**RADIOGRAPHY**

**Radiography of the Digital Region**

Radiography can help identify the site of lameness and provide information about the stage to which the pathology has progressed. This helps in determining the most advantageous treatment. When pathologic changes are seen in the region of the distal interphalangeal joint, tissue damage is often rapid and severe.

Before a radiograph is taken, the interdigital space and both claws should be cleansed thoroughly, and both claws should be lightly trimmed. If this is not done, false images or shadows may mask abnormalities present in the claws. The digits can be viewed radiographically using 4 angles or projections.

In the **dorsopalmar/plantar projection**, the image produced shows all of the major bones and joints without overlap. This view allows diagnosis of many diseases of the bovine foot.

In the **oblique projection**, the plate is positioned beneath the claw and the head of the machine is placed dorsad to the digits and rotated backward at a 45° angle. Because cattle have 2 digits that overlap one another when viewed radiographically from the side, the clarity of an abnormality may be obscured. The oblique view allows the digit to be viewed from such an angle that 1 claw appears to be behind the other, which gives a much clearer picture than can be obtained when the digits are superimposed. Because each digit is projected differently on an oblique view, it is best to compare 2 radiographs of oblique views taken at comparable but opposite angles.

The **lateromedial or mediolateral projection** is generally of much less value than the oblique view. However, because positioning is relatively easy, this view is useful for evaluating fractures, fracture repairs, and luxations.

In the **axial projection**, a lateromedial or mediolateral view of a single claw is accomplished by placing a nonscreen film (eg, a paper “cassette”) between the digits. This view produces a good image of the affected distal phalanx and, if interdigital soft-tissue swelling is not too great, the distal interphalangeal joint.

***Radiographic Analysis and Interpretation***

A number of factors should be considered in radiographic analysis and interpretation. Age differences can be seen radiographically as differences in skeletal development. In calves, physes are present in the distal metacarpus and metatarsus and at the proximal ends of the proximal and middle phalanges. In a very young calf, the distal phalanges may be incompletely ossified so that the bones appear small, and their distal ends are rounded and indistinct. The subchondral bone may appear indistinct and finely irregular; this should not be mistaken for the subchondral bone lysis that is seen in septic arthropathy.

Diseases stimulating periosteal new bone in cattle (such as corkscrew claw and post-recovery septic arthritis) can cause marked changes in bone contour and increased bone opacity.

Slight bony changes at articular margins and musculotendinous attachments are commonly seen on radiographs of older cattle. Roughening of the distal surface of the distal digit is a normal sign of aging. Changes that occur during the normal aging process should not be confused with active bony changes.

Reactive new bone (osteophyte, enthesiophyte, or exostosis) that has been present for some time has a distinct border and a rough outline, and the opacity is normally even. Active new bone has an indistinct border and a rough outline, and the opacity is uneven.

Diffuse loss of bone opacity occurs in subacute laminitis, nutritional bone disease, and after limb immobilization. Focal or localized loss of bone opacity occurs in bone infection (osteomyelitis) or inflammation (osteitis), early fracture healing, and with defects in endochondral ossification (osteochondrosis).

Increase in joint width is caused by the presence of increased fluid in the joint. However, this is less evident if the animal is bearing weight at the time the radiograph is taken. To confirm that the joint is in fact wider than normal, it may be compared with the contralateral joint.

Indistinctness and loss of opacity of the subchondral bone are often associated with joint infections. Loss of opacity is often irregular. For this reason, a single radiograph is unlikely to detect this pathology; therefore, several radiographs taken from different angles are usually advised. Comparison between suspect and known normal joints is recommended. Subchondral bone may be indistinct in a young animal.

Radiography is important for evaluating the progress of a fracture repair. A radiograph taken immediately after a fracture has been realigned is the basis for future evaluations, and subsequent radiographs are essential if nonunion or bone infection is suspected.

Loss of bone opacity is difficult to recognize with certainty in metabolic and nutritional diseases. Because all of the bones in the body may be equally affected, it is not helpful to compare one bone with another. In an adult animal, cancellous regions in the bone ends may become coarser or “granular” in appearance as smaller bone trabeculae are resorbed. In the diaphysis of a normal bone in both immature and adult animals, the cortex is thickest at midshaft and becomes thinner toward both ends. If the cortex at midshaft approaches the thinness of the proximal and distal diaphyses, generalized osteopenia must be suspected.

Soft-tissue swelling can be demonstrated on radiographs only in the early stages of a septic disease. The characteristics of a soft-tissue swelling may indicate the location of a lesion and the tissues involved, muscle or tendon disease, cellulitis or edema, or dark gas shadows (eg, a sinus or a cap of an abscess).

**REGIONAL ANALGESIA**

For distal digital analgesia (used for surgical or diagnostic procedures), the dorsal site is located on the dorsal axis proximal to the interdigital space close to the metacarpal or metatarsal phalangeal joint. The needle should be placed with care (because the proper digital artery can be found at the dorsal site), and 10 mL of 2% lidocaine injected. If the needle is inserted deep into the interdigital space, the nerves of the flexor surface can be reached. This obviates the necessity of a flexor site block for simple procedures. The distribution of the nerve supply to the axial face of the digits of the forelimb is not constant, which makes this technique unreliable for digital analgesia of the forelimb.

The preferred flexor site is a little lower than the dorsal site because it is difficult to pass a needle through the partially cartilaginous palmar/plantar ligament. The medial and lateral sites are located at the level of the dewclaws, and the needle is inserted dorsally (horizontal in the standing animal) from a point 2.5 cm slightly proximal to the dewclaws. For the flexor site and the medial and lateral sites, ∼5–8 mL of 2% lidocaine is injected. For surgery of the digit (eg, amputation), the dorsal, palmar/plantar, and medial or lateral sites are used, depending on the claw. For interdigital surgery (eg, removal of corns), both the dorsal and palmar/plantar sites are used.

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**ARTHROSCOPY AND ARTHROCENTESIS**

Arthroscopy enables visualization of the interior surfaces of a joint for diagnostic or surgical purposes. Arthrocentesis is a procedure by which synovial fluid may be removed from a joint for examination. Local anesthetic can be introduced to ascertain if painful lesions are present in the joint. Intra-articular therapy permits medication to be deposited into the joint. As this procedure may be painful, a nerve block at a higher level is recommended.

For the distal interphalangeal joint, the needle is inserted lateral to the common or long extensor tendon, which inserts into the extensor process of the distal phalanx. The entry point is just proximal to the coronary band. For the pastern joint (proximal interphalangeal joint), the needle is inserted lateral to the extensor tendon. For the fetlock joint (metacarpophalangeal or metatarsophalangeal joint), the needle is directed downward close to the bone and between it and the interosseous (suspensory) ligament. The joint can also be entered from the dorsal surface in a similar manner to the distal joints; however, the flexor pouch is more capacious than the dorsal one. For the digital synovial sheath (sheath of the deep flexor tendon), the needle is directed downward behind the interosseous ligament.

For the stifle joint, it is advisable to use 2 sites because the lateral femorotibial compartment in some animals may not communicate with the rest of the joint. The first site is close behind the lateral patellar ligament (lateral femorotibial compartment), and the needle should be directed caudally. The needle is inserted in the second site between the medial and middle patellar ligaments and directed slightly down and toward the large medial lip of the trochlea (femoropatellar and medial femorotibial compartments).

For the hip joint, the needle should be directed caudally and medially in front of the trochanter major and just in front of the insertion of the middle gluteus.

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