Pituitary Dwarfism

Other names for this condition: juvenile panhypopituitarism, hypopituitarism, growth hormone deficiency, hyposomatotropism.

Disease description

Pituitary dwarfism is a congenital abnormality of the pituitary gland that results in reduced growth and development. It can be caused by an isolated growth hormone (GH) deficiency, but sometimes it is part of a combined pituitary hormone deficiency syndrome whereby other hormones (e.g., thyroid, reproductive, etc.) are also deficient.[1-3]

Pituitary dwarfism is seen most often in the German shepherd dog, but is also seen in the Karelian Bear Dog, Saarloos Wolfhound, Czechoslovakian Wolfdog, Miniature pinscher, American Eskimo Dog (Spitz), and Weimaraner.

Symptoms

While not all pituitary dwarfs display the same symptoms, most have marked growth retardation (usually noted by 2-5 months of age) and retention of their "puppy coat," resulting in an abnormally soft and woolly hair. The fur is easily removed, resulting in baldness that begins at points of wear, such as the collar area on the neck and on the tail. Eventually, much or the hair on the body and rear end is lost. Fur often remains on the head and legs/feet. The skin becomes progressively blackened and scaly, often with secondary bacterial infections.[1] There are delays in bone growth, and premature closure of the growth plates resulting in small stature. The teeth erupt later than usual and external genitalia remain infantile.

Two 7 weeks old German shepherd litter mates.

Most pups in the litter averaged 13-14 pounds (left) except for one that weighed less than 4 pounds (right).

Some affected patients also have congenital heart defects such as patent ductus arteriosus.[1] Male pituitary dwarfs often have one or both testicles fail to descend into the scrotum. Female pituitary dwarfs may display persistent estrus, characterized by swelling of the vulva, attractiveness to male dogs, and bloody vaginal discharge of more than four weeks duration. Blood progesterone level in affected females is low, indicating that ovulation does not occur.[1]

Diagnosis

Routine blood tests are usually mostly normal. An elevated plasma creatinine concentration (kidney value) has been noted in some cases.[1] Many affected dogs go into

kidney failure by middle age, if untreated. High white blood cell count can be present, as can low blood sugar, and low phosphorus.

Blood Tests - Thyroid. Low thyroid function (hypothyroidism), due to a decrease in production of thyroid stimulating hormone (TSH) by the pituitary gland, is usually present.[1] However, if thyroid hormone results are normal, keep in mind that pituitary cysts can enlarge with age and affected patients may be hypothyroid later.

Blood Tests - Insulin Like Growth Factor (IGF-1) and Growth Hormone (GH). Plasma IGF-I concentrations are low even when age and body size are taken into account. Unfortunately, low IGF-I measurements do not always provide definitive proof of pituitary dwarfism. Since basal plasma GH values may also be low in healthy animals, simply measuring GH levels is not usually helpful. In the past, pituitary dwarfism was diagnosed by measuring GH after various substances that increase GH levels, such as Ghrelin,[6] clonidine, or xylazine. Because DNA testing for pituitary dwarfism is now available and GH testing is often unavailable, GH testing is rarely done today. However, IGF-1 is a common screening test, for dogs that fail to grow, because there are many causes of that problem.

DNA Testing – Dogs with pituitary dwarfism have mutations in both of alleles in the LHX3 gene pair, so their result is "abnormal abnormal." Dogs with test results "normal abnormal" carry the gene and can pass it on to offspring, but are not dwarves. Carrier dogs should not be bred. Pituitary dwarfism in German shepherd dogs and Carnelian bear dogs is inherited as an autosomal recessive trait.

Brain imaging: Computed tomography (CT scan) or MRI of the pituitary fossa in the brain may show cyst formation. The pituitary gland itself may be normal in size, enlarged, or small.[2] Pituitary dwarves do not always show abnormalities on brain scan, and some normal dogs can have cysts in the pituitary that cause no problems.

6 month old FS GSD, smaller than normal. Owner's complaints were lack of hair regrowth post-spay and hair loss.	
	
Note the dull, dry puppy-like hair coat	Close up of tail base -- note the hair loss

Treatment

Growth hormone (GH) replacement can result in side effects (e.g. stump pyometra, mammary hyperplasia, and induction of diabetes mellitus). It often does not result in a significant increase in body size if the growth plates have already closed or are about to close. Finding a source of GH is difficult. GH from the pig is identical to canine GH and thought to be the best supplement to use, given as injections under the skin three times weekly. Skin and hair coat usually improve within 6-8 weeks. Growth of primary hairs is expected but growth of guard hairs is variable. Monitoring of the plasma concentrations of IGF-I and blood sugar is important.[1] If the problem is diagnosed with the dog is still a pup, and growth plates in the bones are still open, growth can occur for several months after GH therapy is started.

If low thyroid function is present, it is treated routinely by administering the thyroid hormone L-thyroxine. Appropriate dose is determined when blood tests show that thyroid hormones have normalized in the body.

Medroxyprogesterone acetate (Megace®) is another treatment that is probably even more controversial than GH injections. This drug is given as an injection every 3 weeks at first, and then every 6 weeks. This results in some increase in body size and development of a complete adult hair coat. Owners should be warned of several side effects: recurrent itchy skin infection, skeletal deformities, mammary tumors, acromegaly, and diabetes mellitus.[1] Blood glucose should be monitored for signs of diabetes. Plasma concentrations of GH and IGF-I can be monitored to try to prevent side effects. Females should be spayed before the start of the Megace treatment to prevent infection of the uterus (pyometra), which can be potentially life threatening.

Prognosis

The prognosis for an untreated pituitary dwarf is guarded. Untreated, affected dogs usually die or are euthanized at an early age (<5 yrs old) either due to infections, neurological dysfunction (due to enlargement of pituitary cyst) or degenerative diseases that occur as a consequence of the GH and TSH deficiencies, such as diabetes or kidney failure.

When treated with GH, the prognosis depends on whether a normal IGF-1 concentration can be produced and whether or not treatment complications (diabetes mellitus, pyometra or acromegaly) occur. Treated dogs live longer and usually have a better quality of life, but rarely survive to old age.

References:

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