

REPORT OF LABORATORY EXAMINATION

Client:	White Shepherd Genetics- (295483) Project - Attn: Judy Huston PO Box 404 Howell, MI 48844	Owner:	Anderson, Pamela 12885 Pine Lake Cedar Springs MI 49319
Rcvd Date:	11/9/2011 2:36:00 PM	Animal:	MAGNUM
Admitted By:	Not, Provided	Species:	Canine
Ordered By:	N/A	Age:	13 years
Encounter:	01268211	Tag/Reg ID:	
CR#:	AP	Other ID:	
		MRN:	
		Breed:	German Shepherd
		Gender:	Male

N e c r o p s y P r e l i m i n a r y R e p o r t

Accession Number:	Received Date/Time:	Verified Date/Time:	Pathologist:
NC-11-0001281	11/9/2011 2:38:00 PM	11/10/2011 12:40:02 PM	Patterson, Jon S.

History

A 13-year-old, intact male white German shepherd was euthanized on 11/9/11 after a 1-year history of progressive hind limb weakness and neurologic deficits. The owner first noticed that the dog was weak in the left hind limb. In addition, proprioceptive deficits were evident, as the dog would drag the toes of the hind feet. Over the past 6 months, the dog had problems defecating and would have to lie down to do so. The animal was taken to a veterinarian in May 2011, as it appeared the dog had suffered a stroke. Antibiotic treatment (cephalexin) led to improvement in the dog's condition, and the animal was on antibiotics intermittently over the past 6 months. In addition, treatment included aspirin daily. Over the past few days, the dog showed increased discomfort, and euthanasia was elected. The dog was strictly an outdoor dog, living with 3 other white shepherds.

Gross Description

A 39.95-kg dog in good nutritional condition and good post mortem condition was presented dead for necropsy. The skin was shaved in a rectangular, 10x3-cm area on the dorsal aspect of the right antebrachium. A 10-mm long x 2-mm diameter, cylindrical, soft, gray tag of redundant skin was present on the point of the right elbow.

The brain and entire spinal cord were removed and examined. The leptomeninges on the convexities of the cerebral hemispheres were white in a few sulci (age-related fibrosis). There was less than 1 mL of dark red fluid in the subdural space over a 1-cm length of the C1 spinal cord segment, just caudal to the atlanto-occipital joint. The dura mater of the cervical spinal cord contained a few oblong, 2x5-mm, gray red, bony plaques (age-related dural ossification). The spinal cord was otherwise grossly normal, except for the cauda equina, as described below.

There was bridging spondylosis of the ventral aspects of vertebral bodies at intervertebral joints T9-T10, T12-T13, L1-L2, L2-L3, L3-L4, and the lumbosacral junction. At T9-T10, the bony, white, semicircular bridge was 15 mm long (cranial to caudal) and 4 mm tall (dorsoventral). The caudalmost edge of this bridge was sharp. At T12-T13, the bony bridge was 13 mm long and 7 mm tall. At L1-L2, the bony bridge was 22 mm long and 8 mm tall. At L2-L3, the bridge was 28 mm long and 12 mm tall. At L3-L4, the bridge was 15 mm long and 3 mm tall. The semicircular bony bridges at the latter 4 sites were smooth. At the lumbosacral junction, bridging spondylosis was especially prominent, as the semicircular bony

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bridge was 35 mm long and 16 mm tall, protruding ventrally in the pelvic canal and compressing the rectum. The bridge was smooth, but somewhat asymmetrical, with more bony growth on the right side than the left. The intervertebral disc at the lumbosacral junction was yellow brown, slightly dry, and protruded into the overlying vertebral canal, compressing nerve roots of the cauda equina. The protruding disc material was 10 mm long (diameter) and 5 mm tall. Several other intervertebral discs were yellow brown and dry, and some showed cracking (degeneration) within the intervertebral space. No other disc protruded into the vertebral canal, however.

