The Importance of Total T4 in Screening for Thyroid Disease in your Preanesthetic and Geriatric Patients

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The thyroid gland is the largest endocrine organ in the body. It produces thyroxine (T4) and triiodothyronine (T3), which regulate the metabolic rate, growth rate and function of many other body systems. Hyperthyroidism and hypothyroidism are the most common endocrinopathies affecting senior/geriatric feline and canine patients, respectively. The onset of thyroid disease is often insidious in senior pets, occurring over months to years. Because thyroid disorders typically respond well to treatment and carry a good prognosis, it is important for the clinician to be aware of the common clinical signs as well as the unusual manifestations of thyroid disorders and to routinely screen patients with suspected or potential thyroid disease. In addition, thyroid disease, especially hyperthyroidism, may impact anesthetic considerations, so preanesthetic determination of thyroid status is often important for the well-being of the patient.

Feline hyperthyroidism

Feline hyperthyroidism was first recognized as a distinct clinical entity in 1979. It has since been diagnosed with increasing frequency. Hyperthyroidism is due to the overproduction of thyroid hormones from the thyroid gland and, in the vast majority of cases, is due to a benign thyroid adenoma or hyperplasia. Enlargement of the thyroid gland(s) or a goiter is palpable in approximately 70% of hyperthyroid cats. The overproduction of thyroid hormone increases the metabolic rate, which increases energy needs, usually resulting in weight loss despite a normal or, often, increased appetite. Other signs may include increased thirst and urination, hyperactivity, nervousness, vomiting and diarrhea and an unkempt hair coat. The increased metabolic rate can also increase heart rate and blood pressure and negatively impact all major body organs. Hyperthyroidism typically affects cats over 7 years of age, although it should be considered in cats as young as 3 years of age that have compatible clinical signs. There have been several risk factors suggested for predisposing cats to hyperthyroidism, such as breed, canned cat foods (especially those brands with pop-off lids or containing bisphenol A diglycidyl ether [BADGE]), exposure to environmental chemicals (such as PBDE flame retardants) and even some cat litter. Also, cats are living longer today than they did 30 years ago, allowing more time for hyperthyroidism to manifest itself. The underlying cause of hyperthyroidism, however, remains elusive and is likely multifactorial, so more studies are needed.

Total T4 screening for feline hyperthyroidism

Total T4 is an excellent screening tool for feline hyperthyroidism. A T4 above the reference interval limit is diagnostic for hyperthyroidism in cats. Older cats with consistent clinical signs and T4 values in the gray zone may have early (or occult) hyperthyroidism or hyperthyroidism and a concurrent nonthyroidal illness (NTI). Low T4 values secondary to NTI in cats and dogs is also referred to as the euthyroid sick syndrome. A CBC, full chemistry panel and complete urinalysis should always be performed in addition to a T4 to evaluate for NTI. Like cats with clinical hyperthyroidism, many cats with occult hyperthyroidism or T4 suppression secondary to NTI will have significant increases in ALT and ALKP and occasionally a mild polycythemia. Hyperthyroidism is most often confirmed in these cats by performing a free T4 (fT4). For those cats where the T4 is within reference interval limits and hyperthyroidism is still suspected, a quantitative technetium scan may be performed, or less commonly, a T3 suppression test.

A T4 above the reference interval limit is diagnostic for hyperthyroidism in cats. A total T4 that is well within reference interval limits, generally 2–4 µg/dL, makes hypothyroidism highly unlikely.

Preanesthetic screening is critical

Cats with clinical or occult hyperthyroidism may have serious secondary or concurrent disease, such as hypertension, hypertrophic cardiomyopathy or gastrointestinal, hepatic or renal disease. These cats are at risk of developing life-threatening arrhythmias both during and after the anesthetic event. Diagnosing hyperthyroidism on the preanesthetic blood screen may require modifying the anesthetic and monitoring protocol or postponing the procedure altogether until the patient’s hyperthyroidism has been fully evaluated and controlled.

Canine hypothyroidism

In dogs, hypothyroidism is due to impaired secretion of thyroid hormones. The large majority of dogs have primary hypothyroidism resulting from lymphocytic thyroiditis or idiopathic thyroid atrophy. Hypothyroidism is most commonly diagnosed in middle-aged dogs and often affects midsize to large breeds. Common clinical signs of hypothyroidism include lethargy, inactivity, weight gain, cold intolerance, hair loss or excessive shedding, lack of hair regrowth following clipping, dry or lusterless hair coat, excessive scaling and recurrent skin and/or ear infections.

Total T4 screening for canine hypothyroidism

Total T4 is the recommended initial screening test in dogs with clinical signs suggestive of hypothyroidism. A total T4 that is well within reference interval limits, generally 2–4 µg/dL, makes hypothyroidism highly unlikely. Additionally, dogs with no clinical signs of hypothyroidism and results within reference interval limits are likely euthyroid. Dogs with low-normal or borderline-low T4 concentrations may be hypothyroid, normal or have NTI/euthyroid sick syndrome. Also, suppression of T4 concentrations by medications, such as corticosteroids, NSAIDs, phenobarbital and certain antibiotics, may occur in dogs. It is important to note that some breeds, such as greyhounds, other sight hounds and Alaskan sled dogs, may normally have a low or borderline-low T4. Therefore, it is imperative that the clinical signs and history of all patients be considered when evaluating thyroid function tests.

As with cats, a CBC, full chemistry panel and complete urinalysis should always be performed in addition to a T4 to further evaluate for NTI. Dogs with concurrent NTI should have their NTI treated, then have thyroid function reevaluated. Dogs with clinical signs of hypothyroidism without obvious NTI and low or low-normal T4 concentrations should be evaluated further by submission of free T4 (fT4) and canine TSH to confirm hypothyroidism. A high T4 concentration is a likely variation of normal; however, an elevated level may occur secondary to anti-T4 autoantibodies or, rarely, hyperthyroidism secondary to thyroid neoplasia.

Preanesthetic screening is also important for dogs

Similar to cats with hyperthyroidism, dogs with undiagnosed and unregulated hypothyroidism may have an increased risk of complications both during and after the anesthetic procedure. These dogs are often obese and have decreased basal metabolic rates. This makes them more susceptible to hypothermia during and after anesthetic procedures. Hypothyroid dogs may have less competent immune systems, which may predispose them to opportunistic infections. These dogs, like diabetics and those with hyperadrenocorticism, are also thought to have delayed wound healing compared to healthy dogs. A low or borderline-low T4 on the preanesthetic screen should prompt modifying or postponing the procedure until a full workup for hypothyroidism can be performed and the disorder treated, if required.

For more information on T4 testing and in-house T4 capabilities, visit idexx.com/snapshotdx.