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**Next Congress:**

14.30–15.00

# Radiography and radiology of the equine foot

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**Indication**
- Positive palmar digital nerve block
- Positive distal interphalangeal joint (DIP) block
- DIP joint effusion
- Penetrating injury to sole
- Wounds
- Laminitis
- Assessment of foot conformation
- Prepurchase/presale radiographs.

**Equipment**
- Portable x-ray machine sufficient
- Farriery kit for shoe removal and hoof preparation
- Play dough or other material to pack frog grooves
- Flat blocks to raise feet for DP and LM projections
- Block (tunnel or Hickman block) for oblique projections
- Lead gowns, thyroid protectors, gloves.

**Preparation**
- It is preferable to remove the shoes, however in some cases we leave the shoe on to assess the position of the shoe in relation to the foot
- The foot should be trimmed with hoof knives to remove any loose horn and dirt
- Careful packing of the foot with e.g. play dough improves image quality by eliminating gas shadows created by the frog
- Some people prefer not to pack the sole since they prefer to see the outline of the frog grooves over their whole length and not to run the risk of packing artefacts.

**Radiographic projections**

***Standard foot series:***
- Lateromedial (LM)
- Dorsoproximal-palmarodistal oblique (DPrPaDiobl) for distal phalanx and navicular bone
- Palmaroproximal-palmarodistal (PaPrPadiobl) oblique - Sky-line/flexor view.

***Additional projections:***
- Dorsopalmar (DP) Dorso-60°-proximo-45°-lateral-palmarodistomedial oblique.

Oblique projections such as this may be used for evaluating the wings of both the navicular bone and the pedal bone, and they are particularly useful for confirming the presence of wing fractures of the pedal bone suspected in the 60° DP projection.

**Radiographic technique (especially angles) described in textbooks work for the 'textbook' case. Look at the individual horse and do not be afraid to adjust your radiographic technique accordingly!**

**Radiology of the foot**

***Assessing foot conformation***

Foot conformation influences the forces acting on the structures in the foot, especially the deep digital flexor tendon, the navicular bone and the distal interphalangeal joint. This may predispose horses to developing pathology and radiographs are hence often used to assess foot conformation in lameness work-ups but also as guidance for farriery.

One should bear in mind that many of the parameters used are influenced by the current trimming and/or shoeing status and by the stance of the horse when the radiographs are taken.

*Dorsopalmar imbalance*
- The solar surface should show a 2–10° upward slope from dorsal to palmar/plantar
- The slope of the heels should equal the slope of the dorsal hoof wall
- A plumb line drawn from the centre of the distal end of the middle phalanx to the ground should transect the solar surface in its middle third
- The dorsal surface of the pedal bone and hoof wall should be parallel
- There are variations in the thickness of the dorsal hoof wall and the sole.

*Hoof pastern axis*
- The dorsal hoof wall and the dorsal surface of the pastern should have the same slope
- This is assessed by drawing lines along the long axis of the bones and assessing the angles between those lines.

***Assessing for laminitis***
- The presence of a radiolucent line within the dorsal hoof wall indicates air between the separating laminae
- The dorsal hoof wall and the dorsal surface of the distal phalanx should be parallel. Diverging angles indicate rotation of the distal phalanx away from the hoof capsule (>15° indicates poor prognosis).
- An increase in distance between the coronet and the extensor process of the distal phalanx indicates sinking of the distal phalanx within the hoof capsule ('founder distance' >13 mm indicates sinking).
- A radiolucent line along the coronet is also an indicator of sinking.
- Both rotation and sinking causes the tip of the toe to move closer to the solar surface which it breaks through in extreme cases.
- Chronic radiographic signs of laminitis includes deformation of the tip of the distal phalanx to resemble a 'slipper', thickening and ring formation of the hoof wall, signs of osteitis and disuse osteopaenia.

***Assessing the distal interphalangeal joint for osteoarthritis***
- Osteophyte formation is recognised on the extensor process of the distal phalanx and at the dorsoproximal edge of the navicular bone
- DIP joint effusion can be seen radiographically as a soft tissue opacity bulging out on the dorsal aspect just proximal to the coronet
- Subchondral bone sclerosis and narrowing of the joint space can be seen in advanced cases.

***Assessing the navicular bone***

The following parameters should be evaluated systematically:

*Distal border*

- Synovial fossae on the distal border: shape, number, size, location
- Fewer than 6, narrow, conical shaped fossae are considered normal
- Mineralised opacities off the distal border
- New bone formation on the flexor cortex.

*Opacity of the bone*

- Lucent areas within the medulla or in the flexor cortex
- Poor demarcation between cortex and medulla (this however is influenced by projection)
- Loss of trabecular pattern of the bone
- Thickness of the flexor cortex.

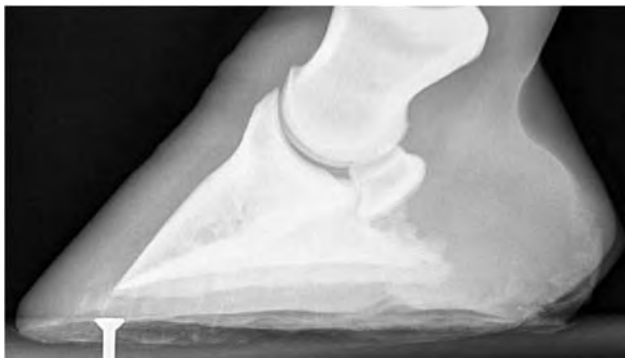
*Shape of the navicular bone*

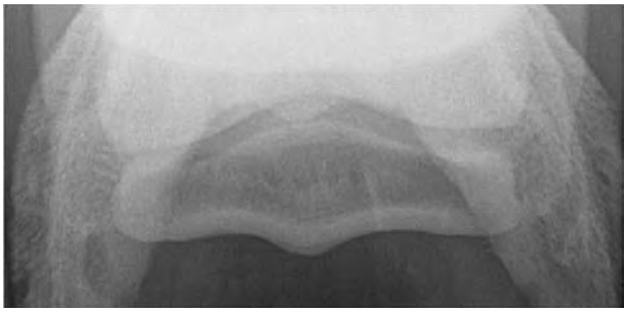
- Navicular bones should be symmetrical and similar in both legs.

*Proximal border*

- The proximal border shows 2 margins: the convex articular border and the flexor border, which is variable in outline. Concave or undulating borders have been suggested to be associated with an higher risk of navicular disease in Warmbloods.
- New bone formation representing enthesiophytes at the attachment sites of the collateral ligaments.

With the exception of flexor cortex erosion, that represent radiographically as large round lucencies in the medulla on the DPrPaDio and as a disruption of the flexor cortex on the PaPrPaDiobl, none of the evaluated parameters are pathognomonic for navicular disease, however the likelihood for a horse to suffer from navicular disease seems to go up with the number of radiographic abnormalities present.



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