Tips on taking great radiographs

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Radiographic images
- Should honestly represent the horse
- The quality of images reflects on the radiographer
- Digital images can help with some exposure errors, but can make motion errors more obvious
- Horse should be removed from stall and limbs cleaned
- Horse should stand square
- Sedation can be necessary

Radiograph labeling
- Accuracy is critical whether analog or digital
- Includes
  - Veterinarian/firm taking radiographs
  - Animal ID
  - Date performed
  - Limb
- Readable and legible
- I prefer an on-plate marker (usually indicating limb) for digital images despite a digital label
- Standard label location
  - Lateral on most
  - Dorsal or cranial on lateral to medial images

Examples of names for projections
- The radiologists term for the view:
  Dorsolateral/palmaromedial oblique
  (sometimes specific angles are included)
- The acronym: DLPMO
- Common terms used by equine veterinarians: lateral oblique or DL
- All angles are estimates

Complete image sets
- Fetlocks (4-5 projections)
  - Dorsopalmar (elevated 15°): DP
  - Flexed lateral/medial (forelimbs): FLM, flexed
  - Standing lateral/medial: lateral, LM
  - Dorsolateral/palmaromedial oblique (30° dorsolateral and 15° elevated): DLPMO; lateral oblique, DL
  - Dorsomedial/palmarolateral oblique (30° dorsomedial and 15° elevated): DMPLO; medial oblique, DM

Complete image sets
- Carpus (5-6 projections)
  - Dorsopalmar: DP
  - Lateral/medial: Lateral, LM
  - Dorsolateral/palmaromedial oblique (30° dorsolateral): DLPMO, lateral oblique, DL
  - Dorsomedial/palmarolateral oblique (20° dorsomedial): DMPLO, medial oblique, DM
  - Flexed lateral/medial: flexed, FLM
  - Skyline of distal row (race horses): skyline
Complete image sets

- Hock (4 projections)
  - Dorsoplantar (10° dorsolateral): DP
  - Lateral/medial: Lateral
  - Dorsolateral/plantaromedial oblique (65° dorsomedial): DLPMO, lateral oblique, DL
  - Dorsomedial/plantarolateral oblique (65° dorsolateral): DLMPO, medial oblique, DM
  *Can replace with a plantarolateral 25° to dorsomedial oblique or PLDMO*

- Stifles (3 projections)
  - Lateral to medial: LM
  - Caudo/cranial (10-15° proximodistal beam): CaCr, DP
  - Caudolateral/craniomedial oblique (30° caudolateral): CaLCrMO, caudolateral

The purpose of oblique or skyline projections

- Is to silhouette portions of bone and bone margins that are hard to appreciate on standard orthogonal views

Equipment

- X-ray generator
- Plates or DR unit
- Labels (required for analog)

Personnel

- 3 Minimum: shooter, plate and horse holder
- More are better and faster
- Adding label changer or an image evaluator for DR speeds up process

Radiation safety

- Important
- Lead gowns for all in beam: includes horse holder
- Lead gloves for plate holder; limit beam to avoid gloves
- Dosimeter mandatory for all personnel routinely in beam

Don’t do this

- Human phalanges on plate are COMPLETELY unacceptable
**Fetlock Dorsal/palmar (or plantar) (DP) (Elevated 15° Proximal)**

- Aim beam down, place plate to pastern slope
- Helps if fetlock is vertical or a little caudal
- Should include the pastern joint

**Fetlock Dorsal/palmar (DP) (elevated 15°)**

- Correct: image is DP, sesamoids are elevated above fetlock joint surface
- Because the elevated DP can distort the pastern joint, some will also include a more horizontal DP of the pastern

**Fetlock DP (elevated 15°)**

Incorrect:
- Beam too horizontal, cannot visualize joint and subchondral bone of condyle

**Fetlock standing lateral/medial: SLM**

- Arrange radiograph machine and film/detector to acquire a true lateral
- Aim horizontally through joint, sesamoids should overlap

**Fetlock flexed Lateral/medial: FLM**

Correct
- Limb should not be abducted
- Excellent view of MSR

**Fetlock flexed lateral/medial**

Incorrect: joint spaces overlapping, cannot see MSR
- Horses with poor conformation can be a challenge, so evaluate that before shooting
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**Fetlock DLPMO:**  
Dorsolateral 30° palmaromedial oblique

Correct: Caudal border of sesamoid, palmarolateral eminence of P1 and medial dorsal eminence of P1 are outlined.

