



Diagnostic Exercise

From The Davis-Thompson Foundation*

Answer Sheet

Case #: **204**; Month: **January**; Year: **2023**

Title: Metastatic calcification and nephrosclerosis in an adult sloth (*Choloepus hoffmani*)

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Clinical History: Multiple fragments of various organs from the necropsy of an adult sloth (*Choloepus hoffmani*) were received. The animal, prior to its death, had presented decay and poor general body condition, which is why it was euthanized.

Necropsy Findings, gross images and microscopic images: According to the referring veterinarian, at necropsy, irregular and locally extensive hard yellowish lesions, were observed in the subcutaneous tissue of the thorax and abdomen (Fig.1). Similar lesions were observed in the tunica media of the aorta.

Answers:

Morphologic diagnoses: Subcutaneous tissue and tunica media of the aorta: Locally extensive metastatic calcification (Fig. 1, 2 and 3).

Histopathologic description:

- Kidney: There is moderate to severe interstitial fibrosis affecting the cortex and medulla. There are also small clusters of lymphocytes and macrophages in the interstitium. Hemosiderin is present in the cytoplasm of macrophages and a few renal tubular epithelial cells. There is glomerulosclerosis and multiple foci of mineralization in several renal tubules (Figs. 4). Renal glomeruli show mild to moderate thickening of the outer layer of Bowman's capsule and mesangium by an eosinophilic and PAS-positive material (Fig. 5).
- Subcutaneous tissue: The subcutaneous tissue shows locally extensive deposits of an extracellular, basophilic, granular material, which sometimes have a clumped appearance (metastatic calcification). Necrotic tissue is not observed. (Fig. 2)
- Aorta: The tunica media shows locally extensive deposits of a material, similar in appearance to that seen in the subcutaneous tissue (metastatic calcification). Necrotic tissue is not observed. (Fig. 3)



Figure 1. Locally extensive metastatic calcification in subcutaneous tissue.

