



Canine Hypercalcemia

-Major causes of hypercalcemia in dogs include primary hyperparathyroidism, osteolysis, granulomatous disease, spurious, young age (skeletal immaturity), hypoadrenocorticism, neoplastic, renal failure, vitamin D toxicosis

Recommended Diagnostics

-Once total hypercalcemia is noted on a serum chemistry, an ionized calcium should first be submitted to confirm true hypercalcemia

*Lipemia, hemolysis, acidosis and dehydration may cause a falsely elevated total hypercalcemia

-Historical questions should include questioning owners about exposure to cholecalciferol rodenticide, psoriasis creams, supplements (including salmon oil), thiazide diuretics, day-blooming jessamine, or nightshade

-Due to breed predisposition, if patient is a Keeshond, testing PTH levels for primary hyperparathyroidism should be prioritized before any testing.

-The most common cause of hypercalcemia in dogs is neoplasia, particularly lymphoma, anal sac adenocarcinoma, multiple myeloma, or carcinomas (nasal, prostatic, squamous cell carcinoma, etc). Therefore a thorough physical exam focusing on peripheral lymph nodes, anal sacs, mammary glands, skin lesions, prostate, long bones, and spine may help direct subsequent diagnostics.

*If peripheral lymph nodes, mammary glands, or anal sacs are enlarged, a FNA should be the next step.

*If bone or spinal pain is detected, radiographs should be the next step to look for osteolysis or hypertrophic osteodystrophy.

*If any respiratory signs are noted or strong suspicion of neoplasia, thoracic radiographs should be the next step.

*Panniculitis may cause hypercalcemia due to granulomatous disease

*Cytology of any skin lesions should be performed looking for fungal organisms

-If none of the above physical exam clues are noted, submit a chemistry panel to check for azotemia, evidence of hypoadrenocorticism (lymphocytosis, eosinophilia, hyponatremia, hyperkalemia, lack of stress leukogram, hypoglycemia, hypocholesterolemia, anemia).

*To save money, may first use an Azostick to rule out renal failure

*If strong suspicion of hypoadrenocorticism, perform baseline cortisol. If $< \text{ or } = 2 \text{ ug/dl}$, perform an ACTH stimulation test. If baseline is $> \text{ or } = 2 \text{ ug/dl}$, hypoadrenocorticism is likely ruled out and a full ACTH stimulation test does not have to be performed.

-The next step is a PTH, PTHrp, and Vit D panel through Michigan State University to test for primary hyperparathyroidism, neoplasia, or hypervitaminosis D.

*A normal PTHrp does not rule out neoplasia, but if positive, neoplasia is highly likely.

*Vitamin D toxicosis may occur due to cholecalciferol rodenticide

-Fungal testing via urine antigen tests to screen for blastomycosis, histoplasmosis, or aspergillosis.

-A urinalysis may support renal failure.

-Abdominal ultrasound should be performed early if abdominal pain or organomegaly is noted.

Treatment

-Treat underlying disease

-Use **0.9% saline** to correct dehydration and obtain diuresis (2-3x maintenance)

-**Furosemide** (after rehydration) at 2 mg/kg PO or IV every 8-12 hours

-**Salmon calcitonin**: fast acting but short-lived effect; 4-6 IU/kg SQ BID-TID; may not work as well after first few doses; can be expensive

-**Bisphosphonates (pamidronate)**: 1 mg/kg IV (diluted in 100 ml of 0.9% saline) over 2-3 hours every 2-4 weeks; give IV fluids before, during, and after infusion; inexpensive

-**Glucocorticoids**: 1-2 mg/kg SID-BID; wait to give until lymphoma has been ruled out as previous steroid administration may preclude cytological diagnosis of lymphoma