The caudal two-thirds of the trachea and the mainstem bronchi contained a moderate volume of white froth. The right lung was diffusely gray red, while the left lung was mostly pink, with small red areas. Both lungs were normal (spongy) in consistency, but they contained approximately 20 randomly scattered, pinpoint to 5-mm diameter, hard foci. Foci which were near the pleural surface and large were visible and white, but the smaller, intraparenchymal foci were appreciable only by palpation. The right atrium was enlarged externally (10 cm long [cranial to caudal] x 5 cm wide [dorsoventral]), and mottled dark gray red and dark red, but there was no obvious mass, and there were no abnormalities visible from the endocardial surface.

The liver was diffusely mottled dark red brown and light brown, with a rather dull, granular capsular surface. The diaphragmatic capsular surfaces of the right lateral and medial lobes were mostly white gray and thickened (1-2 mm) by fibrous tissue. In a 10-cm segment of the lateral edge of the right medial lobe, the parenchyma was withdrawn so that the tan capsular tissue was prominent in a 1-mm wide band. The spleen was irregularly shaped due to the presence of approximately 20 spherical, raised, dark purple nodules which resembled splenic tissue on cut section (nodular hyperplasia). The nodules ranged in diameter from 1-4 cm. Attached to the omentum and 3 cm but separate from the spleen, there was an irregularly shaped, somewhat triangular splenic fragment which measured approximately 2.5x1.5x1.5 cm. In a 10x2-mm area on the capsular surface of this fragment, and in a round, 6-mm diameter area on the visceral capsular surface of the major portion of the spleen, there were raised, yellow gray brown, firm plaques (hemosiderotic plaques). Both adrenal glands were enlarged and somewhat irregularly shaped, measuring approximately 2.5 cm long and 1 cm in diameter. The cortices were irregular in contour, and blended somewhat into the medullae.

The stomach contained approximately 20 mL of pale yellow green fibrous (straw- or hay-like) material and a cylindrical, 2-cm diameter, 10-cm long, tan piece of undigested meat. The small intestinal mucosa was corrugated, tan, and slightly thickened throughout its length. The jejunal mucosa contained numerous thin (2-mm wide), red streaks which ran parallel to the length of the intestine. The jejunum contained a small volume of tan mucus and hair. The cecal mucosa and the adjacent 3-cm length of the colonic mucosa were mottled red and dark yellow, and were somewhat dull and granular. Numerous thread-like, 1- to 1.5-cm long, white worms (whipworms; *Trichuris vulpis*, presumptive) were present on the affected mucosal segments.

The prostate gland was enlarged (5x4.5x4.5 cm), symmetrical, and brown yellow. The right testis contained a spherical, 1.5-cm diameter, pale yellow brown, rather soft mass. The left testis contained two similar 1-cm diameter masses.

Gross Diagnosis(es)

- 1. severe multifocal intervertebral bridging spondylosis (T9-T10, T12-T13, L1-L2, L2-L3, L3-L4, and lumbosacral junction);**
- 2. chronic intervertebral disc protrusion at the lumbosacral junction, with compression of the cauda equina;**
- 3. segmental chronic typhlocolitis, with associated trichuriasis (whipworm infection)**
- 4. hepatopathy, with locally extensive capsular fibrosis**

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5. multinodular splenic lymphoid hyperplasia
6. multifocal splenic capsular hemosiderosis
7. right atrial dilation
8. moderate diffuse prostatic hypertrophy and hyperplasia
9. multiple testicular neoplasms
10. multifocal pulmonary calcification

Comment:

The most significant finding in relation to the dog's clinical signs was bridging spondylosis at the lumbosacral joint. The size of this area of bony proliferation was striking, and probably contributed to the dog's pain and difficulty defecating. There also was intervertebral disc disease and protrusion at this site, undoubtedly affected the nerve roots of the cauda equina and possibly the nearby spinal cord. It is likely that the dog also had lumbosacral stenosis. Most of the other gross necropsy findings were age-related, or related to the fact that this was an intact male dog (prostatic enlargement, testicular tumors). Histopathologic examination of brain, spinal cord, and major organs is in progress.

Jon S. Patterson, DVM, PhD, Dipl ACVP
Anatomic Pathologist

Jon S. Patterson, DVM, PhD, DACVP

(Electronically signed by) JSP

Verified: 11.10.2011 12:40

JSP /JSP

N e c r o p s y F i n a l R e p o r t

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Verified Date/Time: 12/6/2011 2:27:41 PM
Pathologist: Patterson, Jon S.

