

What Is Your Diagnosis?

In collaboration with the American College of Veterinary Radiology

History

A 13-week-old 0.87-kg sexually intact female domestic shorthair cat was presented to MedVet Cincinnati's emergency service for evaluation of a suspected urinary tract obstruction based on the lack of recent use of the litterbox with concurrent onset of abnormal behaviors that included reluctance to greet the owner, inappetence, and lethargy. The owner reported that the patient had developed epiphora and nasal discharge overnight and had a sudden-onset of sneezing. No vomiting, diarrhea, or coughing was reported.

On examination, the patient was quiet, alert, and responsive. On physical examination, it was noted that the patient was atypically small in size for the reported age. A small amount of dried nasal discharge and dried ocular discharge were noted bilaterally. A distended, pot-bellied appearance was described, and the patient displayed signs of discomfort during abdominal palpation. Firm structures were palpated in the mid abdomen bilaterally. No blood work was performed. Based on the presenting clinical signs, abdominal radiography was performed (**Figure 1**).

Formulate differential diagnoses, then continue reading.

Radiographic Findings and Interpretation

Abdominal radiography revealed a markedly distended colon and portions of the rectum, with partially mineral opaque fecal material consistent with desiccated fecal material compatible with constipation (**Figure 2**). The colon and included portions of the rectum were uniform in diameter with no evidence of structural abnormalities (eg, compression

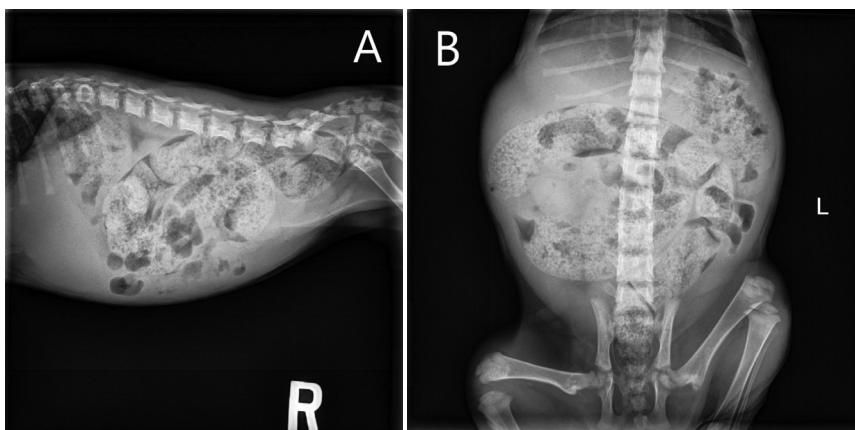


Figure 1—Right lateral (A) and ventrodorsal (B) abdominal radiographic images of a 4-month-old 0.87-kg sexually intact female domestic shorthair cat evaluated because the owners suspected urinary tract obstruction.

or stenosis). The epiphyses of the included vertebrae were poorly mineralized and less distinct than what would have been expected for the reported age of the patient, and the lumbar vertebral bodies were equivocally shortened and more square in appearance than typical for 4-month-old cats (**Figure 3**). There were no additional clinically meaningful radiographic abnormalities. The appearance of the lumbar vertebrae was suggestive of delayed epiphyseal ossification. Based on the concurrent reported lethargy, distended abdomen, and constipation, the primary differential diagnosis was congenital hypothyroidism. Another potential but less likely differential given the lack of concurrent facial dysmorphism that could have been considered was mucopolysaccharidosis. Given the lack of reported multiple epiphyseal dysplasia in cats, this etiology was not included in the initial list of possible differential diagnoses.

Treatment and Outcome

Pending review of the radiograph by a board-certified veterinary radiologist and because of concerns for constipation, an enema was performed overnight to alleviate the desiccated fecal material and fluid therapy was administered SC. The patient was discharged from the emergency department to the care of the owner.

