

**SNAKE RADIOLOGY: THE ESSENTIALS!**

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**RESTRAINT AND POSITIONING**

Snakes are relatively easy to position and restrain for radiographic examinations. Ultimately, anesthesia will provide the best positioning. If the purpose of the examination is to rule out radiodense foreign bodies, the snake may be allowed to coil in its natural position while the radiograph is taken. If detailed examination of the skeletal, respiratory and digestive system is desired, the snake must be extended. A plastic restraint tube can be utilized for this purpose; however, this may produce some radiographic artefact. The snake is introduced into a tube with a diameter that will not allow the snake to turn around and exit the tube. The radiograph is taken before the snake has an opportunity to back out. Snakes can also be restrained with heavy sand bags or tape but great care is required to avoid bruising. In larger snakes, several films will be needed to radiograph the entire length of the body. It is important to properly mark the snake and label each exposure in order to keep track of all the views. Lateral views are best taken using horizontal beams to avoid displacement artefact of the viscera. However, standard laterals with the snake taped in lateral recumbency can be useful especially where horizontal beams are not possible or safe to undertake. The interpretation of dorsoventral views is hindered by the spine and ribs, but can still be useful when dealing with obvious lesions including eggs and mineralised masses.

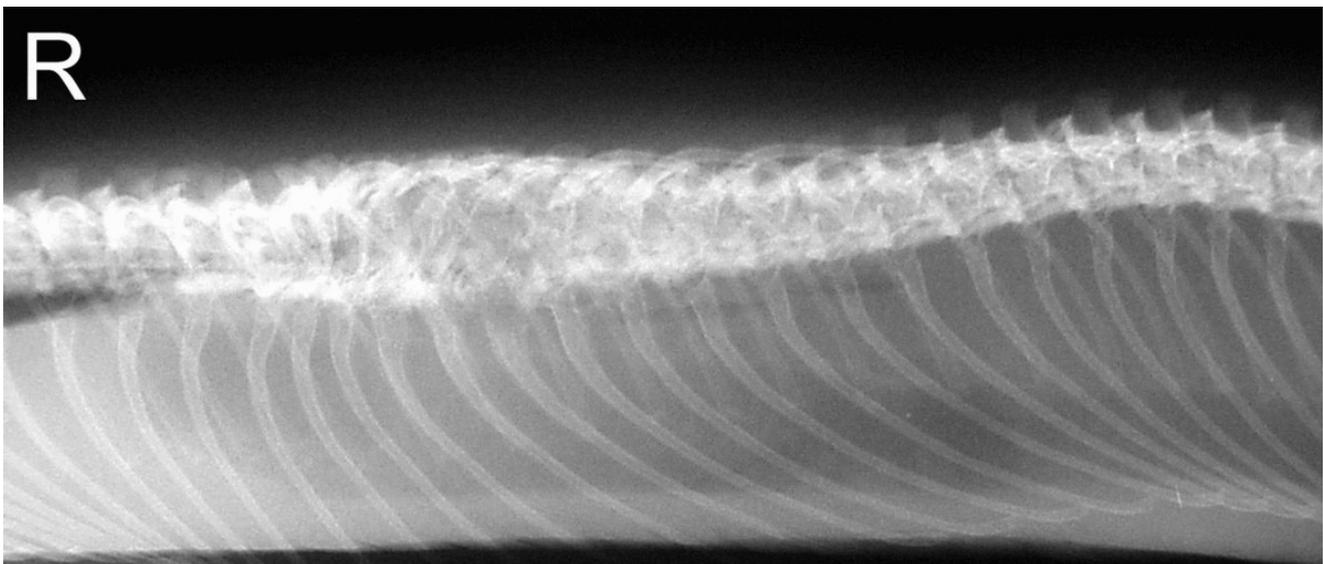
**Table 1.** Approximate Body Organ Position in Snakes

Organ	Approximate % Position from Snout
Heart	22–35
Lung(s)	25–50
Air Sac	45-85
Liver	35–60
Stomach	45-65
Spleen, pancreas, gall bladder	60–70
Small intestine	65–80
Kidneys	65–90
Colon	80-100

**INTERPRETATION**

**Musculoskeletal System**

Traumatic fractures, metabolic bone diseases, spondylitis/spondylosis, osteomyelitis, and congenital abnormalities are common indications for examining the skeletal system of snakes (Figure 1). Again, it is imperative to properly label each radiograph to document a lesion as it is difficult to discern by looking at the radiograph exactly where the lesion is located in the actual animal. Fractured ribs with periosteal bone formation are a common finding in snakes. Another common finding is exuberant vertebral periosteal bone formation. On radiographs, this appears as several "fused" vertebrae. Clinically, the animal is less flexible in the area that is affected and may display an angular deformity. The aetiology of this condition has not been conclusively documented, however, traumatic and/or infectious causes have been suggested.



