

Metabolic Bone Disease in a Green Iguana (*Iguana iguana*)



Amy Zeigler '06



Dr. Ricardo de Matos, Advisor



Signalment

- “Evan”
- 11 year old green iguana
- Unknown sex

- Owner got her from a pet store while still young
- Never been seen by a veterinarian
- No other reptiles in the house





Environment

- Large dog crate with a towel on floor
 - Two heat rocks, heat lamp and heating pad
 - Overhead fluorescent light
 - Pool for soaking and a drinking bowl
 - Several logs to climb on
- Temperature and humidity level unknown



Diet

- Spring mix salad (75%)
- Other vegetables (20%)
- Fruits and breads (5%)
- No vitamin or mineral supplements





Presenting Complaint

- Presented to the Exotics Service on March 30, 2005 with a two week history of
 - Decreased appetite
 - Weakness in the hind limbs
 - No defecation



Clinical Findings

- QAR
- 1.56 kg – very small for an adult iguana
- Slightly dehydrated
- Small femoral pores and dewlap size indicated that Evan was a female



Clinical Findings

- Fine muscle tremors in tail and all limbs
- Crepitus felt at base of tail
- Unable to support body weight
- Had no tail motor function, minimal hind limb movement, absent cloacal tone
- Large quantity of what was assumed to be impacted feces felt in coelomic cavity



Clinical Findings





Clinical Findings





Clinical Findings



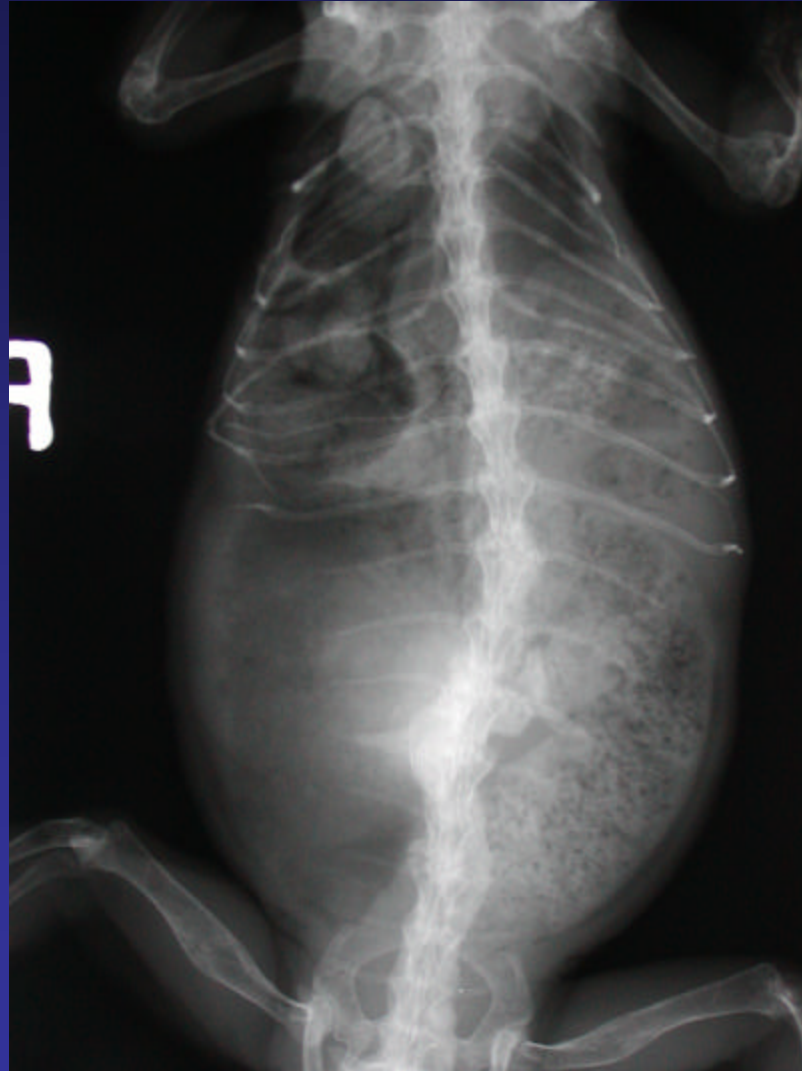


Radiographs

- Decreased bone density over entire body
- Multiple old spinal fractures with bony proliferation
- Severe right deviation of the vertebral column at the sacrocaudal junction
- Large amount of feces in colon