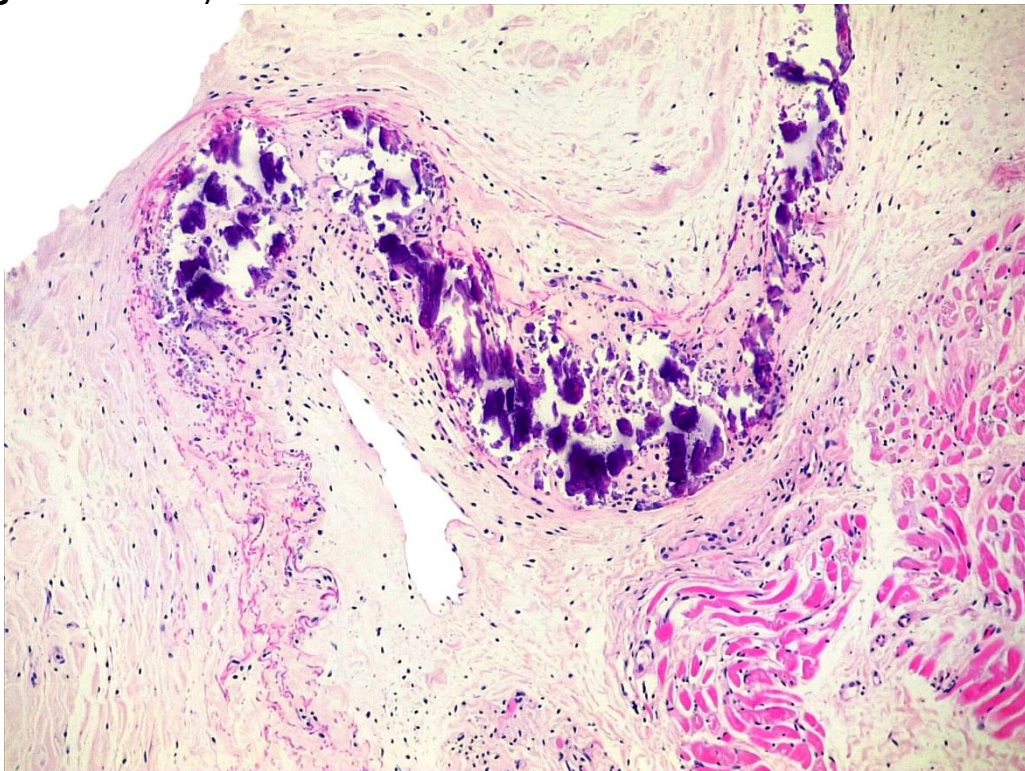


Figure 2. Locally extensive metastatic calcification in subcutaneous tissue.
H&E

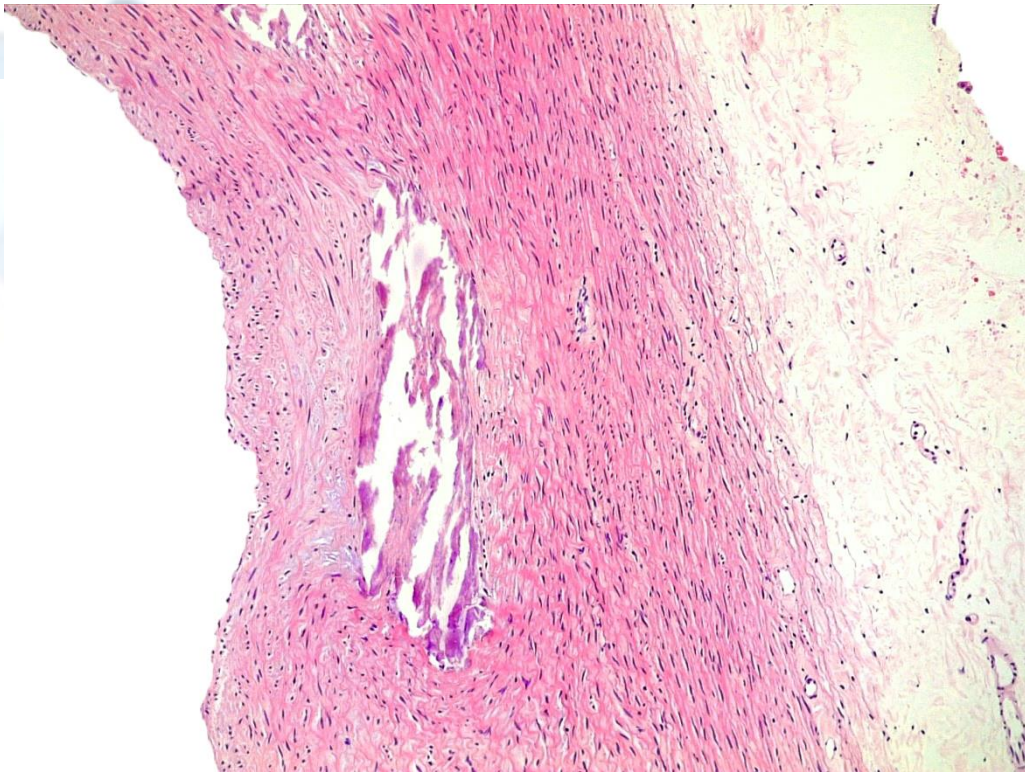


Figure 3. Locally extensive metastatic calcification in the tunica media of the aorta. H&E.

Pathogenesis: * See Discussion

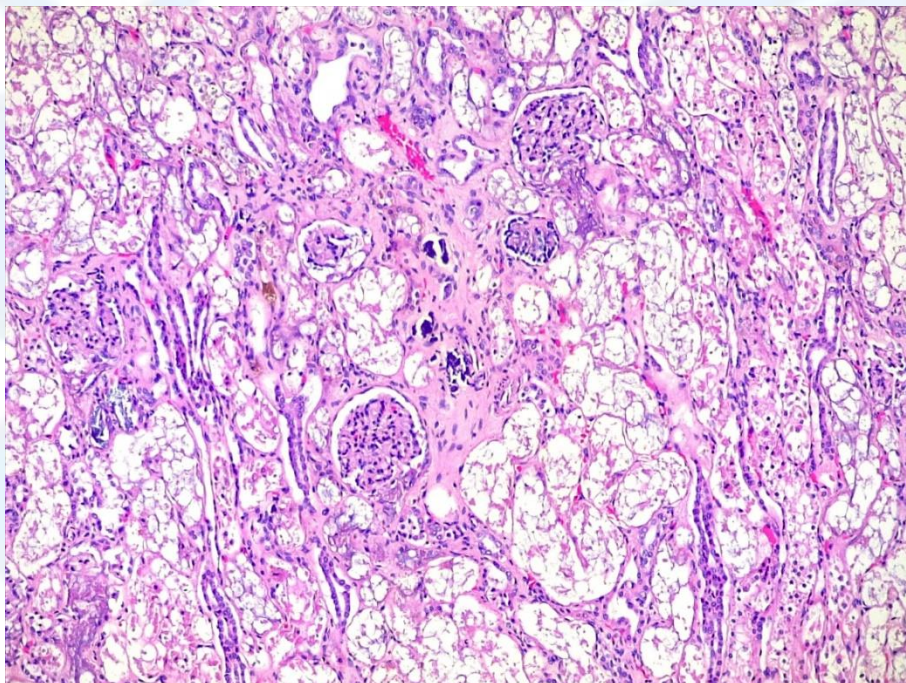
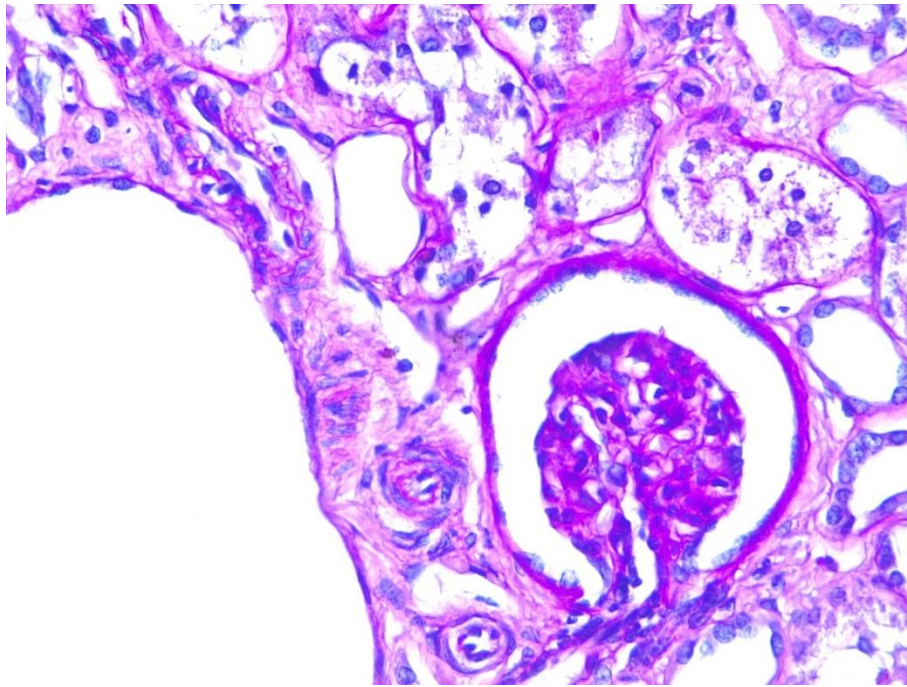


