Thorax

The thorax is the most common examination requested in small animal radiology. There are many reasons for doing a thoracic study: a HBC looking for lung contusions, a cardiac problem looking at the heart, a met. check looking for metastatic lesions in the lung fields. There are several views you can do in a thoracic study. Our standard views are a RIGHT LATERAL and a DORSOVENTRAL (D/V) view. You could also do a LEFT LATERAL and a VENTRODORSAL.

Lateral View

Measure the patient at the widest part; in this case it is over the diaphragm. I like measuring the animal standing. Make sure the front legs are pulled out and away from the cranial part of the thorax. The exposure should be taken at peak inspiration. When positioning for the lateral, have your collimated light field start at the shoulder and end at the twelfth rib. You can leave the light field opened up to the length of the cassette. Collimate the width of the light field to the edges of the animal. This reduces scatter radiation. The crossbeam from the collimator should line up with the caudal edge of the scapula. A left-side down lateral should also be done when looking for mets in the chest. A foam wedge under the sternum helps to keep the ribs superimposed.

Dorsoventral View (DV)

Measure at the widest part of the thorax (over the diaphragm). The D/V view is best to see the heart in the normal position. The light field should be the length of the cassette, with the light collimated to the width of the thorax of the animal. The crossbeam should be right behind the scapula. The exposure should be at peak inspiratory phase.

Ventrodorsal View (V/D)

A V/D view is done when there is fluid obscuring the heart and the lung fields. By turning the animal on its back, you can drop the fluid down into the chest and you should be able to visualize the lung fields better. Chances are you will not be able to visualize the heart. You will not see the heart in the proper position with this view. When we are doing the thoracic study we use sandbags to restraint the animal so that we do not have to manually restrain it. For the lateral position, 1 sandbag over the neck and 1 over the back and front legs will help keep the animal on the table. For the D/V position we use a foam cradle and 1 sandbag over the neck.

Abdomen

The 2 standard views of the abdomen are a RIGHT LATERAL and a VENTRODORSAL. Both of these views should be done on the expiratory phase of breathing because this is when there is less motion in the abdomen. You can also do a left-side down lateral when you are looking at the stomach and the pylorus.

Lateral View

The animal is measured at the widest part of the abdomen (over the diaphragm). Place the crossbeam right behind the last rib. If you have a patient longer than the cassette length, then take 2 laterals. The light field should be from the xiphoid to the base of the tail. Include the diaphragm and make sure the hind legs are pulled back far enough so they do not overlie the bladder or prostate. Sandbags can be utilized to help restrain the patient so you do not have to manually restrain it. Remember to leave the whole length of the light field and collimate to the width of the animal.

Ventrodorsal View (V/D)

Again measure the animal over the diaphragm, as this is the widest part of the abdomen. Place the crossbeam behind the last rib. Be sure to include the entire diaphragm, and if the animal is too long for the cassette, you may have to take a second V/D. Remember to collimate the light field to the width of the animal.

Pelvis

The 2 standard views for the pelvis study are the LATERAL and the VENTRODORSAL. We have a saying in orthopedic studies, “better life thru chemistry,” meaning a sedated animal makes the study go that much faster. There are many drugs that can be used.
Lateral View

Measure the animal at the widest part of the pelvis. Leave your settings on the machine the same for the lateral and the V/D. Our lateral view is done right-side down. If we do a left-side down, I always put an L marker on the down leg to show it is left-side down. The legs are scissored so that the down leg is forward and the back leg is back and parallel to the table. Wedges and sandbags are used to hold the legs in place. Laterals only show 2 things if there is a luxated hip, and it allows them to look at the lumbosacral (L-S) part of the spine. By scissoring the legs, you will be able to tell which leg is luxated, and if the animal is having trouble getting up or down, you can determine if it is in the L-S part of the spine. Collimate the light field to the pelvis, femurs, and the L-S spine. Center the crossbeam on the greater trochanter.