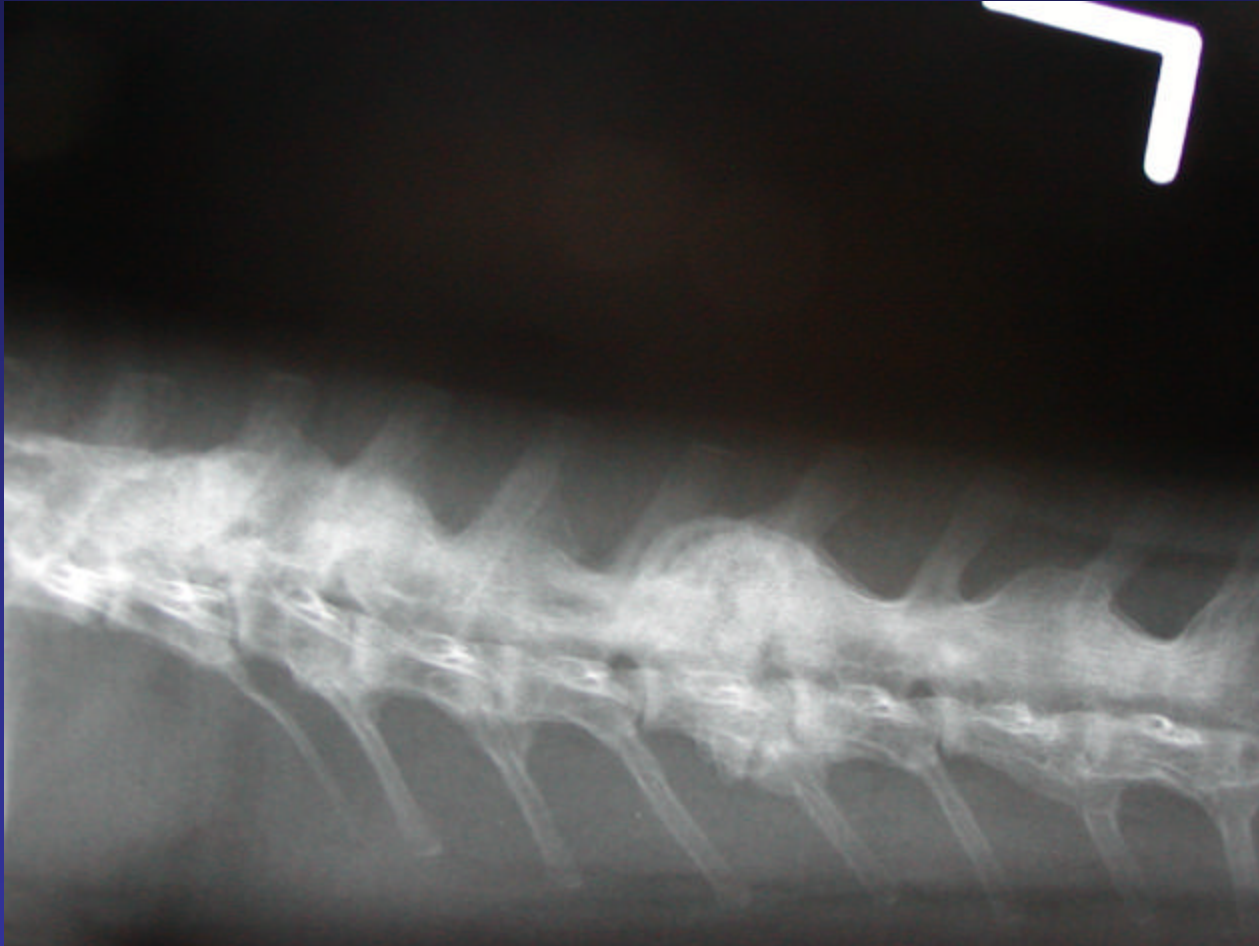


Radiographs





Radiographs





Radiographs





Problem List

- Small size
- Decreased appetite
- Hind body paresis
- Inability to defecate/distended colon
- Muscle tremors
- Decreased bone density
- Multiple spinal fractures



