

What's Your Diagnosis?

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Signalment: Jazz is a female intact 2 year old German Shorthaired Pointer.

Presenting complaint: Jazz was presented to the K-State emergency service on August 22nd with a three to four day history of vomiting and not eating or drinking as well as constant grunting and groaning with respirations .

History: Jazz began vomiting on three days earlier and was taken to her primary care veterinarian when the vomiting had not resolved. They took abdominal radiographs and nothing obvious was noted. The dog was given subcutaneous fluids, maropitant, and a dose of Banamine. Later that night, Jazz started having grunting and groaning associated with her respirations. The dog was taken to another veterinarian where a barium upper GI study was performed, along with some bloodwork. The barium study revealed no sign of obstruction or rupture associated with the GI tract. However, there was diffuse subcutaneous emphysema in the cervical region, pneumomediastinum and pneumoretroperitoneum. Her bloodwork at the second referring veterinarian showed azotemia and electrolyte abnormalities (hyponatremia, hypochloridemia, and hypokalemia). She was referred that time.

Physical exam on Presentation: Tachypnea with grunting respirations, tachycardia (around 150 bpm), and a normal rectal temperature. Subcutaneous emphysema in the ventral cervical region and left lateral thorax were appreciated. Lung sounds were normal and abdominal palpation was unremarkable. There was dark brown, leaky diarrhea.

Initial bloodwork: Azotemia (BUN 86, creatinine 1.8) and electrolyte depletion (Na was 129, Cl was 88, and K was 3.3)

- Consistent with marked fluid loss from the vomiting

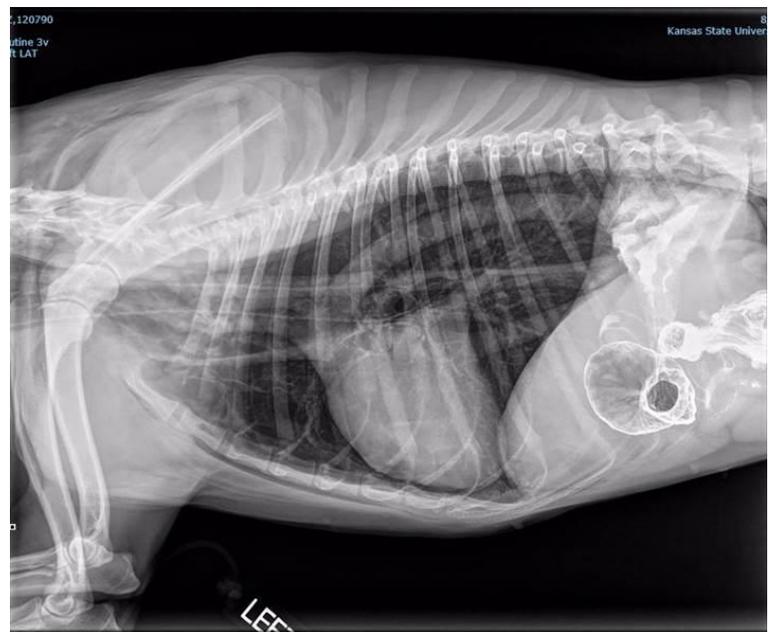
Radiographs were taken at this time:



Right lateral Neck and VD Neck

There is a gas opacity dissecting the tissue planes in the cervical region, highlighting the trachea and esophagus. This gas opacity is also appreciated in the forelimb, ventral soft tissues of the thorax, lateral soft tissues of the thorax and is more severe on the left side. Esophagus and trachea are unremarkable. Musculoskeletal structures are normal. The thoracic structures will be commented on in the thorax films below.

Conclusions: Subcutaneous emphysema in the cervical and thoracic region





Right and left laterals and VD thorax

The gas in the neck that was seen on the neck films is still visible. There is gas opacity ventral to the sternum. The mediastinal structures (trachea, esophagus, descending aorta, azygous vein) are easily distinguished due to gas in the mediastinum. There is gas within the craniodorsal abdomen. Subcutaneous air is present the axillary region bilaterally and within the ventral thoracic body wall. It is worse on the left side (dissects to around the 8th rib space). The trachea is normal in diameter and position. The cardiac silhouette is within normal limits. The pulmonary vasculature is within normal limits. The pulmonary parenchyma is normal. There is still contrast in the stomach and bowel. Musculoskeletal structures are normal.

Conclusions: Cervical and thoracic subcutaneous emphysema. Pneumomediastinum. Strong evidence of a pneumoretroperitoneum. Because the original contrast agent was given more than 4 hours prior, a functional ileus is a strong consideration.

Diagnostic plan:

Due to the presence of free air in the subcutaneous space, mediastinum, and retroperitoneal space, we felt that Jazz needed an endoscopic evaluation of her pharynx, trachea and esophagus because a rupture of one of these structures was at the top of our differential list. Other considerations at this time were for bullous emphysema with a rupture of the bullae. The lungs looked normal with no evident bullae or interstitial disease but bullae are not always found radiographically.

