HISTORY

Candy had no history of significant illness. She was fine at 7:00pm on 09-09-2004 when observed by her owners. When she was observed again at around 10:30pm she was dead. She was delivered DOA to the veterinary hospital.

GROSS EXAMINATION

The animal submitted for necropsy is Candy, a spayed female Australian Shepard canine (Figures 1 – 2). The animal measures approximately 39 inches from nose tip to tail-base. The hair coat is medium-long and is mostly light brown and white in color.
Integumentary System:
A small spot of blood was noted on the hair of the right chest just caudal to the axilla. When clipped, this spot revealed the presence of a small penetrating wound approximately ¼ inch in diameter (Figures 3 – 4). The wound was present just above the costochondral junction in the intercostal space between the 6th and 7th rib, with no corresponding wound in the skin on the left side of the chest. There is considerable hemorrhage in the subcutaneous tissues at this site. Tracing the wound, it entered the thoracic cavity. Postmortem x-rays were taken revealing a small radiopaque object on the left side of the chest, opposite the wound on the right (Figures 5 – 6).

Cardiopulmonary System:
The thoracic cavity was filled with approximately 1 liter of blood (Figure 7). A small penetrating wound continuous with the one noted in the skin was present on the right inner thoracic wall between ribs 6 and 7. Continuous with the wound in the thoracic wall was an area of hemorrhage on the right middle lobe of the lung. This area of hemorrhage was roughly circular and measured approximately 1 inch in diameter (Figure 8 – 9). All other lobes of the lungs featured an irregular mottling owing to congestion. The pericardial sac was filled with blood. Continuous with the wound in the
middle lung lobe was a penetrating wound in the heart (Figure 10). This wound was present just above the apex of the heart in the right ventricle and coursed through the right ventricular lumen, the ventricular septum, the left ventricular lumen, and left ventricular wall. A small, indistinct area of hemorrhage was noted in the intercostal muscles of the left thoracic wall, continuous with the wound in the left ventricular wall. Dissection into these intercostal muscles revealed the presence of a small metallic object measuring about 1/8 of an inch (Figure 11 – 12).

GROSS DIAGNOSES:

1) Acute intercostal, pulmonary, and cardiac trauma with severe hemothorax and hemopericardium

2) Focal, acute, severe pulmonary and cardiac trauma and hemorrhage
Digestive System:
No significant gross lesions are observed in the oral cavity or within the esophagus. No hemorrhage of fluid accumulation was noted in the abdominal cavity. The stomach and intestine feature very mild postmortem gas expansion. The stomach and the upper small intestine feature small amounts of semi-solid ingesta. No overtly foreign or suspicious material was identified on gross inspection. No ulceration or hemorrhage is noted. The terminal colon features normally formed fecal material.

**Gross Diagnosis: Moderate postmortem autolysis and gaseous dilation**

Liver:
The liver had a deep red to mahogany hue, with mild surface reticulation. It measured approximately 7 x 6 inches (Figure 13). The edges are relatively sharp but there is mild blood oozing on cut surface.

**Gross Diagnosis: Mild to moderate passive hepatic congestion**

Pancreas:
No significant gross lesions are observed in the pancreatic parenchyma or surrounding fatty tissue.

**Gross Diagnosis: Grossly normal pancreas**

Spleen:
The spleen measures approximately 18 cm and features no elevated nodules or masses. The parenchyma has an irregular, mottled appearance.

**Gross Diagnosis: Grossly normal spleen**
Urogenital System:
Both left and right kidneys were similar in their gross presentation. Both are of normal size and conformation but are mildly congested (Figure 14). No significant gross lesions are observed in the bladder which is empty.

**Gross Diagnosis:** Mild to moderate, bilateral renal congestion with grossly normal bladder

Nervous system:
The brain was removed in its entirety. It was sliced sagittally in order to reveal the presence of any internal hemorrhage, infarction, malacia, or neoplasia. No significant gross lesions were observed.