Differential Diagnoses

- Small body size
 - Genetic predisposition
 - Hormonal imbalance
 - Nutritional deficiencies





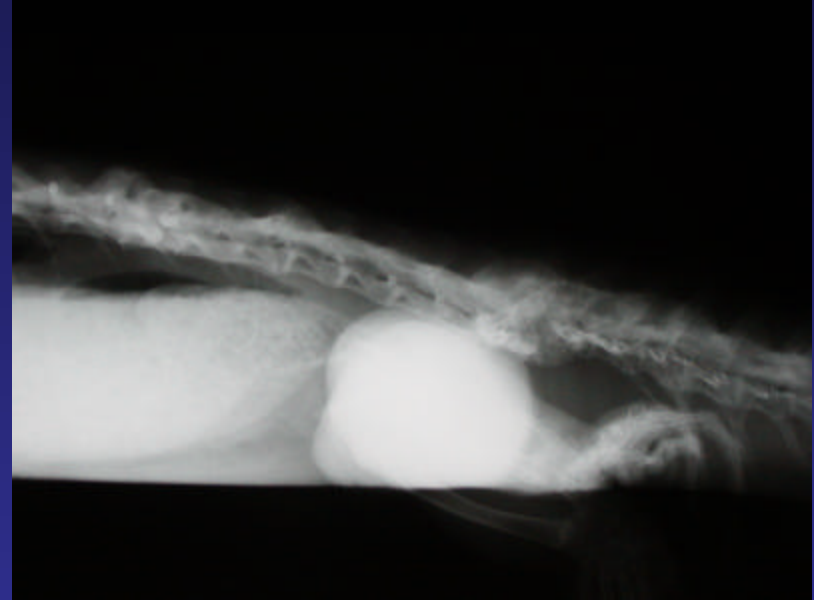
Differential Diagnoses

- Inability to defecate
 - Poor diet
 - Dehydration
 - Anorexia
 - Gastrointestinal obstruction
 - Renal disease (enlarged kidneys)
 - Nerve damage from spinal fractures



Differential Diagnoses

- Hind body paresis
 - General weakness
 - Hypocalcemia
 - Other electrolyte disturbance
 - Spinal cord damage from fracture/luxation





Differential Diagnoses

- Fine muscle tremors
 - Hypoglycemia
 - Neurological disease
 - Inflammatory disease
 - Toxin exposure (insecticide, heavy metals)
 - Nutrient deficiencies (biotin, thiamine, vitamin E/selenium)
 - Ionized hypocalcemia



Diagnosis

- Taking into consideration Evan's history of poor husbandry, clinical signs, and radiographic findings, a diagnosis of

Metabolic Bone Disease

was made with secondary pathologic fracture and luxation of the spine



Metabolic Bone Disease

- Actually a collection of several different diseases involving calcium homeostasis
 - Fibrous osteodystrophy
 - Nutritional secondary hyperparathyroidism
 - Osteoporosis
 - Hypocalcemia
 - Osteomalacia and rickets





Metabolic Bone Disease

- Three common causes:
 - Calcium-deficient diet
 - Imbalanced Ca:P ratio in diet
 - Vitamin D deficiency either in diet or from lack of UVB light exposure



Metabolic Bone Disease

- Commonly caused by a calcium-deficient diet, or more importantly, an inappropriate calcium:phosphorus ratio
 - Many foods commonly fed to reptiles are deficient in calcium
 - Others contain far too much phosphorus
- Appropriate Ca:P ratio for the reptile diet is 1:1 – 2:1



Metabolic Bone Disease

Item	Ca:P	Relative Calcium Content
Beet greens	2.6 : 1	High
Broccoli leaves	3.9 : 1	High
Broccoli stems	0.7 : 1	Low
Iceburg lettuce	0.9 : 1	Low
Romaine lettuce	0.8 : 1	Low
Spinach	2 : 1	Low
Ground beef	0.06 : 1	Low
Chicken muscle	0.05 : 1	Low
Mealworms	0.2 : 1	Low

Calcium:phosphorus ratios and relative calcium content of various food items commonly fed to reptiles. Adapted from Table 46-1, *Reptile Medicine and Surgery*



