

Raise Your Hands for Hands Free Radiology

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Introduction

For years veterinarians and veterinary technicians and assistants have taken radiographs utilizing manual restraint. This practice came from an attempt to keep costs low, and the misbelief that these were faster and safer to obtain. However, we know that our exposure to radiation over time has a cumulative effect on our bodies. Transitioning to hands-free radiology techniques provides dual benefits for a veterinary practice: it significantly protects personnel from safety hazards and improves the diagnostic quality of the images, as still patients inherently yield better radiographs. Ultimately, hands-free radiology is no longer an optional approach; it is the standard of care.

History and Health Risks of Exposure

In the early days of radiology, there was a profound lack of understanding regarding the long-term health effects of radiation. The X-Ray was invented in 1895 by William Roentgen and often utilized as a party trick. In the early 1900s, it was standard practice to calibrate x-ray machines every morning by taking a radiograph of the technician's hand. Understanding radiation risk requires recognizing that an individual's radiation dose is cumulative over their entire lifetime. Exposure poses two main types of health effects: deterministic effects and stochastic effects. Deterministic effects only occur above a specific threshold dose, such as exposure to a large dose of radiation, like in the Chernobyl disaster. These effects may include skin burns, hair loss, and cataracts. Stochastic Effects are random effects that have no safe threshold to prevent occurrence; however, the risk of developing stochastic effects, such as cancer or genetic mutations, is directly proportional to the radiation dose received.

To mitigate these severe risks, veterinary teams must apply the ALARA (as low as reasonably achievable) principle by prioritizing time, distance, and shielding. Distance is a particularly critical factor, as dictated by the Inverse Square Law. While the proper use of Personal Protective Equipment (PPE) including lead aprons, thyroid shields, and lead gloves is necessary, personnel must understand its limitations. Lead is designed to stop the primary beam, but physical distance is still required to protect against scattered radiation. Furthermore, teams must utilize dosimetry badges to monitor exposure and ensure no one exceeds the Maximum Permissible Dose (MPD).

Over time, a "holding culture" became the norm in veterinary medicine, largely driven by the desire for speed, a lack of specialized positioning equipment, and cost concerns.

Today, there is both a legal and an ethical mandate to eliminate manual restraint during imaging.

Techniques for Hands-Free Radiology

Successful hands-free radiography relies on a combination of mechanical restraint aids and targeted pharmacological support. Before exposing the patient, it is crucial to prepare all materials in advance and plan for as little patient repositioning as possible. Have the radiology room ready and all possible restraint aids easily accessible. Discuss with the team what order the radiographs will be taken and have a plan for increasing level of sedation if needed. Set client expectations for the possibility of sedation in order to provide safe, comfortable, and quality diagnostics.

Mechanical Restraint Aids

A variety of positioning devices are essential for stabilizing the patient including Foam Wedges and Troughs. Available in different sizes to provide stability in lateral, sternal, and dorsal recumbency, wedges and troughs help to position the patient for the views needed. V-troughs are particularly essential for maintaining dorsal recumbency during ventrodorsal (VD) views. Sandbags must be radiolucent, so they do not obscure anatomy. They are effective because their weight provides stability, and they can simulate the feeling of hands resting on the patient. Patients can be positioned and secured using wide, non-adhesive tape (like porous tape, which is radiolucent), Velcro straps, and gauze ties to maintain alignment without causing discomfort.

Pharmacological Support

Although some patients are accommodating enough to utilize the restraint aids without additional help, some patients are too uncomfortable or have a higher fear, anxiety, stress (FAS) score and additional support is needed to obtain these radiographs without placing hands on. A dosing protocol utilizing light sedation is much safer and yields higher-quality images than physically struggling with a stressed patient. Full unconscious sedation is not always necessary and for some patients anxiolytics like gabapentin and trazodone can be administered prior to the clinic visit for fearful patients.

For patients with a higher FAS, alpha-2 agonists (such as dexmedetomidine) provide excellent restraint and muscle relaxation, with the benefit of rapid reversal. Opioids (like butorphanol) or benzodiazepines can be used as adjuncts for pain and anxiety. A multimodal approach will allow clinicians to prescribe lower doses with better effects. The sedation protocols should be tailored to each patient and consider the views that are needed to be obtained (spinal radiographs and OFA views will always need full unconscious sedation, while abdominal radiographs may be taken while the patient is

awake). The patient's pain score should be considered, and pain should always be addressed before manipulating the patient on the x-ray table. The patients underlying health and comorbidities may dictate which protocol is selected for sedation.

Whenever sedation is used, IV catheter placement should be considered, emergency drugs and reversal agents should be on hand and ready, and the patient should be actively monitored and recorded.

If the clinician determines that additional sedation is not in the patient's best interest, consider alternative diagnostics such as ultrasound or echosonography in place of radiographs.

Implementation and Culture Shift

Implementing hands-free radiology requires clear protocols and a consistent shift in hospital culture.

Leadership Buy-In

Hands Free Radiology is a culture shift, and that requires support and guidance from the hospital leadership. The clinician team needs to be aligned with hospital operations and in agreement to prioritize staff safety moving forward. Once the leadership team agrees that Hands Free Radiology will be part of their practice culture, hospitals should develop or source written, step-by-step guides for positioning common views using only mechanical aids. Checklists should be utilized to confirm that PPE is worn, the patient is secured, and pharmaceutical reversal plans are established. To prevent accidents, a designated individual should be solely responsible for operating the machine and ensuring the room is clear.

Identifying a "Lead Radiographer" or Champion to learn and teach these techniques can help sustain this culture shift. Mandatory, recurrent training is necessary for all personnel. Teams can practice utilizing restraint aids on well-behaved staff pets to build confidence. Most importantly, hospital leadership must empower team members to stop any procedure if a safety protocol is violated or a hand is near the primary beam. Staff must also be permitted to refuse to take radiographs if sedation is not adequate.

Finally, setting clear client expectations is vital. Teams must engage in a "Safety Conversation," explaining that sedation is frequently required to achieve high-quality diagnostics while keeping both the pet and the staff safe. This includes proactively discussing the time and cost associated with proper sedation and monitoring versus rapid, low-quality imaging.

Like with any skill, it takes time and practice to achieve competency. Starting out with healthy pets is a good place to start. As staff become more comfortable with the restraint aids and the process of Hands Free, the clinical team can start expanding to more compromised patients. Eventually, the mindset will be that radiographs are taken Hands Free as a standard. There will be occasional cases where it will be difficult to achieve this. Keeping a list of those cases and then having regularly scheduled check-ins to review those cases will help the team problem solve for the next time a similar case is presented. It is important to include both the veterinarians and the technical staff in these conversations, to make sure all sides are heard and understood.

Conclusion

By understanding that radiation exposure is cumulative over a lifetime and that each exposure has risks, hospitals can utilize a culture of Hands-Free Radiology to improve staff safety. Fully utilizing mechanical positioning aids, and leveraging pharmacological support when needed, veterinary teams can keep teams safe, patients more comfortable, achieve a higher quality diagnostic image, and do it all in less time. Achieving this requires practice and commitment to ongoing learning and team collaboration.

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