How to Perform Standing Lateral Oblique Radiographs of the Equine Pelvis

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1. Introduction
Radiography of the equine pelvis is indicated where physical examination or other localizing diagnostic techniques, such as intra-articular analgesia or nuclear scintigraphy, localize an abnormality to that region.1–3

Radiography techniques currently employed for diagnosis of pelvic fractures or abnormalities of the coxofemoral joints are ventrodorsal radiographs obtained with the horse under general anesthesia and ventrodorsal radiographs obtained in the standing sedated horse.4

As well as complications related directly to anesthesia, horses with suspected pelvic fractures may be subject to additional risks when radiographs are obtained under general anesthesia because of the potential for fracture displacement and subsequent lacerations of the internal iliac arteries during the induction or recovery period. A ventrodorsal radiograph, obtained in the standing sedated horse, requires the X-ray machine to be placed ventral to the abdomen and the cassette to be placed dorsal to the sacrum. This technique may potentially create a significant scattered-radiation hazard to involved personnel. It may also present considerable risk to the equipment in fractious horses, because safe handling of the cassette, centering of the X-ray beam, and collimation of the X-ray beam can all be difficult.

Recently, the usefulness of standing lateral oblique radiographs of the equine pelvis in the diagnosis of hindlimb lameness has been shown.5,6 The purpose of this paper is to describe how to perform this technique safely in practice and to highlight the clinical situations in which it may be useful.

2. Materials and Methods
The horse is sedated by administering a combination of detomidine HCl (0.01 mg/kg, IV) and butorphanol tartrate (0.02 mg/kg, IV). Additional sedation may be necessary depending on the duration of the examination procedure. Restraint in
low-sided stocks may be of benefit in nervous horses. If the horse is still sensitive to external stimuli after sedation, a blindfold should be positioned over the eyes and the external ear canals should be filled with cotton wool. Care must be taken not to oversedate the patient because of the effect of the resulting ataxia on image quality. For the same reason, the use of xylazine instead of detomidine is not advised.

Ideally, the horse should be standing squarely on all four limbs; however, many patients with fractures of the pelvic area will not be able to comfortably bear weight on the affected limb. Rectal examination of the bony structures of the pelvis is advised before radiographic examination to obtain further clinical information about the possible site of injury and to manually evacuate the rectum of fecal material. The resulting air-filled rectum provides good contrast for the visualization of the underlying bony structures and avoids the potential for artifacts that may be created by overlying fecal material.

A vertically positioned X-ray cassette is placed against the side of the pelvis under examination. The X-ray tube is angled ~30° ventrally from the horizontal position and centered between the level of the greater trochanter of the femur and the base of the tail on the tube side, which is approximately two-thirds of the craniocaudal distance between the palpable landmarks of the tuber sacral and the tuber ischiae (Fig. 1). If the horse is unable to bear weight on the affected limb, the pelvis will tilt so that the affected side is in a more ventral position. To compensate for this, it is necessary to increase the angle between the X-ray beam and the horizontal by 5–10° and to center the X-ray beam several centimeters further ventrally than described for a horse that is standing square. The height and the craniocaudal position of the cassette are adjusted to coincide with the path of the X-ray beam. Rare-earth screens and a stationary parallel grid are used; a film-focal distance of ~100 cm should be used. For our X-ray machine and film screen, and grid combination, the kilovolts used vary between 90–130 kV and 125–400 mA depending on the size of the horse and the pelvic muscle mass. The lead strips within the parallel grid are oriented vertically so that the dorsoventral angulation does not result in the phenomenon of grid cut-off. In our clinic, the cassette is held by a gantry-mounted holder; however, a cassette mounted or suspended from a vertical stand would be equally suitable. Because of the exposure factors, only the person holding the horse should be present at the time of exposure. Lead protective aprons and thyroid collars are essential.

3. Results

The areas of the pelvis visualized using the technique of standing lateral oblique pelvic radiography include the caudal half of the ilial shaft, the greater trochanter of the femur, the femoral head, the acetabulum, and the coxofemoral articulation on the side closest to the cassette. If the X-ray beam is centered more caudally, the ischium may also be visualized.