Following the review of the radiographs by a Diplomate of the American College of Veterinary Radiology, recommendations to the owner were for the cat to have full blood work (CBC and serum bio-

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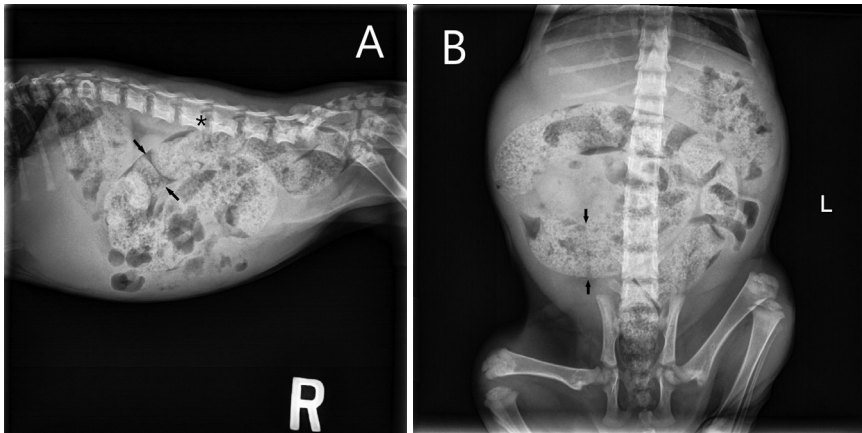


Figure 2—Same images as in Figure 1. The colon is markedly distended with mineral opaque fecal material (arrows). The epiphyses of the included vertebrae are smaller than expected for the cat's age, and the lumbar vertebrae are short and square (asterisks).



Figure 3—Right lateral abdominal radiographic image of a euthyroid 4-month-old sexually intact male domestic shorthair cat. The image is provided for comparison with the cat in Figures 1 and 2. The epiphyses of the included vertebrae are appropriately mineralized, and the lumbar vertebrae are radiographically normal in size and shape (asterisk). The colon is unremarkable with mild distention and contains a typical volume of fecal material.

chemical analyses) and a thyroid panel performed with the referral partner to assess for suspected underlying congenital hypothyroidism. Results of the thyroid panel indicated low concentration of total thyroxine (T4; 0.5 $\mu\text{g}/\text{dL}$; reference range, 0.8 to 4.7 $\mu\text{g}/\text{dL}$) and high concentration of thyroid stimulating hormone (TSH; 5.81 ng/mL ; reference range, 0.06 to 0.42 ng/mL), which further supported the presumptive diagnosis of congenital hypothyroidism. Treatment was initiated with levothyroxine (0.1 mg, PO, q 24 h) for management of hypothyroidism and with lactulose suspension (10 g/15 mL; 0.5 mL, PO, q 8 to 12 hours) for management of constipation. At recheck examinations 1.5 months and then 7 months after starting these medications, the patient's T4 concentration was 1.0 $\mu\text{g}/\text{dL}$ and then 2 $\mu\text{g}/\text{dL}$, respectively. The owner reported that the patient was clinically doing well. At approximately 1

year of age and after having received approximately 7 months of medical management, the patient had a physically appropriate size for its age. Recheck abdominal radiography was performed for comparison to assess for persistence or resolution of the previously described osseous abnormalities and revealed that the lumbar vertebrae were clinically normal in shape and size with no additional residual abnormalities present.