**Figure 1.** Spinal osteomyelitis in a boa constrictor.

### Digestive System

The esophagus is not normally visualised unless gas or contrast material is present. The stomach is located in the middle third of the body. Often, the radiodense skeletal remains of recently ingested prey can be visualized. The liver is ventral to the lungs and caudal to the stomach. Ingesta of varying opacities can be observed in the small and large intestines in the caudal third of the body. The cloaca lies at the level of the last pair of ribs. The pancreas, gallbladder and spleen are not normally visualised. Common indications for radiographically evaluating the digestive system include hypertrophic gastritis, foreign body ingestion/impaction, constipation, hepatomegaly and hepatic masses. Contrast studies are useful in diagnosing intestinal obstruction and constipation. In addition, contrast material in the gastrointestinal tract can often outline and help determine the origin of a nonspecific intracoelomic masses; intraluminal or extraluminal.

### Cardiopulmonary System

The heart generally lies at the end of the cranial third of the body. Cardiomyopathy has been reported in snakes, which can be indicated by cardiomegaly on radiographs. Metastatic mineralization of large blood vessels is often apparent around the heart due to the negative contrast afforded by the adjacent lungs.

The trachea can be visualized as a radiolucent line in the cranial third of the body extending from the head to the cardiac silhouette. The lungs are visualised caudal to the cardiac shadow in the middle third of the body, except in viperids and elapids where they can also be found cranial to the heart. Except in boas and pythons, the left lung is vestigial or absent and thus, not usually appreciated. In most species, the lung continues as a thin walled air sac into the caudal third of the body, extending in some almost to the level of the cloaca. The overlap of other organs such as liver and stomach over

the lung fields can make the radiographic interpretation of respiratory disease challenging. Common indications for evaluating the respiratory system are rhinitis, suspected neoplastic and infectious disorders of the trachea and lung, as well as abscesses or granulomas (Figure 2).

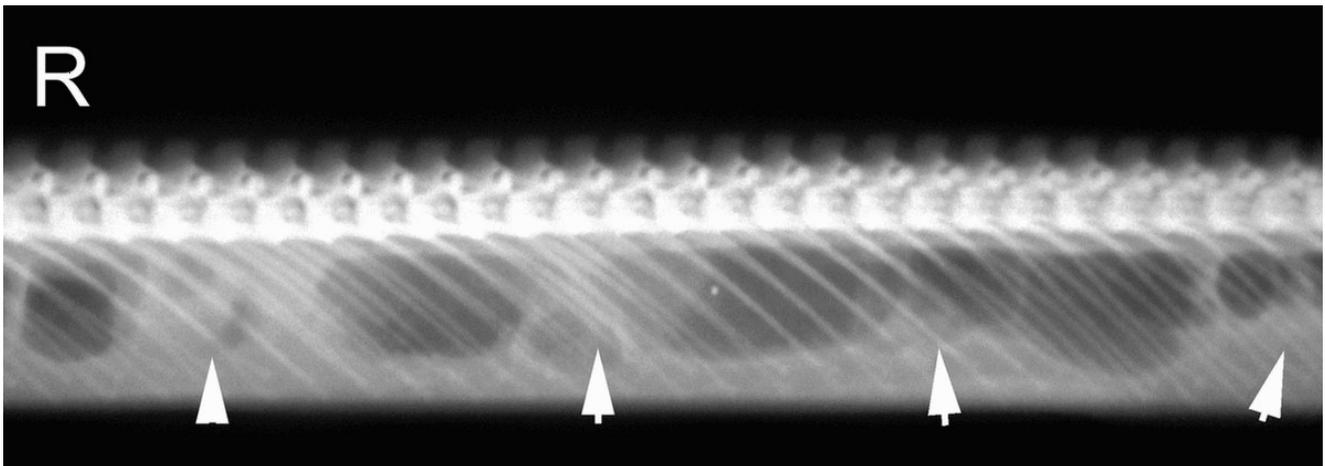
### Urogenital System

The kidneys of snakes are located dorsal to the intestinal tract in close association with intracoelomic fat bodies. They are not always radiographically evident, unless enlarged or mineralised. Disease processes that can cause renomegaly include renal gout and neoplasia.

