table with a box or stand. The x-ray beam should be centered at the affected talocrural joint. The tarsus should be flexed until it forms a 10° to 15° angle with the x-ray beam (Figure 7). This may also be a good view to determine whether the distal tibial fracture is articular.

Tarsal ligamentous injuries, osteochondral fragments, and osteochondral fractures that may not be identified on routine radiographic views can be identified using additional traction force stress views.9 To obtain these views, the patient should be placed in sternal recumbency and the affected tarsus positioned on a cassette. The tarsus should be gently distracted proximally and distally. Bending forces can be applied to open the joint medially or laterally as described for the carpus. These views may demonstrate widening of the medial or lateral region of the tarsus if ligamentous instability is present. To obtain these views, the affected tarsus should be placed on the cassette while the patient is in sternal recumbency. The lateral region of the tarsus can be evaluated by gently bending the medial region of the tarsus with a wooden spoon (Figure 8). This stress view can be obtained for the medial region of the joint using the same technique.

**CONCLUSION**

Additional radiographic views of the canine pelvis and pelvic limb may be necessary to diagnose challenging lesions that are not seen on routine views because of osseous superimposition. This paper outlines several additional views that can be used to better visualize these challenging orthopedic lesions. They are easy to obtain with practice and may potentially provide a definitive diagnosis.

---

**Figure 6A**

**Figure 6—(A) Demonstration of patient positioning for a dorsolateral to plantaromedial oblique view of the tarsal joint (arrow). The patient is placed in sternal recumbency. The affected tarsal joint is caudally extended and placed on the cassette. (B) Dorsolateral to plantaromedial oblique radiographic view of the tarsal joint. Note the subluxation of the central tarsal bone consistent with a central tarsal bone fracture (arrow). This oblique view allows visualization of the dorsomedial portion of the tarsal joint. Osseous superimposition of the central tarsal bone occurs with routine views.**

**Figure 6B**
REFERENCES


ARTICLE #2 CE TEST

The article you have read qualifies for 1.5 contact hours of Continuing Education Credit from the Auburn University College of Veterinary Medicine. *Choose the best answer to each of the following questions; then mark your answers on the postage-paid envelope inserted in Compendium.*

1. Which radiographic view for hip laxity may be used without the requirement of a specially certified veterinarian?
   a. extended ventrodorsal
   b. dorsal acetabular rim
   c. flexed ventrodorsal
   d. a and b

2. Which additional radiographic view may be indicated to better visualize a femoral neck fracture?
   a. ventrodorsal oblique

3. If joint laxity is demonstrated on the medial side of the stifle during a physical examination, which radiographic view would best be able to diagnose ligamentous instability?
   a. caudocranial oblique
   b. mediolateral hyperextended
   c. caudocranial with bending force applied laterally
   d. caudocranial with bending force applied medially

4. Which additional radiographic view may demonstrate evidence of hip dysplasia or trauma associated with the acetabular rim?
   a. flexed ventrodorsal
   b. dorsal acetabular rim
   c. extended ventrodorsal
   d. ventrodorsal oblique

5. Which view allows the best visualization of the trochlear ridges of the talus?
   a. flexed dorsoplantar skyline
   b. plantarodorsal hyperextended
   c. mediolateral flexed
   d. hyperextended dorsoplantar skyline

6. The skyline view of the patella will allow visualization of which structure?
   a. cranial surface
   b. articular surface
   c. trochlear ridges of the talus
   d. a and b
   e. all of the above

7. Which view allows the best visualization of a central tarsal bone fracture and luxation?
   a. dorsolateral to plantaromedial oblique
   b. mediolateral flexed
   c. dorsoplantar
   d. dorsomedial to plantarolateral oblique

8. What osseous structure is well visualized with the dorsoplantar skyline view of the tarsal joint?
   a. medial malleolus
   b. troclear ridges of the talus
   c. sustentaculum tali
   d. a and b
   e. all of the above

(continues on page 886)
9. Why can osseous lesions be better visualized with additional views?
   a. less superimposition of osseous structures
   b. x-ray beam is oriented tangential to the lesion
   c. less superimposition of soft tissue structures
   d. a and b
   e. a, b, and c

10. Which additional view may not be helpful in demonstrating osteochondrosis of the tarsal joint?
    a. hyperextended mediolateral
    b. dorsoplantar flexed skyline
    c. dorsoplantar oblique
    d. hyperflexed mediolateral
    e. all of the above