Comments

Congenital hypothyroidism is a rare disorder that has been reported in dogs and cats and is one of the more common causes

of disproportionate dwarfism in veterinary patients.¹ It has been previously documented in domestic shorthair cats,^{1,2} and in a family of Abyssinians.³ Growth and maturation of the brain and osseous structures are often stunted in affected patients.⁴ Commonly reported clinical signs in dogs and cats affected by congenital hypothyroidism include disproportionate dwarfism, delayed dental eruption, abdominal distention, constipation, lethargy, abnormal dull mentation, abnormal hair coat, bowed limbs, stilted or stiff gait, alone or in combination.^{1,2,5}

Diagnosis is primarily based on measurement of serum thyroid hormone concentration (total and free T4) to confirm low T4 concentration and to rule out euthyroid sick syndrome.¹ Confirmation of the diagnosis is further supported by the reported clinical history, physical examination findings, and radiographic observations. In particular, the radiographic images can provide important information about the skeletal maturity of the patient which can aid in diagnosis and may prompt additional diagnostics. The primary radiographic findings in patients affected with congenital hypothyroidism are typically suggestive of disproportionate dwarfism and commonly include epiphyseal dysgenesis or dysplasia (delayed or reduced ossification of epiphyseal cartilages, with or without stippled or irregular margination of the epiphyses), delayed ossification of the ossification centers of the long bones, endplate dysplasia (shorter vertebral bodies), and delayed skeletal maturation.^{2,5}

A common, but poorly understood, nonosseous radiographic finding often associated with congenital hypothyroidism is megacolon.² Due to the common occurrence of megacolon in patients with congenital hypothyroidism, one of the most common signs is constipation, and as a result, abdominal radiographic evaluation is often an initial and crucial part of the workup for the underlying cause for constipation.^{1,2} The initial radiographic examination can provide important diagnostic findings, such as osseous abnormalities consistent with delayed maturation and evidence of megacolon, which

when observed concurrently are highly suggestive of underlying congenital hypothyroidism in juvenile patients. Therefore, we recommend abdominal radiography for all young patients with constipation, particularly if there is clinical concern for delayed or stunted maturation, and to thoroughly evaluate the included skeletal structures for key radiographic abnormalities such as epiphyseal dysgenesis and end-plate dysplasia, which will aid in diagnosis.

Treatment involves oral supplementation of thyroid hormone and life-long management is required. If diagnosed and treated early in life, many of the abnormalities associated with low thyroid levels can be reversed and normal development of the musculoskeletal and central nervous system structures may resume. Given the lack of previously reported long-term follow-up of nontreated affected individuals, we hypothesize that without appropriate diagnosis and medical management to correct the insufficient thyroid hormone concentrations, the previously described musculoskeletal, CNS, and colonic abnormalities would persist and that the patient would likely have permanent disproportionate dwarfism, mental dullness, and chronic megacolon. Radiographically, nontreated patients will likely have persistent reduced ossification of the epiphyseal cartilages, shorter and more square vertebrae, and potential

persistent megacolon. The long-term prognosis for affected individuals is unknown.¹

Based on the constellation of key radiographic findings and common physical examination findings associated with congenital hypothyroidism, particularly in young patients with constipation, as observed in this patient, the authors recommend that congenital hypothyroidism should be considered as a potential underlying cause of the patient's clinical signs and that thyroid testing should be performed.

References

1. Crowe A. Congenital hypothyroidism in a cat. *Can Vet J*. 2004;45(2):168-170.
2. Traas AM, Abbott BL, French A, Giger U. Congenital thyroid hypoplasia and seizures in 2 littermate kittens. *J Vet Intern Med*. 2008;22(6):1427-1431. doi:10.1111/j.1939-1676.2008.0203.x
3. Jones BR, Gruffydd-Jones TJ, Sparkes AH, Lucke VM. Preliminary studies on congenital hypothyroidism in a family of Abyssinian cats. *Vet Rec*. 1992;131(7):145-148. doi:10.1136/vr.131.7.145
4. Hall JE, Guyton AC. Thyroid metabolic hormones. In: Hall JE, Guyton AC, eds. *Textbook of Medical Physiology*. 13th ed. Elsevier; 2011:951-963
5. Ettinger SJ, Feldman EC. Hypothyroidism. In: Scott-Moncreiff JCR, Guptill-Yoran L, eds. *Textbook of Veterinary Internal Medicine—Volume II*. 7th ed. Elsevier; 2004:1535-1544.