Areas of the pelvis that are not seen using this technique are the ilial wings, the tuber coxae, the tuber sacral, the sacroiliac joints, the sacrum, the pubis, or the entire ischium.

We have used this technique to aid in the diagnosis of hindlimb lameness in 18 horses. These horses were referred to the teaching hospital at the University of Bristol, Langford, between March 2000 and June 2005. A variety of breeds with different body weights were examined. Iliac-shaft fractures were conclusively diagnosed in three horses, and an acetabular fracture was diagnosed in one horse. In 3 of 18 horses, the findings were substantiated with ultrasonography, scintigraphy, and/or further radiographs. In one horse, ventrodorsal radiographs showed additional fractures of the ischium and pubis. In two horses, dorsal luxation of the coxofemoral joint was diagnosed. In four horses, irregular new bone formation was identified either on the dorsal aspect of the acetabulum, the femoral neck, or the cranial aspect of the greater trochanter of the femur. In all four of these horses, these locations corresponded to areas of increased radiopharmaceutical uptake identified using scintigraphy. In two of those horses, diagnostic analgesic techniques located the significant source of pain to the coxofemoral joint. In one horse, an abnormal relationship was shown between the proximal aspect of the femur and the acetabulum. Post-mortem examination of this horse showed a proximal femoral fracture, but this was not apparent on the radiographs. In seven horses, the lateral oblique radiographs were considered unremarkable.
4. Discussion

The lateral oblique view of the pelvis obtained in the standing horse consistently facilitates visualization of the iliac shaft, the greater trochanter of the femur, the femoral head, the acetabulum, and the coxofemoral articulation of the side under examination. The technique is straightforward and non-invasive to perform, and it provides an invaluable diagnostic tool for investigation of horses with suspected pelvic injury or coxofemoral-joint abnormalities.

The most important advantage of this technique is that it can be carried out in the standing sedated horse; therefore, general anesthesia is not needed, which increases patient safety and reduces the cost involved in reaching a diagnosis.

Fig. 2. Normal radiographic appearance of the coxofemoral joint as seen on the standing lateral oblique projection of the equine pelvis. The acetabulum (small white arrow), femoral head, greater trochanter of the femur, ilial shaft (black arrow), and ischium (large white arrow) are all consistently visualized.

Fig. 3. Standing lateral oblique projection centered over the femoral head. There is new bone formation on the neck of the femur (white arrow).

Fig. 4. Standing lateral oblique radiograph of the equine pelvis showing a displaced fracture of the ilial shaft. The fracture fragments are overriding (white arrow). The image is distorted slightly, because the horse was unable to bear weight on the affected limb.

Fig. 5. Standing lateral oblique projection of the coxofemoral joint. There is extensive new bone formation on the dorsal aspect of the acetabulum.
Disadvantages of this technique include the lack of visualization of the pubis, sacrum, and iliac wings and the inability to assess right-left symmetry within the same image. This may lead to an underestimation of the true extent of a horse’s injuries if findings are not carefully correlated to ultrasonographic and scintigraphic findings. The large exposure factors also pose a potential radiation risk to personnel, and the long exposure times may affect the image quality because of movement blur.

5. Conclusion

In the authors’ opinion, standing lateral oblique pelvic radiography provides an invaluable diagnostic tool for the investigation of suspected pelvic lameness in the horse.

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References and Footnotes


aDomosedan, Pfizer Animal Health, Sandwich, Kent CT13 9NJ, UK.
bTorbugesic, Fort Dodge Animal Health, Southampton SO3O 4QH, UK.
cUD150B-10 generator (maximum exposure factors of 150kV and 1000mA) with Comet tube, Argostat tube crane, and Bucky system with a parallel 12:1 grid, Shimadzu Medical Imaging Systems, Manchester, M17 1GP, UK.
dMG SR Konica Medical Film, Konica Minolta Medical and Graphical Inc., Tokyo 191, Japan.
eKodak X-Omatic cassettes with Kodak lanex regular screens, Eastman Kodak Company, New York, NY 10001.
fEverything X-ray, High Wycombe, Bucks HP12 4JN, UK.