



Pathology in Practice

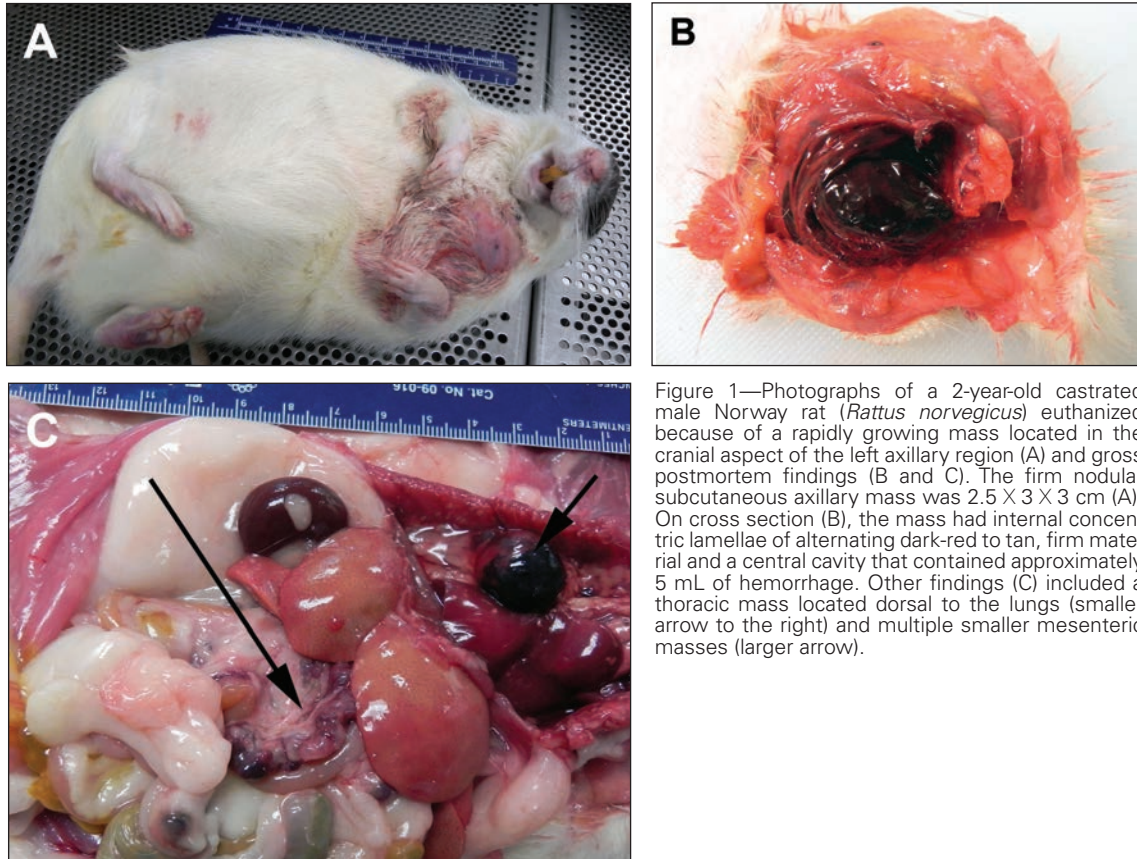


Figure 1—Photographs of a 2-year-old castrated male Norway rat (*Rattus norvegicus*) euthanized because of a rapidly growing mass located in the cranial aspect of the left axillary region (A) and gross postmortem findings (B and C). The firm nodular subcutaneous axillary mass was 2.5 × 3 × 3 cm (A). On cross section (B), the mass had internal concentric lamellae of alternating dark-red to tan, firm material and a central cavity that contained approximately 5 mL of hemorrhage. Other findings (C) included a thoracic mass located dorsal to the lungs (smaller arrow to the right) and multiple smaller mesenteric masses (larger arrow).