Ventrodorsal View (V/D)

Remember to leave the settings on the machine the same. The patient is on its back, with 1 person at the head of the table and 1 person at the tail. Grip the back legs at the tarsus with your thumbs on the inside of the legs; this will help you rotate the legs. Pull the legs toward you with the femurs parallel to the table and rotate the stifles in so that the patellae are pointed up. You do not have to push the legs down toward the table. Collimate the light field lengthwise from the top of the pelvis to right below the stifles, centering right on the pelvis with the crossbeam. Bring the width of the light field up to the sides of the animal. If the animal is painful and you cannot pull the back legs straight out, ask your doctor if you can do a frog-leg view of the pelvis. Instead of pulling the legs back, push the legs toward the head and let them relax with the stifles rotated to the outside (laterally). Collimate the light field wider and shorter on the length just to the pelvis area.

Extremities

Front Limb

The front limbs as well as the back should be separated out to each individual area, because the beam needs to be centered where you are interested in. You can do whole legs if the doctor is looking for gross abnormalities. Again, sedation is very helpful in getting the necessary radiographs. The thicker part of the extremity (shoulder/humerus) will be under the table with the elbow on down to the part done tabletop.

Shoulder

We have 2 standard views of the shoulder, the lateral and the V/D. If your doctor is only looking for an OCD lesion, then the lateral view is the only one you need to do.

Lateral View

For the lateral shoulder measurement, measure the whole width of the shoulders, then cut the measurement in half (i.e., if the measurement is 22 cm from shoulder to shoulder, then the lateral measurement is 11 cm). Place the affected side down, push the head up and the top leg back, and pull the affected leg forward. You can usually use sandbags or bungee cords to hold the head and top leg back. Collimate the light field to a square area around the shoulder, placing the crossbeam on the shoulder joint. Your study should include half of the humerus up to the neck of the scapula.

V/D, PA, or Caudocranial View

The easy way to set the technique is based on whatever the KvP was for the lateral; set it 10 KvP higher for the V/D. Leave the Ma and time the same; you must, however, get a very good stretch on the affected legs. A sedated animal usually will be good for this view. Place the animal on its back. Pull the affected leg forward and parallel to the table. The other leg can be pulled forward to help balance the animal. Collimate the light field from the elbow to the caudal end of the scapula, with the width of the light field just outside the lateral aspect. The crossbeam should be right on the shoulder joint. You can also do obliques from this view.

Humerus

The 2 standard views for the humerus are the lateral and the A/P, with the animal in V/D position. One caution with this study is that if the animal is suspected of having a bone tumor, then only the lateral should be attempted, because bone cancers like to grow in the proximal humerus and the distal radius/ulna. By putting the animal on its back and cranking on the affected leg, you could possibly break the leg. Do your lateral first and process the radiograph to see if this is the case.

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Lateral View
The measurement will be similar to the shoulder, probably 4–5 KvP less than the shoulder. Pull the affected leg forward with the head and neck back and the top leg back, just like a lateral shoulder position. Collimate the light field from the elbow to the shoulder; the crossbeam will be mid-humerus. It is very hard to get a uniform exposure because of the difference of thickness between the shoulder and the elbow.

A/P View
For the A/P view, have the animal in the V/D position, but instead of pulling the leg forward like a shoulder, bring it back caudally, parallel to the table and pulled out away from the thoracic area, so that the soft tissues from the thorax are not superimposed with the humerus. Measurement for this is like the shoulder, 10 KvP higher than your lateral humerus settings. Collimate the light field from the shoulder to the elbow.

Elbow
There are 2 standard views for the elbow study, the lateral and the A/P (craniocaudal). These studies are usually done table top; with that in mind, it saves money and time when you split the cassettes and get both views on one radiograph.

Lateral View
The lateral is done affected side down, with the neck and head up and the top leg sandbagged or held back out of the way. The leg is placed in a natural supinated relaxed position. A foam wedge can be used under the carpus to keep the leg lateral. Collimate the light field from mid-humerus to mid-radius/ulna with the crossbeam on the elbow.