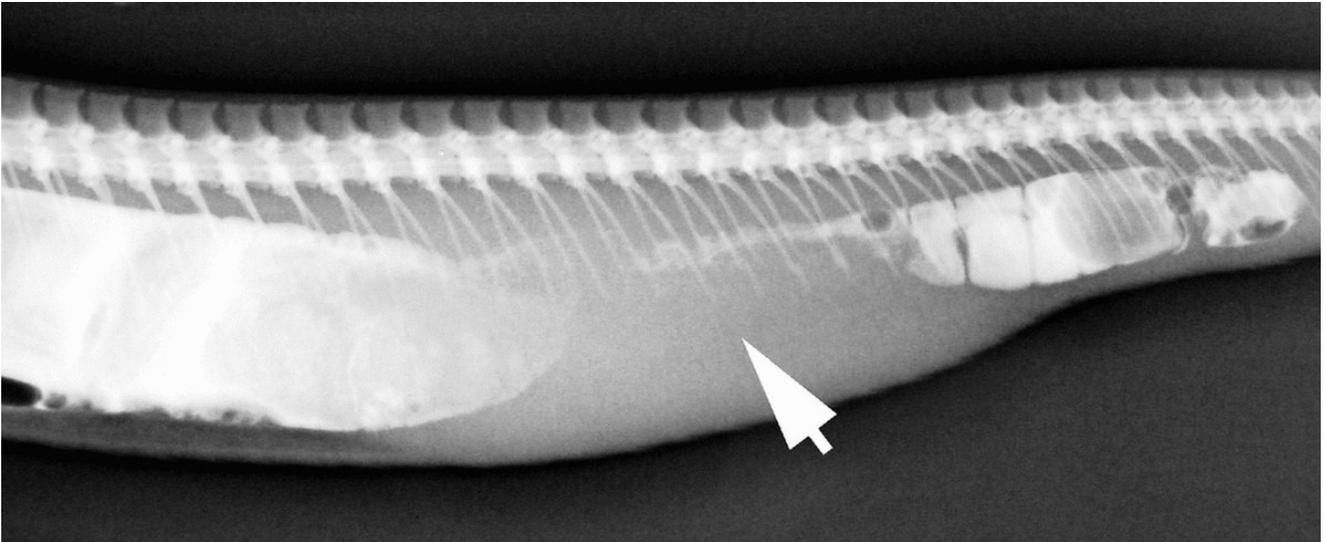
The oviducts lie in the middle and caudal third of a coelom. Eggs of oviparous species are leathery and poorly calcified, but can often be appreciated on plain radiographs. Viviparous species (boas and viperids) do not produce eggs. In these species, fetal skeletons become visible as they mineralize late in gestation. The hemipenes of some species may appear mineralised and can be detected radiographically. A discrete soft tissue swelling at the level of the cloaca may indicate cloacitis, abscessation or fat deposition. Common indications for evaluating the reproductive system include dystocia, apparent infertility and reduced fecundity. It is important to note that dystocia is difficult to diagnose by radiology alone and a careful history, in combination with clinical signs and other diagnostic techniques such as ultrasound, is often necessary to make the final diagnosis (Figure 3).

### Miscellaneous

The presence of any swelling is an indication for radiography. Abscesses, which can either be extracoelomic or intracoelomic and associated with a specific organ or the coelomic wall are common findings in snakes.



**Figure 2.** Multiple soft tissue opacities (*arrows*) within the lung fields of a ball python, later confirmed as pulmonary mycobacteriosis.



**Figure 3.** Barium contrast enema demonstrating compression of the lower intestinal tract due to a mass effect, which was later confirmed as an ovarian granulosa cell tumor.

**REFERENCES**

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