Figure 4. Kidney, cortex: Moderate to severe fibrosis of the interstitium, glomerulosclerosis, hemosiderin deposits and metastatic calcification. H&E.



Discussion:

This sloth presented foci of mineralization in the aorta, pericardium, kidney and subcutaneous tissue, in the absence of necrosis, suggesting that the changes were metastatic. Possible causes include the consumption of hypercalcemia-causing plants, pseudo- hyperparathyroidism, primary hyperparathyroidism and secondary hyperparathyroidism (renal and nutritional).

To the best of our knowledge, there is no information available in the literature about susceptibility of sloths to metastatic calcification. Based on the anamnesis and given that the animal was in captivity in a shelter and on a controlled diet, consumption of hypercalcemia-producing plants and nutritional hyperparathyroidism were ruled out. Vitamin D intoxication has been reported as a cause of calcification in sloths but in those cases parathyroid atrophy and hyperostosis of subperiosteal and trabecular bone were seen (2), something that was not observed in this case. Although only fragments of skin, kidney, aorta and liver were received in the laboratory for histopathological study, the referring veterinarian mentioned the absence of enlargement of parathyroid or other organs, which most likely rules out pseudo hyperparathyroidism and primary hyperparathyroidism. The renal lesions observed are severe and could have caused renal hyperparathyroidism. If this was the organs were submitted, so this case, the renal lesions would have generated retention of phosphorus, which in turn would have precipitated in soft tissues by binding to blood calcium. This would have generated calcium-phosphorus imbalance, leading to secretion of parathyroid hormone and bone resorption, associated with soft tissue calcifications. According to some authors, chronic kidney disease is a common postmortem finding in adult sloths (1). Chronic kidney disease associated with metastatic calcifications in the lungs, aorta and kidneys has been reported in two-toed sloths before (2, 3). Calcification of large vessels secondary to atherosclerosis and another cardiac lesions (such as myocardial necrosis, myocardial fibrosis and cardiac hypertrophy) have been reported in sloths (2). In cases of atherosclerosis, the lesions are in

the tunica intima and are associated with dystrophic calcification of atheromatous plaques. In the case presented here, the lesions affected mainly the tunica media, which is highly suggestive of metastatic calcification, and no atherosclerosis or cardiac lesions were observed.

Calcification associated with endocrinopathies such as Cushing's or Addison's disease have been described, but in those cases the large vessels are not usually affected, and the calcification is often limited to the skin. In this case, it was not possible to evaluate the adrenal and pituitary glands as only a few organs were submitted, so this pathogenesis remains speculative and other possibilities cannot be ruled out.

References

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3. Salas E, Wolf T, Harris S. Chronic renal disease in a captive two-toed sloth (*Choloepus didactylus*) with concurrent hepatocellular carcinoma. J Zoo Wildl Med. 2014;45(2):402-5.

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