Metabolic Bone Disease

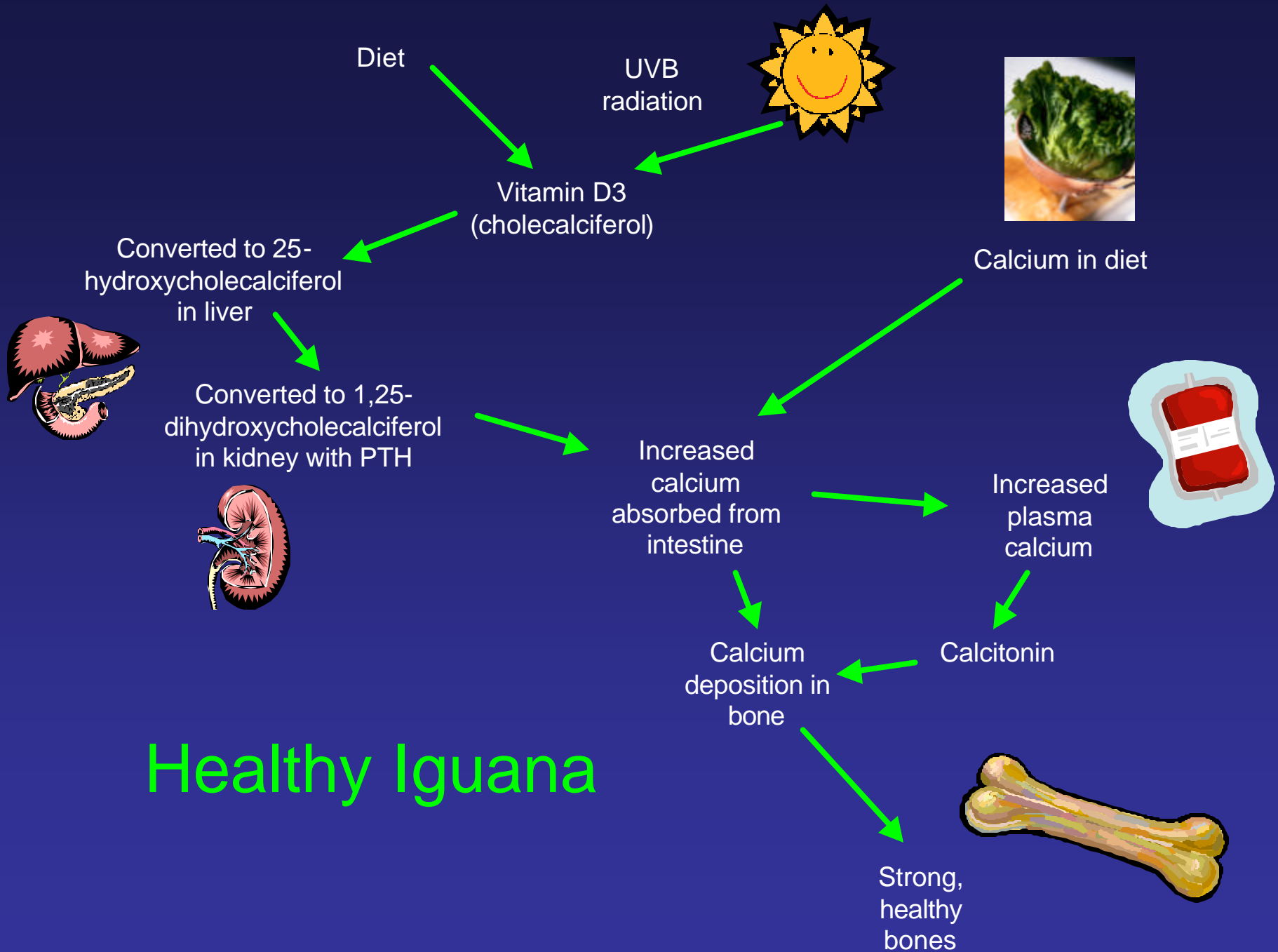
- In addition to poor diet, lack of Vitamin D can result in a functional calcium deficiency
 - Responsible for the uptake of calcium from the intestine
- Vitamin D comes from the diet but can also be made in the skin upon exposure to proper ultraviolet light (UVB)