The endoscopic examination did not reveal any tear or rupture. The only finding was multifocal erosions of the gastric mucosa (seen as pinpoint reddish brown dots).

Differentials:

- ❖ **Differentials for the gastric erosions:** Banamine administration or caustic substance that potentially caused the initial vomiting
- ❖ **Our differentials for grunting respirations, tachypnea, tachycardia:** subcutaneous emphysema, pneumomediastinum, or pneumoretroperitoneum and pain related to these
 - **Differentials for the subcutaneous emphysema, pneumomediastinum, or pneumoretroperitoneum:** iatrogenic causes (from SQ fluid administration from the first veterinarian; very unlikely), unrecognized bullous, interstitial lung disease, vomiting and coughing (has been described to cause pneumomediastinum in humans).

Over the course of 48 hours the azotemia resolved, dehydration and electrolyte abnormalities were corrected.

Unfortunately, the grunting respirations and tachypnea were not improving, nor did the tachypnea. At this point, we took our second set of radiographs two days later.



Thorax left and right lateral and DV thorax

There is less gas within the mediastinum and the structures of the mediastinum are not as easily distinguishable when compared to prior radiographs. The gas is still seen dissecting through the tissue planes of the neck but is also decreased. There is a diffuse, unstructured interstitial pattern in the cranial ventral thorax and caudal lung lobes. There is gas in the retroperitoneal space. There is peritoneal gas seen in the cranial ventral abdomen on the right lateral view. Loss of peritoneal detail in the cranial ventral abdomen on the left lateral view. The barium contrast agent is seen in the transverse colon.

Conclusions: Compared to previous radiographs, pneumomediastinum and subcutaneous emphysema are improved. Pneumoretroperitoneum is unchanged. Diffuse mild unstructured interstitial pattern.

Radiographically, Jazz was improved. Unfortunately, clinically, she was not. Her vomiting, diarrhea, and electrolyte abnormalities had resolved. We deemed that her initial insult was an acute nonspecific gastroenteritis.

Updated problems:

1. Persistently tachypnea and required nasal insufflation
2. Oxygen-dependent and rapidly oxygen-responsive
3. Unexplained free air
4. **New problem: extreme polyuria** - required 10 ml/kg/hour (5x maintenance) just to maintain her weight.
5. **New problem: intermittent cough**

We decided to take another set of radiographs on 4 days later, due to concern over the developing cough.



Right and Left lateral

The pneumomediastinum and subcutaneous emphysema have resolved. There is a diffuse, unstructured interstitial pulmonary pattern. Ventrally there is alveolar infiltrate and air bronchograms in the left cranial, right cranial and right middle lung lobes. This interstitial pattern has increased from previous radiographs and the alveolar infiltrate and air bronchograms are new findings. The trachea, esophagus, cardiac silhouette are all unremarkable. Cranial abdominal serosal detail is poor.

Conclusions: Pneumomediastinum or subcutaneous emphysema resolved. Ventral alveolar infiltrate is most consistent with aspiration pneumonia. The unstructured interstitial pattern throughout the lungs could be due to inflammatory infiltration, pulmonary edema, or hemorrhage.

A literature search found that pneumomediastinum, subcutaneous emphysema and pneumoretroperitoneum in a human after consumption of a herbicide called paraquat had been reported. After researching paraquat in dogs and determining that Jazz did have contact with this substance, we came to the conclusion that Jazz had **paraquat toxicity**.

What is paraquat?

Paraquat is a restricted use herbicide in the US that requires a permit to apply to crops. The US formulation of paraquat contains a substance that induces vomiting and is also caustic to the GI tract and can cause ulceration. Paraquat accumulates in the type 1 pneumocytes and is toxic to these cells causing an insidious death due to respiratory failure. It also induces renal tubular necrosis and causes marked electrolyte depletion and azotemia.

Jazz was euthanized on day 8 of her hospitalization after the final set of radiographs were taken and it was determined that she has paraquat toxicosis.

Necropsy and Histopathology findings:

Lungs were severely hemorrhagic with diffuse, severe pulmonary edema. On histopathologic exam, there was severe interstitial, necrotizing pneumonia with type II pneumocyte hyperplasia, hemorrhage and edema. The pancreas was severely hemorrhagic and edematous as well (both on histopathology and grossly). The kidneys have multifocal, interstitial nephritis with tubular necrosis and regeneration.

A toxicant screen on the serum was performed at Iowa State University. The serum came back as negative for paraquat. However, this is not unexpected as paraquat is excreted rapidly by the kidneys and it is reported that almost 100% of the toxin is gone from the bloodstream within 24 hours.

Conclusions:

Paraquat is highly toxic to animals. Early diagnosis and aggressive treatment are extremely important to improve survival. Currently, there is very limited effectiveness treatment. Because of this, the best solution to paraquat poisoning is to inform owners whose pets may have access to this compound and prevent exposure.