History

NA

Gross Description

NA

Gross Diagnosis(es)

NA

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Laboratory Findings

NA

Microscopic Description

Sections of spinal cord (cervical, thoracic, lumbar, sacral, cauda equina), brain, skeletal muscle (semimembranosus, semitendinosus, epaxial muscles), liver, kidney, heart, spleen, lung, stomach, small intestine, cecum, adrenal gland, prostate gland, pituitary gland, and testis were examined.

There was evidence of attenuation and/or degeneration of myelin in all sections of the spinal cord. Peripheral dorsal and dorsolateral white matter tracts were most prominently affected, and changes were most severe in mid-thoracic to cranial lumbar segments. Attenuation was characterized by thinning of myelin sheaths, with patchy variation in tinctorial quality of the myelin; Luxol Fast blue staining highlighted these changes. Myelin degeneration was characterized by scattered foci of spongiosis, with occasional vacuoles containing individual macrophages or axon and myelin debris. Rare axonal spheroids were present. In the gray matter of the spinal cord, there was mild gliosis, with multifocal satellitosis. Small to moderate numbers of neuronal cell bodies contained gray brown, granular, lipofuscin pigment. Nerve roots of the cauda equina contained many vacuoles of various sizes, and several vacuoles contained macrophages or debris. Occasional small aggregates of lymphocytes and macrophages were present.

In most areas of the gray matter of the brain (cerebrum and brainstem), there was mild gliosis, with multifocal satellitosis. In the brainstem, from the level of the caudal colliculi to the caudal cerebellar peduncles, there was mild, multifocal, patchy spongiosis in most white matter tracts in the ventral halves of the examined sections. Small numbers of scattered neurons contained lipofuscin.

There was thickening of the intimal and/or medial layers of most myocardial arteries and arterioles by homogeneous, pale eosinophilic to pale basophilic material suggestive of amyloid. Lipofuscin accumulation in cardiac myocytes was subtle.

In sections of liver, there was moderate diffuse congestion, and many sinusoids contained aggregates of hemosiderin-laden Kupffer cells. There was mild multifocal portal fibrosis, with occasional areas of bridging between portal triads. Most hepatocytes were mildly to moderately swollen, with predominantly clear to pale eosinophilic, granular cytoplasm.

Renal glomeruli were slightly enlarged and hypercellular, with multifocal thickening of capillary loops by eosinophilic material. Occasional interstitial aggregates of lymphocytes, plasma cells, and macrophages were present.

In the lung, there was moderate smooth muscle hypertrophy of terminal and respiratory bronchioles. Small aggregates of lymphocytes and macrophages--some of which contained granular, gray black, somewhat refractile pigments indicating pneumoconiosis--were present in the connective tissue of some bronchial and bronchiolar walls.

Three sections of adrenal gland were examined. In one section, there was a discrete, oval mass composed of dense sheets of cortical cells. The mass compressed the surrounding cortex and medulla. The cells of the mass were large and moderately pleomorphic, with generally large, round to oval, hypochromatic nuclei and a small to moderate amount of pale eosinophilic cytoplasm. Many nuclei contained single prominent nucleoli, and there were 2-4 mitotic figures per 10 high-power (400X) fields. The surrounding cortical cells were swollen with predominantly clear cytoplasm. In a second section of adrenal gland, the cortex was of irregular thickness because of the presence of coalescing nodules of well differentiated, uniform cortical cells (nodular hyperplasia). A third section was histologically normal.

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In sections of small intestine, the lamina propria of villous tips was expanded by small to moderate numbers of lymphocytes, plasma cells, and macrophages, with occasional neutrophils. There was also mild smooth muscle hypertrophy in villous tips.

The cecal mucosa contained moderate numbers of lymphocytes, plasma cells, and macrophages, and small numbers of eosinophils. The lumen contained exfoliated epithelial cells, debris, bacterial colonies, mucus, and cross sections of numerous nematodes.