History

A 2-year-old castrated male Norway rat (*Rattus norvegicus*) was evaluated at the Cornell University Hospital for Animals because of a rapidly growing mass located in the cranial aspect of the left axillary region. According to the owner, the rat appeared normal 3 days before but had since developed signs of depression and become inappetent. At initial evaluation, the rat had non-weight-bearing lameness of the left thoracic limb.

Clinical and Gross Findings

On clinical examination, there was a 2.5 × 3 × 3-cm firm nodular subcutaneous mass within the cranial aspect of the left axillary region that was not freely movable (Figure 1). The rat appeared uncomfortable during palpation of the mass. The pinnae and tail were pale. Non-weight-bearing

lameness of the left thoracic limb was evident. Attempted fine-needle aspiration of the mass resulted in substantial bleeding and yielded a sample that was nondiagnostic. Because of the advanced age of the rat and rapid clinical progression, the owner elected for euthanasia.

On postmortem examination, the mass was well demarcated and on section was comprised of a 1-mm-thick, dark-red to black wall surrounding internal concentric, 2- to 5-mm-thick lamellae of alternating dark-red to tan, firm material (Figure 1). A central cavity within the mass contained approximately 5 mL of dark-red gelatinous material (hemorrhage). Two similar masses (1.3 × 0.5 × 0.4 cm and 1.1 × 0.5 × 0.3 cm) were detected in the right axillary region. In the thoracic and abdominal cavities, there were similar smaller masses. A 1.3 × 1.3 × 1.8-cm mass was adhered to the parietal pleura of the left midthoracic region and was closely associated with the mediastinum. Closely associated with the pancreas and adjacent mesentery, there were approximately 12 to 15 smaller, similar masses ranging in size from 0.5 × 0.5 × 0.5 cm to 1.2 × 0.7 × 0.5 cm.

Formulate differential diagnoses from the history, clinical findings, and Figure 1—then turn the page →

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Histopathologic Findings

Histologically, the axillary masses were composed of central, alternating layers of hemorrhage and fibrin, admixed with moderate numbers of neutrophils, surrounded by a thick wall of fibrous connective tissue. Fibrous connective tissue, admixed with moderate numbers of macrophages and fewer lymphocytes, plasma cells, and neutrophils, extended into the adjacent skeletal muscle. The myofibers of the adjacent skeletal muscle were small, shrunken, and angular (atrophy), and some had a vacuolated cytoplasm with loss of cross-striations (degeneration). The thoracic and mesenteric masses had similar histologic features with variable amounts of organization and fibrosis, suggesting various stages of chronicity (Figure 2). The mesenteric masses were composed of mesenteric arterial walls that were expanded by a large amount of fibrous connective tissue, often admixed with small to moderate numbers of hematoidin-laden macrophages. The fibrous connective tissue was composed of more plump, angular, and reactive fibroblasts toward the lumen of the vessel and more mature, flattened, and parallel fibroblasts around the periphery. Within the lumen of some of the mesenteric arteries, there was a moderate amount of either fibrin admixed with neutrophils (fibrin thrombi) or sclerotic collagen admixed with plump fibroblasts and macrophages (indicative of recanalization). The pancreas was unaffected with no detectable histologic abnormalities. Microscopic examination of tissue samples from the remaining major organs revealed no important pathological changes.



Figure 2—Photomicrograph of a section of an affected mesenteric vessel from the rat in Figure 1. Notice the mesenteric blood vessel (thin arrows) adjacent to the pancreas (thin arrow) and small intestine (arrowhead). The mesenteric blood vessel is composed of central, alternating layers of hemorrhage and fibrin, admixed with moderate numbers of neutrophils, surrounded by a thick wall of fibrous connective tissue. H&E stain; bar = 2 mm. Inset—Higher-magnification view of the wall of a mesenteric artery illustrating the remnant tunica media (arrow) and fibrinoid necrosis and neutrophilic infiltration of the tunica intima. H&E stain; bar = 100 μ m.

