

AMC

Animal Medical Center

SINCE 1910

Pituitary Surgery in Dogs and Cats

What is Transsphenoidal hypophysectomy?

What and where is the Pituitary Gland?

The pituitary gland, also called the hypophysis, is an important mediator of hormonal control in animals and humans. The most significant hormone groups controlled by the pituitary in dogs and cats are cortisol, thyroid hormone, growth hormone and water-balance (anti-diuretic hormone) systems. The normal pituitary is a small structure contained within sphenoid bone which is a flat bone comprising the base of the brain. The space within the sphenoid bone is known as the pituitary fossa.

What is Transsphenoidal hypophysectomy?

Transsphenoidal hypophysectomy (TSH) is a common surgery performed in people to treat tumors of the pituitary and other structures within the region of the pituitary gland. This surgery is considered a minimally invasive procedure. In people the surgical approach is through the nose and assisted by the use of an endoscope to improve visualization. Because of the difference in skull and nasal structure this surgery is performed through the mouth in dogs and cats. A small incision is made in the soft palate to gain access to the sphenoid bone and the pituitary fossa. Because of the small size of the surgical approach and complex anatomy TSH is technically challenging. Excellent post-operative monitoring and care is essential to good recovery.

The most common reason TSH is performed in dogs and cats is the treatment of functional tumors of the pituitary glands. The most common pituitary tumor in dogs is a functional tumor causing Pituitary-dependent hyperadrenocorticism (PDH), or Cushing's disease. The most common functional pituitary tumors in cats secrete growth hormone producing Acromegaly. Dogs and cats with functional pituitary tumors are usually brought to their veterinarian because of clinical signs of hormone dysfunction even though the problem is caused by a tumor at the base of the brain. Some patients develop nonfunctional masses in the area of the pituitary gland. These nonfunctional masses cause neurological signs that signal there is a problem. These signs can be nebulous: behavior changes, lethargy, decreased appetite, and visual and balance problems. Some of these signs can be seen with functional pituitary tumors as well making the diagnosis challenging. Often these signs only develop once tumors are large and compromising adjacent brain structures. For this reason MRI or CT scan should be considered in any patient diagnosed with a functional pituitary disorder. Early detection may help with treatment decisions.

What are the treatment options?

Medical management: Currently in the United States medical therapy is the primary treatment for functional pituitary tumors. In dogs with PDH medical therapy involves drugs that target corticosteroid production by the adrenal gland or ACTH secretion by the pituitary gland. These therapies can improve the clinical signs of PDH in 85% patients. Disadvantages are the need for chronic, daily administration and the need for frequent monitoring. Side effects of vomiting, diarrhea and decreased appetite in addition to adrenocortical necrosis are possible. The main issue with medical management is that these fail to address the primary cause the disease; the pituitary tumor itself. Relapse rates may be high as 50% within first the several years of therapy. Tumor growth can continue throughout this period and contribute to poor outcome. Medical therapy in cats is less certain than dogs. PDH in cats is less common than dogs and response to medications is not consistent. Acromegaly has gained increased awareness in cats because of the clinical syndrome of insulin-resistant diabetes mellitus. In these cats uncontrolled diabetes mellitus is a chief problem and insulin regulation is often not achieved unless the tumor is addressed.

Radiation therapy: Management of functional and nonfunctional tumors of the pituitary gland with radiation therapy has increased with greater access to specialized veterinary centers offering this therapy. Radiation has its best efficacy controlling tumor size and can shrink masses by 25% in up to half of cases. Depending on tumor size this may not relieve neurological signs. These effects on size may take months to occur so response is gradual. Smaller tumors, treated early may respond more favorably. Control of the endocrine signs is variable and often not permanent in many cases. Long-term outcome can be good with survival ranging from one to four years. Radiation side effects are variable with hair loss, whitening of hair, conjunctivitis and mucositis being most common in the short term. Partial or complete blindness and radiation-induced brain necrosis are less common but serious side-effects that can happen months or years after therapy.

Transsphenoidal hypophysectomy: This surgery has been used to treat PDH in dogs since the late 1990's with good success. With experience TSH has shown comparable or better long term success than established medical treatments (e.g. mitotane or trilostane). The majority of these studies have come from the Netherlands, the United Kingdom and Japan where the surgery is performed at only a single veterinary center within each country. Factors limiting the widespread use of TSH are: (1) difficulties visualizing the surgical site due to the small anatomy; (2) challenges defining surgical landmarks due to variations in skull size and shape in various breeds; (3) lack of facilities specialized in the post-operative management of these complex cases.

Transsphenoidal hypophysectomy has become the primary treatment for acromegaly in cats at veterinary medical centers that perform these surgeries. Compared to hypophysectomy, radiation therapy has not been shown to normalize growth hormone and IGF-1 levels meaning insulin resistance and cardiomyopathy may persist. The rate of diabetic remission is approximately 70% with the remaining patients achieving improved glycemic control. Diabetic remission is maintained long term with survival times greater than 5 years.

Since 2015 the Neurology Service at the Animal Medical Center has worked to establish minimally invasive neurosurgical techniques to advance surgical treatment of complex diseases involving delicate anatomy as with transsphenoidal hypophysectomy. High-definition video endoscopes are used at the AMC to improve visualization. The benefits of improved visualization when performing transsphenoidal hypophysectomy was shown in a recent study by colleagues now based at Washington State University.

Use of the VITOM exoscopic system (Kart Storz Endocsopy, Tuttlingen, Germany) allows for improved access and removal of more complex masses than previously reported. To improve accuracy and safety the AMC uses a veterinary-designed neuronavigation system (Brainsight2 Rogue Research, Montreal Canada) to accurately navigate and identify the landmarks and extent of operated pituitary tumors. This system allows for pre-operative MRI and CT images to be used to orient the surgeon in real-time during surgery which increases safety and improves surgical access. These technological and surgical advances are supported by our experienced and dedicated ICU team staffed by critical care specialists.

The team:

Dr. JP McCue has been performing complex neurosurgical procedures at the Animal Medical Center since 2011. Dr. McCue was first board-certified in small animal Internal Medicine in 2009 prior to obtaining board certification in Neurology. His complimentary skillset of expertise in the management of endocrine disorders and experience as a neurosurgeon have facilitated establishing the AMC as a center for management of surgical diseases of the pituitary in the United States.

Dr. Chad West, DVM, MS, DACVIM (Neurology) has been head of the Neurology/Neurosurgery department since 2005 and is the co-chair of the minimally invasive neurosurgery center at the AMC. His expertise and experience buoy the collaboration inherent to these procedures.

All patients requiring advanced neurosurgical procedures are managed by the cohesive efforts of multiple specialists within the critical care department. These patients are benefitted by the strong support of the radiology and internal medicine department and the veterinary technical staff of the AMC.