Flexed Lateral View
A flexed lateral is done for OFA or for a better look at the back of the elbow. To obtain this view, bring the affected leg up toward the head. It is important to pull the top leg back out of the way so the soft tissue of the shoulder is not superimposed over the elbow that is flexed.

A/P (Craniocaudal) View
For the A/P view, place the animal sternally in the D/V position, with the affected leg extended forward. We angle the beam 15 degrees to open up the joint. It is best to have 1 person hold the head up and 1 person pull the leg forward. The leg should be straight from the humerus down to the radius/ulna. To help keep the leg straight, make sure the back legs are going the same way as the leg you are radiographing (i.e., if you are doing the right leg, the back legs should be turned to the right). Collimate the light field halfway up the humerus to halfway down the radius/ulna with the crossbeam on the elbow. You can split the cassette and put both lateral and A/P on the same film.

Radius/Ulna
There are 2 standard views for the radius/ulna study, the lateral and the A/P.

Lateral View
Measure close to the elbow for this study. The lateral is done with the affected side down. You should be able to restrain the animal with sandbags, 1 over the neck and 1 over the back legs, with the top front leg sandbagged back. Collimate the light field from the mid-metacarpal area to just above the elbow with the crossbeam on the middle of the radius/ulna. Collimate to just outside the limb.

AP View
Place the animal sternally in the DV position. Extend the leg out and place a wedge or sponge behind the elbow to keep the leg extended. Have the back legs going in the same direction as the leg you are working on. Collimate from the metacarpal area to above the elbow, with the crossbeam on the center of the radius/ulna.

Carpus
There are 4 views to the carpal study, the lateral, the A/P, and the 2 obliques, medial and lateral oblique. We usually start with the lateral and then do the A/P and obliques.
Lateral View
Place the affected side down with the light field collimated from the distal radius/ulna to halfway down the metacarpals. You can usually sandbag the animal to restrain it. To keep your hands out of the primary beam, use a wedge to keep the paw lateral and a wooden kitchen spoon to immobilize it.

A/P and Oblique Views
Place the animal sternally in the DV position. Extend the leg out so that you have more control over it. Collimate the light field from the distal radius/ulna to mid-paw, with the width to just outside the paw. Center the crossbeam on the carpus. Since you are doing this tabletop, you should be able to split the cassette and get the lateral and A/P on 1 and the 2 obliques on another. For the obliques, keep the leg extended and rotate the leg 45 degrees laterally, then medially. Again, use a wedge to oblique the paw and a wooden spoon to hold the paw still.

Foot (Paw) Front
There are 4 standard views for the foot. These are same as for the carpus: lateral, A/P, and the obliques. If you want to save time and or money, include the whole paw in a carpus study.

Lateral View
Place the affected side down. Collimate the light field from the distal radius/ulna to below the toenails. Center the crossbeam on the metacarpal area. Collimate the width to just outside the paw. A foam wedge should be used to keep the paw lateral and a wooden spoon should be used to immobilize it. Again, since this is done tabletop, split your cassette and place the lateral and A/P on the same cassette. Make sure both projections are going the right way.

A/P and Oblique Views
Place the animal sternally in the DV position and extend the affected leg, holding it out with a wedge. Collimate the light field from the distal radius/ulna down to below the toenails, with the crossbeam on the metacarpus. For the medial and lateral oblique, leave the leg extended and rotate the leg 45 degrees, or place a foam wedge under the paw to obtain these views. Remember to split the cassette to save time and money. Use a wooden spoon to hold the paw so that your hand is not near or in the primary beam.

Extremities: Rear Limbs
Positioning of the rear limbs is similar to the front limbs. Every study should be an individual study. The thicker part of the hind leg (the pelvis and the femur) should be done under the table using a grid. The stifle on down can be done tabletop.