There was moderate diffuse hyperplasia and hypertrophy of prostatic acinar epithelium, characterized by folding of the lining acinar epithelium, and increased height of lining cells. Some glands were ectatic or cystic. The interstitium was prominent because of increased quantities of fibrous tissue. The interstitium also contained multiple aggregates of mononuclear inflammatory cells, and occasional aggregates of hemosiderin-laden macrophages.

The pars distalis and pars intermedia of the pituitary gland contained multiple irregularly shaped lakes of homogeneous, amorphous, basophilic to pale eosinophilic material. Thin, tortuous bands of fibrillar, eosinophilic material (fibrous tissue, presumptive) also were present in the pars distalis.

In a section of testis, there was a discrete, round, subcapsular, densely cellular mass composed primarily of small nests and occasional cords of well differentiated, uniform interstitial (Leydig) cells. The cells generally had round, hypochromatic nuclei and abundant pale eosinophilic, granular to finely vacuolated cytoplasm. In a few areas, nuclei were large and had single prominent nucleoli. Mitotic figures were not noted. The mass compressed the surrounding testicular (seminiferous tubular) parenchyma slightly. Mature spermatids were lacking in most seminiferous tubules, with tubules lined primarily by Sertoli cells.

In a section of spleen, the capsule was markedly and irregularly thickened by dense fibrous tissue which contained aggregates of hemosiderin-laden macrophages, small lakes of hematoidin, and numerous foci and bands of mineralization (hemosiderotic plaque). Small aggregates of hemosiderin-laden macrophages also were present in the red pulp.

Morphologic Diagnosis(es)

moderate diffuse myelin degeneration and loss in the spinal cord
moderate segmental myelin degeneration and spongiosis of the cauda equina
mild to moderate gliosis and satellitosis of the brain
mild neuronal lipofuscinosis of the brain and spinal cord
moderate diffuse cystic prostatic hypertrophy and hyperplasia
multiple testicular interstitial cell (Leydig cell) tumors
moderate chronic eosinophilic typhlitis with intralesional nematodes (*Trichuris* sp.)
mild diffuse chronic lymphoplasmacytic enteritis
mild diffuse chronic membranoproliferative glomerulonephritis
adrenocortical adenoma
multinodular adrenocortical hyperplasia
moderate diffuse hepatic congestion
moderate multifocal hepatic hemosiderosis
moderate diffuse hepatocellular vacuolar degeneration
mild multifocal hepatic portal fibrosis
moderate myocardial arteriosclerosis

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mild pulmonary pneumoconiosis
splenic capsular hemosiderotic plaque

Final Diagnosis(es)

1. degenerative myelopathy
2. lumbosacral stenosis (presumptive)
3. severe multifocal intervertebral bridging spondylosis
4. prostatic hypertrophy and hyperplasia
5. multiple testicular interstitial cell tumors
6. typhlitis, with associated trichuriasis (whipworms)
7. adrenocortical adenoma and multinodular adrenocortical hyperplasia

Comment:

The major pathologic findings are listed under "Final Diagnosis(es)." Most of the other findings (listed under "Morphologic Diagnosis(es)") were age-related, and not specifically related to white shepherds. There was histopathologic evidence of degenerative myelopathy, which would account for the dog's progressive hind limb weakness and proprioceptive deficits, but there was also evidence of a probable compressive lesion affecting the nerve roots of the cauda equina. The latter lesion was probably associated with intervertebral disc protrusion, and presumed lumbosacral stenosis, and may have contributed to the dog's difficulty defecating. Pain associated with defecation was probably related to the large bony bridge (spondylosis) at the lumbosacral junction.

Jon S. Patterson, DVM, PhD, Dipl ACVP
Anatomic Pathologist

Jon S. Patterson, DVM, PhD, DACVP

(Electronically signed by) JSP

Verified: 12.06.2011 14:27

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S p e c i a l R e q u e s t s

Collected Date/Time (If Provided)	11/09/2011 14:38:00
Procedure	
Notification *	"See Below"

11/9/2011 2:38:00 PM Notification:

This report informs you of laboratory results associated with an Anatomic Pathology case. Laboratory results should be interpreted in conjunction with pathologic findings. In some instances, laboratory results may be received prior to the pathology report. In all instances, a cumulative report will be issued.

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