Is elevated 15° to separate distal border of sesamoids from proximopalmar aspect of P1

Circled areas are of extra scrutiny.

**Fetlock oblique angle forelimb**

- 30° off straight lateral or medial: splits the sesamoids, highlights dorsoproximal P1

- Plate or detector

**Fetlock DMPLO:**  
Dorsomedial 30° palmarolateral oblique

Correct: also includes 15° elevation to separate base of sesamoid from palmar/plantar proximal P1

**Fetlock Oblique Errors**  
(Incorrect Elevation)

- Not elevated enough: sesamoid overlaps caudal P1

- Too elevated: dorsal P1 not readable. But, sometimes useful to over-elevate to project palmar/plantar aspect of condyle

**Common Errors in Fetlock Oblique views**

- Too DP and too elevated

- Too lateral and not elevated enough (proximal plantar aspect of P1 and distal base sesamoid overlap)

**Complete image sets**

- Carpus (5-6 projections)
  - Dorso-palmar
  - Lateral to medial
- DLPMO: Lateral/medial oblique (30° dorso-lateral)
- DMPLO: Medial/lateral oblique (20° dorso-medial)
- FLM: Flexed lateral/medial
- Skyline distal row (always for race horses)
Carpus
(Dorsal-palmar projection)
- Simple straight projection horizontally through the carpal joints parallel with the ground
- One of the less useful views

Carpal Pathology
- For the most part, is on dorsal joint surfaces and involves radial, intermediate and third carpal bones

Carpus
(Latero-medial projection)
- Simple straight projection horizontally through the carpal joints parallel with the ground
- Should project entire accessory carpal bone

Carpus – DLPMO
Dorsolateral 30° – palmaromedial oblique
Correct: can visualize dorsal margin of third and radial carpal bones and beam is horizontal

DLPMO 30° off lateral
Plate or detector

Carpus DLPMO
Dorsolateral 30° – palmaromedial oblique
Way too DP  Still too DP  Excellent
1/3 of radial carpal bone

- Best projection: about 1/3 of the radial carpal bone is projected dorsally to the intermediate carpal bone
- Helps project more of the dorso-medial aspect rather than the medial "corner"

Carpus – DMPLO
Medial/lateral oblique

Correct: can visualize the dorsal margin of the third and intermediate carpal bones (small target)

Beam is horizontal through joints

Carpus – DMPLO
(Dorsomedial 20°– palmarolateral oblique)

- Should always have about 1/3 of accessory carpal bone overlapped by radius/proximal row of carpal bones
- And have a bit of overlap of splints and MC
- Of course, if the goal is to see the splints, a more DP view will be useful (45°) to project the space between MC2 and MC3

Labeled carpal oblique images

Incorrect
- First: too dorsal, (accessory carpal bone buried)
- Second: rotation angle ok, but beam angled down

Correct: can visualize the dorsal margin of the third and intermediate carpal bones (small target)

Beam is horizontal through joints

Carpus – DMPLO
(Dorsomedial 20°– palmarolateral oblique)
Carpus – FLM: Flexed Lateral/medial
Correct: joints are separated and surfaces are even

Carpus – Flexed Lateral/medial
Incorrect: when not true lateral/medial
– Overlap of distal radius and proximal row
– Overlap of proximal and distal rows

Additional view for racing age horses

Flexed proximal/distal dorsal skyline (Sky_DRow)

Flexed proximal/distal dorsal skyline (Sky_DRow)

Tarsus views (4)

- Dorsal/plantar
  - For young horses: Dorsal 10° lateral/plantaromedial oblique
  - For older horses: Straight 0° Dorso-palmar
- Lateral/medial (lateral)
- DLPMO: Dorsolateral 65° to plantaromedial (lateral oblique)
- DMPLO: Dorsomedial 65° to plantarolateral (medial oblique)