Metabolic Bone Disease

- For many animals, dietary Vitamin D is sufficient
- Iguanas, however, rely heavily on Vitamin D from their skin and usually cannot survive for long on dietary sources alone





Deficient diet

No UVB radiation



Decreased cholecalciferol

Calcium deficient diet



Decreased calcium absorbed from intestine

Decreased plasma calcium

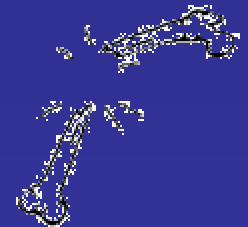
PTH release from parathyroid gland



Calcium mobilized from bone

Iguana with MBD

Soft, fragile bones





Metabolic Bone Disease

- In most cases, the owner doesn't even realize that their pet is sick
 - Most changes occur very slowly and start as soon as the owner acquires the animal
 - Small size and inability to hold up their body is not noticed unless the animal is placed next to a healthy iguana
 - Anorexia and paralysis usually do not occur until very late in the disease process





Prevention

- Education, education, education!
 - In the pet store before purchase
 - Visits to a veterinarian should be encouraged
- The majority of reptile diseases are the direct result of a lack of knowledge about proper husbandry



Back to Evan...

- Diet was not bad, but could have contained a greater variety of greens with a higher calcium content
- More importantly, she had never had an appropriate source of ultraviolet light (natural direct sunlight or special UVB bulb)
- Surprising that she had lived for 11 years under these conditions



Treatment

- In hospital
 - Calcium gluconate injection (100 mg/kg IM)
 - To treat muscle tremors and correct presumptive ionized hypocalcemia
 - 50 mL Reptile Ringers fluids SQ (1 part LRS + 2 parts 2.5% dextrose in hypotonic saline)
 - Plain LRS, PlasmaLyte and others are too hypertonic for reptiles, can actually dehydrate them
 - 60 mL PlasmaLyte enema



Treatment

- Discharged later that day with:
 - Calcium gluconate (1 mL/kg PO BID, then SID)
 - To keep blood calcium levels up long-term and allow bones to begin to strengthen and heal
 - Daily shallow warm water soaks
 - To keep her well hydrated and help her defecate
 - Exercise restriction and minimal handling
 - Fracture/luxation could not be adequately stabilized due to location and fragility of bones



Environmental Changes

- Diet to consist of a greater variety of dark, leafy green vegetables
 - Dandelion greens, turnip greens, mustard greens, kale, etc.
- Maintain more appropriate temperature in cage
 - 80-85 degrees F during the day with a 90 degree F basking area



Environmental Changes

- Remove all heat rocks
 - Known to cause burns, use lamps instead
- Add a UVB (full-spectrum) light source
 - Replace every 6 months
 - Must be no further than 12-18 inches from the basking area
 - No glass or plastic between light and animal



Outcome

- Slow yet consistent recovery that surpassed everyone's expectations
 - Returned to the hospital every 1-2 weeks for enemas and recheck examinations
- By one week:
 - Muscle tremors had resolved
 - Increased appetite and activity level



Outcome

- By two weeks:
 - Able to bear weight on all limbs for several seconds at a time
 - Slight increase in cloacal tone
- By one month:
 - Small tail movements noted
 - However still leaking urates and unable to defecate on her own



Outcome

- By two months:
 - Intermittently passed small amounts of feces between enemas
 - However, at one point developed bacterial overgrowth in impacted feces – given antibiotics to avoid sepsis
 - Regaining motor control of hind limbs and tail at a surprising rate
 - Increased exercise allowed

