Nuclear scintigraphy is an imaging technique that is noninvasive (does not require surgery). It involves administering radionuclides (radioactive elements called isotopes or tracers) which are usually attached (tagged) to drugs that travel to a specific organ in the body. The radionuclides emit gamma radiation which can be imaged with a specialized machine called a gamma camera. The location and amount of the radionuclide within the organ can help assess the function of the organ. The animal may be awake for nuclear scintigraphy, if he is cooperative. After scintigraphy, the patient is usually isolated for 12-24 hours to allow the body time to clear the radioactive tracer. This type of imaging is useful in the evaluation of the bone, brain, kidneys, thyroid, and liver.

Renal scintigraphy

Renal scintigraphy (kidney scan) is useful in evaluating the function of each individual kidney. It requires the animal to lay quietly on his side for about 10 minutes, during which time, the radionuclide is injected into the patient and the images of the kidney are taken. The amount of the radionuclide taken into the kidney is proportional to that kidney's function and its ability to filter the blood that flows through it (glomerular filtration rate - GFR).

Kidney scans help assess function, whereas, the anatomic detail and structure of the kidney are better determined using x-rays and ultrasound. Those diagnostics, however, are unable to measure kidney function. Blood and urine tests assess the combination of both kidneys, but they can not differentiate the function of one kidney versus the other.

Renal scintigraphy has several uses. It can measure the function of an apparently healthy kidney prior to removing the other diseased kidney. This is necessary to know because if the remaining kidney is not functioning at a livable level, surgery would not be a viable option. Renal scintigraphy is also used to identify conditions such as infections, tumors, cysts, kidney stones, or injury from toxins/poisons.

Bone scintigraphy

Bone scintigraphy (bone scan) is used in the evaluation of the skeletal system. A tracer is administered intravenously and images are taken at various times. Bone scans are based on the principle that healthy bones will incorporate certain bone tracers into their structure. Healthy bones are dynamic. Calcium, for instance, is constantly being removed from bone and replaced. The distribution of tracers in bones depends on the rate of this bone turnover and blood flow. The bone scan reveals the changes in the metabolism of the bone more than actual changes in the bone structure.

Bone scintigraphy complements, but does not replace survey radiography. The changes in scintigraphy usually proceed the changes noted on the x-rays, since the bone's metabolism usually changes before the bone's structure changes. Scintigraphy is useful in the evaluation of patients with poorly localized lameness, especially when x-rays are inconclusive. Small lesions can result in significant changes in the metabolism of the bone which is assessed through the images. Bone scans are useful for diagnosing conditions such as infections, tumors, and arthritis. The changes caused by these conditions are often seen on bone scans before they show on x-rays. Earlier diagnosis means earlier treatment, and increases the probability that the treatment will be more successful. Bone changes may be apparent on a bone scan, but the cause of the lesion may not be. In these instances, other diagnostic tests may be necessary.

Thyroid scintigraphy

Thyroid scintigraphy (thyroid scan) is used to detect hyperfunctioning thyroid tissue that causes hyperthyroidism. Its major value is in determining the extent of the gland involvement. It is also used to evaluate thyroid tumors (adenomas and carcinomas) in dogs and cats. The tracer is administered, and it delineates functioning thyroid tissue and will help in determining if the condition involves one or both of the thyroid glands.

Brain scintigraphy

Brain scintigraphy is used to evaluate the integrity of the blood brain barrier. In a normal brain, there is a barrier which blocks the movement of many substances from the blood vessels into the brain tissue. So in a normal brain, the tracer would be unable to pass from the blood through the barrier and into the brain. If a brain tumor, abscess, or vascular lesion (stroke) is present, the barrier may not be intact and the tracer can then enter the affected area.

Portal scintigraphy

Portal scintigraphy is used to diagnose portosystemic shunts. The portal system is comprised of blood vessels which normally collect blood from the stomach and intestines. The system then sends the blood through the liver before the blood goes back to the heart. This allows the liver to be the first organ to receive nutrients (or toxins) absorbed from the intestines. With a portosystemic shunt, the blood bypasses the liver and goes directly to the heart. The liver, then, is malnourished, and the body is potentially exposed to toxins. Portal scintigraphy involves the placement of the tracer into the intestines via an enema and imaging the absorption of the tracer by the liver. Normally, the tracer should go into the portal circulation and to the liver. If a portosystemic shunt is present, the tracer appears in the heart first, or at the same time it appears in the liver. The amount of the shunting is computed from the images. Normal blood flow and typical types of shunts for the species need to be taken into account when reading the images. Surgical correction may be possible to correct the route of the blood flow.