**Gross Diagnosis:** Grossly normal brain

**HISTOPATHOLOGY**

**LUNG:** All of the pulmonary tissue vasculature is moderately distended with blood (congested). At the location of the penetrating wound in the right middle lung lobe, hemorrhage and edema are extensive. No evidence of inflammation or necrosis is noted.

**Microscopic Diagnosis:** Diffuse pulmonary congestion and edema, with focally extensive traumatic parenchymal disruption and hemorrhage

**HEART:** Examined are multiple sections of heart musculature. In general, the myocardial fibers are intact, organized, and feature no hyalinization, degeneration, or inflammatory changes. In the area of the penetrating wound, hemorrhage and fiber disruption are considerable.

**Microscopic Diagnosis:** Focally extensive, traumatic cardiac fiber disruption and hemorrhage

**STOMACH:** Examined sections of gastric glandular mucosa features mild autolytic change, however the mucosal border is intact without evidence of erosion or ulceration. There are no significant inflammatory infiltrates in the lamina propria but mild congestion is evident. No neoplastic cells or etiologic agents are identified.

**Microscopic Diagnosis:** Moderate autolytic change with mild gastric mucosal congestion
INTESTINE: The small intestinal villi feature diffuse autolytic change, however, there is no evidence of blunting, ulceration, necrosis, or inflammation. There is very mild edema in the lamina propria, but no lacteal dilation. There is no evidence of rupture of the bowel wall and no evidence of peritonitis.  
**Microscopic Diagnosis:** Luminal autolytic changes, small intestine

PANCREAS: The pancreas featured normally arranged acini, and normal numbers of well-spaced pancreatic islets. There is no evidence of hemorrhage, inflammation, necrosis, or neoplasia.  
**Microscopic Diagnosis:** Histologically normal pancreas

SPLEEN: Examination of the splenic sections reveals moderate contracture of the parenchyma with prominence of the fibroeliomatous septae. The white pulp follicles are prominent and slightly expanded, and most of the red pulp features fibrous stroma together with histiocytes and lymphocyte. There is no evidence of inflammation, necrosis, or neoplasia. 
**Microscopic Diagnosis:** Mild to moderate splenic contraction with mild lymphofollicular hyperplasia

LIVER: Examined sections of liver are characterized by moderate sinusoidal and vascular congestion. The accumulation is most notable in the central veins and periacinar regions. The hepatic cords around the central veins are mildly attenuated and slightly pale, imparting a distinct reticulated appearance to the section. No periacinar fibrosis is noted. 
**Microscopic Diagnosis:** Moderate, diffuse, acute to subacute passive hepatic congestion

KIDNEYS: Both left and right kidneys were similar in their microscopic presentation. Sections features well proportioned cortical and medullary tissue. Glomeruli are adequate in number and are not distended or sclerotic. Bowmans capsules are not thickened. Mild vascular congestion was evident. No crystaluria or proteinuria is noted in the renal tubules.  
**Microscopic Diagnosis:** Left and right kidneys, mild congestion.

BRAIN: 
Examined are multiple sections of brain featuring no significant histologic lesions beyond mild vascular congestion. Neuronal fibers are intact, organized, and feature no malacic, demyelination, degenerative, or inflammatory changes. No viral inclusions are observed.  
**Microscopic Diagnosis:** Histologically normal brain
SUMMARY, COMMENTS, AND CONCLUSIONS

All of the significant gross lesions observed during the necropsy were in the cardiopulmonary system. These lesions account for the cause of death in this case; severe thoracic exsanguination (bleeding into the chest) due to a puncture of the lung and heart by a high velocity metal projectile. This projectile is consistent with common metal pellets that are fired from air-powered rifles or pistols. The pellet was apparently fired at relatively close range considering the degree of penetration. The pellet entered the right chest wall between the 6th and 7th ribs, passed through the right middle lobe of the lung, the distal aspects of the right and left ventricles, and lodged in the intercostal muscles between ribs 6 and 7 on the left side (Figures 15 – 17). The angle of the pellet’s trajectory was shallow, as the pellet ended up in nearly the same plane as the entry wound.

Figure 15  Figure 16  Figure 17

Pathologist:
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