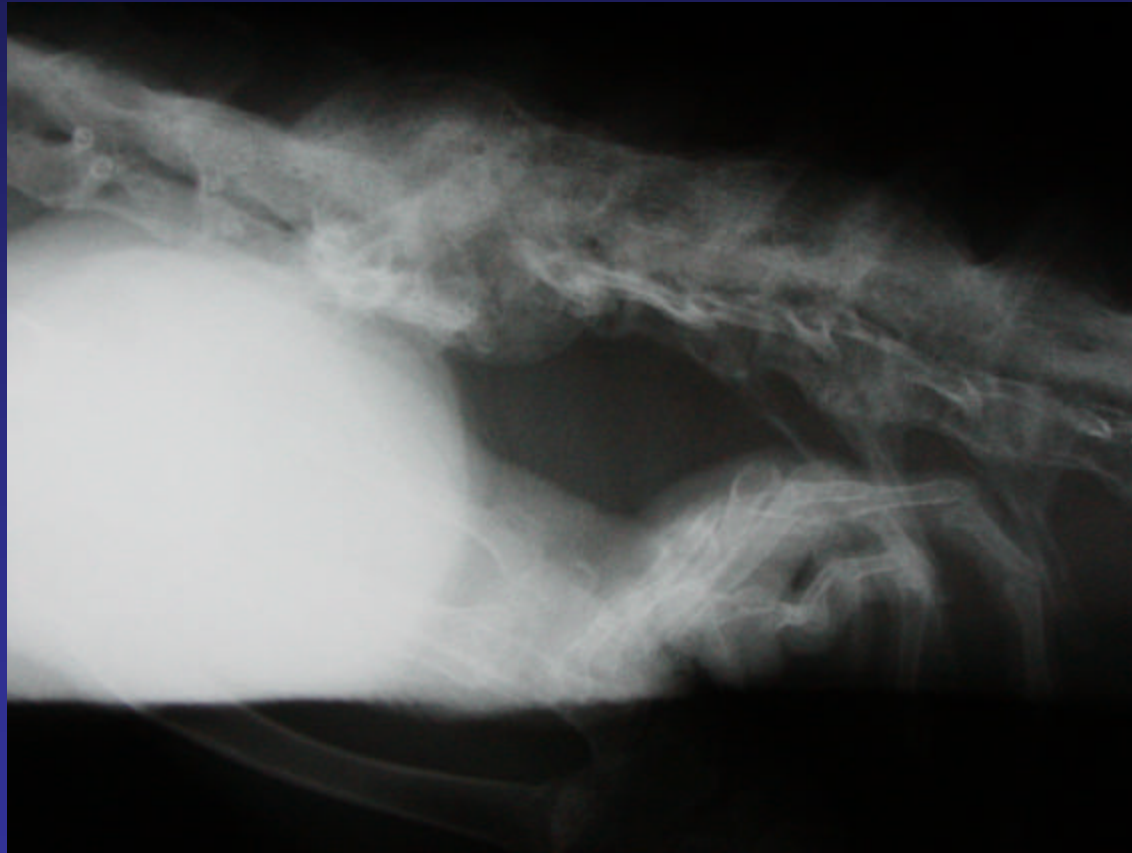


Outcome

- By four months:
 - Radiographs revealed a healed spinal fracture with callus formation
 - However, she was still unable to defecate on her own
 - Metoclopramide, lactulose, cisapride, mineral oil PO were all tried with little effect



Radiographs – 4 months





Final Outcome

- Enemas were stopped five months post-diagnosis with a poor prognosis for survival
- However...



Final Outcome

- For reasons unknown, Evan began to defecate on her own within several weeks of her final recheck
- Owner reports that Evan is still having some difficulty defecating but other signs have disappeared and she seems much more comfortable
- She will always carry the deformities associated with her disease, but her life is no longer in immediate danger



Final Outcome



- Evan's owner is to be commended for her persistence and dedication to her pet's condition and for helping her through her long and difficult recovery



Thanks

- Many thanks to Dr. Ricardo de Matos for helping me prepare this presentation
- Thanks to Dr. Sara Childs for the pictures of Evan
- And of course, many thanks to Allison and Evan for allowing me to discuss her case today!



Questions?





References

1. Boyer, T.H. Metabolic Bone Disease. In Mader, D.R. (ed) *Reptile Medicine and Surgery*. Philadelphia: WB Saunders Co, 1996; 385-392.
2. Frye, F.L. Feeding Captive Reptiles. *Reptile Care – An Atlas of Diseases and Treatments*. Neptune City, NJ: TFH Publications, Inc, 1991; 47-50 and 536-537.
3. Kaplan, M. Iguana Care, Feeding and Socialization. Available at: <http://www.anapsid.org/iguana/icts/index.html>. Accessed Dec. 18, 2005.
4. Mader, D.R. Reptilian Metabolic Disorders. In Fudge, A. (ed) *Laboratory Medicine – Avian and Exotic Pets*. Philadelphia: WB Saunders Co, 2000; 210-212.