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Veterinarian:
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Site:
Received: 11/09/2009
Reference:
Species: Canine
Breed: German Shepherd Dog
Age: 8 years **Sex:** Male Neutered
Weight: 41.6 kgs

History: This dog had a history of bilateral rear limb paresis and deep pain. Radiograph indicated spondylosis at T3-T4, T5-T6, T11-T12, and T13-L1. The animal was euthanized on 11/07/2009 at 3 pm and the animal was submitted for detailed necropsy as part of 'The White Shepherd Genetics Project'. The necropsy was performed on 11/09/09 by Dr. Ramesh Kovi under the supervision of Dr. Armien.

Specimen: An entire body of white German Shepherd dog ['Daytona'] was submitted in a fair state of postmortem preservation. Microchip identification was not detected.

Necropsy: Body Weight: 41.6 kg

Body Condition Score: 4/5 (1 = emaciated and 5 = obese).

General Findings (mucous membranes, body cavities): The oral mucous membranes and the scleral conjunctiva were diffusely pale pink to white.

Integumentary system: No significant macroscopic lesions were detected.

Muscular system: No significant macroscopic lesions were detected.

Skeletal system: Whole vertebral column and the spinal cord were fixed in situ. Further analyses are pending.

Respiratory system: Left lung lobes were diffusely dark red in color (hypostatic congestion). No significant macroscopic lesions were detected.

Cardiovascular system: The heart weighed 356 grams. The right ventricular free wall, left ventricular free wall, and interventricular septum measured 5, 15, and 12 mm, respectively. Multifocally there were roughened, paler areas on the epicardial surface. There was 1x1x0.5 soft mass attached to left atrium on the epicardial surface.

Alimentary system: The stomach contained moderate amount of ingesta, small intestine contained small amount of brownish, mucoid digesta and the large intestine contained semi formed feces. Liver was dark red discolored with some greenish tinge on the surface and more friable.

Urinary system: No significant macroscopic lesions were detected.

Endocrine system: No significant macroscopic lesions were detected.

Reproductive system: The dog was a neutered male. No significant macroscopic lesions were detected.

Hemolymphatic system: There were two 3x2x2cm and 4x6x3 raised, dark red to black colored, smooth, soft, not well demarked nodular masses on the splenic surface.

Nervous system: There was hemorrhage around the spinal cord at T8-T13 and L1. No significant macroscopic lesions were detected in the eyes or brain.

Histopathology:

Slide A-C: Cerebrum- There are no significant microscopic lesions.

Slide D: Cerebellum- There are no significant microscopic lesions.

Slide E: Brain stem- Multifocally there is mild accumulation of yellowish pigment in the neuronal bodies (interpreted as lipofuscin).

Slide F: Lungs-Multifocally the alveolar spaces are filled with moderate amount of eosinophilic homogeneous substance (edema). Multifocally small to medium caliber blood vessels are engorged with blood (congestion).

Slide G: Liver- There is moderate postmortem autolysis characterized by loss of cellular architecture. Multifocally there is moderate increase in hemosiderin-laden macrophages and multifocally there is intracytoplasmic eosinophilic inclusion bodies (interpreted as chronic hepatic degeneration).

Slide H: Kidney- Multifocally the renal cortex is infiltrated by few plasma cells and lymphocytes. There is moderate postmortem autolysis characterized by loss of cellular architecture.

Slide I-J: Skeletal muscle- There are no significant microscopic lesions.
Epicardial mass: The mass composed of multilocular blood filled cavities of variable size and lined by flattened endothelium and these blood filled spaces are supported by moderate amount of fibrous stroma. Multifocally the mass is infiltrated by moderate numbers of plasma cells, lymphocytes and few neutrophils and there is brown globular pigment (hemosiderin).

Slide K-L: Spleen-Multifocally there is marked increase in brown pigment (hemosiderin) and number of siderophages in the red pulp. There is poorly demarcated, unencapsulated, blood filled cavity consistent with hematoma or uneven contraction of the spleen..

Slide M: Femoral diaphyseal bone marrow-The marrow sample is approximately 10% cellular with an M: E ratio of 2:1 and the remainder of the marrow is replaced with adipocytes. All cellular lineages are represented.
Penis: There are no significant microscopic lesions.

Slide N: Urinary bladder- There are no significant microscopic lesions.
Prostate- There are no significant microscopic lesions.
Mesenteric Lymphnode- There are no significant microscopic lesions.

Slide O-P: Heart- There are no significant microscopic lesions.

Slide Q-Thyroid-There is one follicle filled with mineralized colloid.
Adrenal- There are no significant microscopic lesions.

Slide R: Intestine- There are no significant microscopic lesions. There is moderate postmortem autolysis characterized by loss of cellular architecture.