Femur

Lateral View
The lateral femur is very hard to measure for and position. You must measure the widest part of the femur, which is the most proximal area. This is a very thick part, and when doing a femur you must include the head of the femur down to the stifle. Usually the stifle ends up too dark. The affected side is down on the table. Place a wedge or sponge under the sternum of the animal; this will cause the animal to roll halfway between lateral and VD. This will drop the top leg back out of the way. Bungee cords can be used to hold the top leg back. Collimate the light field from the pelvis to just below the stifle, with the crossbeam centered on the mid-femur.

V/D View
The V/D view is just like a V/D pelvis. The animal is on its back with the back legs pulled straight back. If you are dealing with a fractured femur, it is a good idea to do a V/D pelvis; that way the doctor can compare the 2 femurs side by side. Keep femurs parallel to the table. Collimate the light field from the pelvis to just below the stifle and to the width of the leg. The crossbeam is on the mid-femur.

Stifle
The are 2 standard views of the stifle, the lateral and the PA (caudalcranial) view. Since these are thinner parts, this study is done tabletop.
Lateral View
Place the affected side down on the table. Flex the stifle so that your doctor can visualize the joint looking for joint fluid. Place a wedge under the tarsus; this helps keep the stifle parallel to the cassette. A sandbag on the paw immobilizes the leg. Hold the top leg out of the way with bungee cords. Collimate mid-femur to mid-tib/fib with the crossbeam on the stifle.

PA (Caudocranial) View
The animal is sternal in the DV position. I find that is easier to position the stifle and control the animal if I pull both hind legs back. If the animal is not anesthetized, then it usually takes 2 people to position and restrain the animal. Put the animal in a chest positioner if you have one; this will keep it upright. Have 1 person hold at the middle of the animal facing the other person at the back legs. The person positioning the leg will extend both hind legs both, but only radiograph 1 stifle at a time. The person holding the legs stretches the affected leg out, making sure the leg is straight from the femur down to the tarsus. Usually if the tarsus is straight, the stifle will be also. Collimate the light field from mid-femur to mid-tib/fib, with the width of the light just outside the stifle.

Tibia/Fibula
The 2 standard views for the tib/fib study are the lateral and the PA (caudalanial); these are usually done tabletop.

Lateral View
The lateral is done with the affected side down on the table. Hold the top leg back out of the way with a bungee cord or tape. Collimate the light field above the stifle to below the tarsus, as you must get the joint above and the joint below on these long bones. The crossbeam should be on the mid-tib/fib.

PA View (caudalanial)
The PA view is done with the animal sternal (DV position). The affected leg is stretched or pulled out behind the animal. Collimate the light field from above the stifle to below the tarsus, with the width of the light just outside the leg. Center the crossbeam on the mid-tib/fib.

Tarsus
There are 4 standard views for the tarsal study, the lateral, PA, and the obliques. This is done tabletop, so you should be able to save time and money by splitting the cassette. It is important to get a good stretch on the affected leg to help with the positioning.

Lateral View
Place the affected side down on the table. You should be able to restrain the animal with sandbags. The top leg can be pulled forward or backward to be out of the way. Place a sandbag over the paw to immobilize the leg. Flex the tarsus slightly and use a wedge to keep the leg lateral. Collimate the light to just above the tarsus down to the meta-tarsal area. The crossbeam should be on the tarsus.

PA and Oblique Views
For the PA and obliques place the animal sternal in a DV position. Pull the limb back and get a good stretch on it; this will help you with your positioning. Make sure the leg is straight. If you have to manually restrain the animal, it helps to have 2 people controlling the animal. Collimate down to just above the tarsus down to the meta-tarsal area. The obliques should be at about a 45 degree angle.

Rear Foot
The views for the foot are the same as the tarsus: lateral, PA, and the obliques. To keep your hand or fingers out of the primary beam, I suggest using a wooden kitchen spoon to immobilize the foot and help with the obliques. Make sure to include all of the toes, including the toenails.