Tarsus –DP: young horses
(Dorsal 10° lateral/plantaromedial oblique)
Correct: good view of medial malleolus and across distal tarsal joints

Skyline of distal row: fewer indications

Skyline of proximal row: lower indications

Young horses: standard DP fine for older horses
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**Tarsus DP: 10° lateral to sagittal plane**

- Note beam passes through joint between medial malleolus and talus: projects axial aspect of medial malleolus

**Tarsus – DP**

(Dorsolateral 10°/plantaromedial oblique)

- #1: Correct; can visualize axial aspect of medial malleolus
- #2: Too DP; medial malleolus is overlapped by talus
- #3: Too lateral; medial malleolus is overlapped by talus

**Straight 0° DP**

- For older horses
- Projects through flat joints: PIT, DIT and TMT
- Also allows complete evaluation of proximal plantar metatarsus

**Tarsus LM: lateral/medial**

- Correct: Trochlea are superimposed, beam is horizontal through distal hock joints

**Tarsus LM: lateral/medial**

- Incorrect: lateral/medial is too dorsal resulting in poor trochlear superimposition
- Incorrect: beam not horizontal through lower joints

**Labelled tarsal images**

- talus
- tibia
- MT3
- MT4
Tarsus DLPOMO
Dorsolateral/palmaromedial oblique (65° dorsomedial)

- Correct: the medial trochlear ridge is in silhouette, the beam is horizontal and intersects the small cuboidal joints
- Least valuable of the hock views (young horses) gives good look at joint spaces for spavin

Tarsus DMPLO:
Dorsomedial/plantarolateral oblique (65° dorsomedial)

Correct: distal intermediate ridge is well defined, distal joints and trochlear ridges are separated

Tarsus – DMPLO
Incorrect: too far DP, distorted distal intermediate ridge, no medial trochlear ridge, bad angle through distal tarsal joints

DMPL 65° dorsomedial

Highlights DIRT between trochlear ridges

Specialty hock views
- Skyline calcaneus (flexed caudoproximal to caudodistal)
- Flexed lateral to medial projection
- Sustentaculum tali
- Plate or detector

Stifle Views (3)
- Lateral to medial: LM
- Caudal to cranial (10-15° proximodistal beam): CaCr, DP
- Caudolateral/craniodistal oblique (30° caudolateral): CaLCrMO, caudolateral
**Stifle – Lateral to medial**

Correct: can see entire patella and evaluate both trochlear ridges
- Due to external rotation of hindlimbs, aim slightly caudal to cranial (90° to patella)

**Stifle – Lateral/medial**

Incorrect: it takes some effort to get projection correctly: these not lateral: LTR buried in ITG
A bit cranial: cannot evaluate proximal LTR
Too distal and caudal

**Caudolateral/craniomedial oblique (30° caudolateral): CaLCrMO, caudolateral**

Beam directed parallel to top of tibia

**Stifle: CaLCrMO – Caudal 30° lateral/craniomedial oblique**

Incorrect: elevated and too caudal to cranial
Incorrect: Too lateral: cannot evaluate entire medial femoral condyle
Incorrect: LTR overexposed (cannot window what’s not there)
Stifle: CaCr – caudocranial

correct
- Aim beam 10-15° downward to hit joint space. Aim at the narrowest part of the stifle
- Must reveal joint space to evaluate subchondral bone of joint

Stifle joint overlap

- Make sure that the medial femoral condyle (MFC) is not overlapping the tibia or the medial intercondylar eminence is not overlapping the MFC

Stifle joint cut off

- The large size of the stifle joint can make it challenging to image entire joint on every projection
- Make sure that all stifle anatomy is adequately displayed on the 3 images

Stifles

- Areas that should be included: articular surface of both trochlear ridges, both femoral condyles, proximal tibia and patella
- It is acceptable to lose one area (e.g. MFC on the lateral/medial) if it is well defined on the remaining views

If Radiographs Are:

- Poorly exposed or have artifacts, please retake them: DR and CR will not cure all problems
  Clean the legs before taking radiographs so you don’t have to guess if its artifact or not

Motion

- Minor motion can be difficult to see on low resolution preview images but is very apparent on higher quality screens
  Might not appreciate this amount of motion