Morphologic Diagnosis and Case Summary

Morphologic diagnosis: chronic, multifocal hemorrhagic and pyogranulomatous cellulitis with organizing fibrosis (presumptive vascular thrombosis) in the axillary regions and thorax and marked, chronic, pyogranulomatous, and necrotizing polyarteritis with vascular thrombosis and hemorrhage in the mesenteric arteries.

Case summary: polyarteritis nodosa in a pet rat.

Comments

Polyarteritis nodosa is a well-known entity in laboratory rats and is most common in male rats; in Sprague Dawley rats, August red hooded rats, and spontaneously hypertensive rat strains; and in rats with late-stage chronic nephropathy.^{1,2} It is a progressive degenerative necrotizing arteritis and periarteritis, which primarily affects medium-sized arteries, particularly in the mesentery, pancreas, and testes. Almost all organs can be affected to some degree, with the notable exception of the lungs.^{1,2} The etiopathogenesis is uncertain but is thought to be immune mediated, involving immune complex deposition.²⁻⁴ The rat of this report had no clinical, gross, or histologic evidence of chronic renal disease. The Norway rat is not known as a hypertensive strain; nevertheless, the possibility of underlying hypertension in this rat cannot be ruled out.

Differential diagnoses considered after clinical examination of the rat of this report included neoplasia, hematoma, and abscess. One of the more common cutaneous neoplasms in rats is mammary fibroadenoma²; however, the gross appearance of the mass was not consistent with that diagnosis. On the basis of the gross necropsy findings, differential diagnoses considered were multiple hematomas; a neoplastic process, such as hemangiosarcoma; or polyarteritis nodosa, particularly given that many of the smaller nodules were associated with the pancreas and adjacent mesentery. In this rat, the histopathologic lesions of the nodules in the mesenteric arteries were classic for polyarteritis nodosa. The mesenteric arteritis was in variable stages of chronicity, ranging from vessels with acute fibrinoid necrosis and neutrophilic inflammation to those that were completely occluded by sclerotic collagen. Although remnants of blood vessel walls were not detected within the sections of axillary and thoracic masses, it is likely that these masses, similar to the mesenteric masses, also arose from inflamed arteries with subsequent thrombosis, aneurysm, and hemorrhage. The variable distribution and chronicity of the arteritis in the rat were also classic features of polyarteritis nodosa.^{3,5}

To our knowledge, polyarteritis nodosa in a pet (nonlaboratory) rat has not

been previously reported. This condition should therefore be considered as a differential diagnosis for cutaneous, intrathoracic, and intra-abdominal masses in pet rats. Of the domestic animals in which polyarteritis nodosa has been described, rats are the most common; however, similar syndromes in dogs, cats, cynomolgus macaques, and mice have also been reported.³ Canine juvenile polyarteritis syndrome, also known as steroid-responsive meningitis-arteritis and Beagle pain syndrome, is relatively common in young Beagles and results in vascular lesions similar to those associated with polyarteritis nodosa; the lesions primarily involve the small- to medium-sized muscular arteries of the cervical portion of the spinal cord, cranial mediastinum, and heart.^{4,6} This disease has also been identified in Boxers, German Shorthaired Pointers, Nova Scotia Duck Tolling Retrievers, and, rarely, other breeds.⁶ However, unlike polyarteritis nodosa in rats, canine juvenile polyarteritis syndrome has a remitting and relapsing course with short periods of clinical disease followed by several weeks of remission.⁴ Polyarteritis nodosa in dogs with rheumatoid arthritis and systemic lupus erythematosus has also been reported.⁵ Polyarteritis nodosa uncommonly affects humans, sometimes in association with hepatitis B virus

infection, hairy cell leukemia, Sjögren's syndrome, HIV infection, or rheumatoid arthritis.^{1,7,8}

References

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