Slide S: Pancreas- The normal architecture is effaced and the pancreatic acinar cells are attenuated with loss of zymogen staining and very few normal acini are present. Multifocally there is irregular lobulation and the acini are replaced by moderate amount of collagenous fibrous connective tissue. The normal pancreatic ducts are retained and often there is moderate increase in number of ducts. Multifocal to coalescing areas containing islet cells of Langerhans, often replacing and effacing the exocrine pancreatic acini. Multifocally there is hemorrhage and moderate numbers of hemosiderin-laden macrophages. At the periphery, there are aggregates of low numbers of lymphocytes and few plasma cells.

Slide T: Stomach- There is mild infiltration of gastric mucosa by moderate numbers of lymphocytes and plasma cells.

Slide U-V: Eye- There are no significant microscopic lesions in both eyes.

Slide AA-AD: Spinal cord- Multifocally the white matter is reduced by about 60-70% and compressed in several transverse sections of spinal cord. Overall the spinal cord at the sites of vertebral protrusions is smaller and multifocally there are areas of mild demyelination. Multifocally there are areas of marked hemorrhage and few axons are mildly swollen and hypereosinophilic (spheroids). Moderate amount of disc material is present in the subdural space in thoracic segments and there is multifocal, mild osseous metaplasia of the meninges in the lumbar segments. Multifocally there is mild to moderate degeneration and atrophy of the spinal nerves, replaced by fibrous connective tissue.

Special Stains: Slide AA-AC: Spinal cord-Luxol Fast Blue stain and Bielschowsky Silver stain were done and there were no significant microscopic lesions.

Immunohistochemistry: Slide AB: Spinal cord- GFAP IHC-, Slide S: Pancreas- Synaptophysin, insulin, IAPP, glucagon, pancreatic polypeptide IHC was done and the **positive immunoreactivity with these antibodies** sugges that there was marked hyperplasia of islets of Langerhans containing all type of cells of endocrine pancreas)

Diagnosis: Final

1. Heart

   a. epicardial fibrosis, multifocal, mild, chronic [gross findings].

   b. epicardial hemangioma.

3. Vertebral column, spondylosis (T3-T4, T5-T6, T11-T12, and T13-L1).
4. Vertebral column, hemorrhage around the spinal cord between T8-L1, segmental, moderate, acute to subacute.
5. Spinal cord

   a. compression atrophy, multifocal, severe, chronic.

   b. spinal nerve degeneration and atrophy, mild, multifocal, chronic.

6. Pancreas

   a. Ductular and Islet cell hyperplasia, multifocal to coalescing, marked, chronic.

   b. exocrine pancreatic atrophy, locally extensive to coalescing, marked, chronic.

Comments: The cause of neurological signs in this dog was most likely related to severe compression of the spinal cord due to spondylosis at both thoracic and at lumbar vertebral region. Atrophic lymphocytic

pancreatitis may be an autoimmune cell-mediated process. However, we did not see evidence in other organs. Chronic atrophic pancreatitis may result in diabetes mellitus, which in turn, contributes to fatty changes in the liver.

Hemangiomas are benign tumors of vascular endothelium, common in dogs, rare in other domestic animals. At risk breeds include Boxers, Golden Retrievers, German Shepherd Dogs, Whippets and Dalmatians. Dermal or subcutaneous tumors can occur anywhere on the body, slow growth and complete excision is curative. In this animal, well differentiated epicardial hemangioma may be incidental finding and its location is uncommon.

Combined ductular and islet cell hyperplasia is called Nesidioblastosis which is typical of hyperinsulinemic hypoglycemia in humans. Neogenesis of islets may be a means to combat absolute or relative insulin deficiency in diabetes mellitus.

To answer the questions from the White Shepherd Genetics Project:

Cancer in any organs? Where and what kind?

Heart- Hemangioma.

Hemangiosarcoma – confirmed in multiple locations. Not found.

Elbow dysplasia – not found, but mild degenerative joint disease was found. Not found.

Hips – No degenerative joint disease or hip dysplasia found. Not found.

Stifles – No degenerative joint disease or cruciate ligament injuries found. Not found.

Vertebral column –**intervertebral disc disease, and spondylosis were found.**

Degenerative myelopathy – Not found.

Heart defects? dilated cardiomyopathy? None found.

Intestines – inflammatory bowel disease? Not found. [Moderate to advanced post mortem tissue deterioration precluded meaningful histologic investigation of the intestine]

Pancreatic acinar atrophy with interstitial fibrosis, hyperplasia of islets of Langerhans and pancreatic ducts **were found.**

Perianal fistulas – None found.

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Fax:	**Final:**	**Written:** 01/05/2010	**Addendum:**