What Is Your Diagnosis?

History

An 8-year-old 4.5-kg (10-lb) castrated male Chihuahua was referred for evaluation immediately following a dog attack. The dog was initially treated by the referring veterinarian with diazepam and dexamethasone.

At the time of hospital admission, the dog appeared sedate and had signs of pain as demonstrated by vocalization during palpation of the thorax. Mydriasis with a diminished menace response was observed, but the dog seemed to be visual bilaterally. Mucous membranes appeared muddy, and capillary refill time was approximately 2 seconds. Thoracic auscultation revealed mild tachycardia with fair synchronous pulses and muffled lung sounds on the left side. No obvious rib fractures were palpated. An approximately 1- to 2-cm-long wound over the dorsal aspect of the right shoulder area was noted as well as a large swelling over the left lateral side of the thorax. Mild subcutaneous emphysema was palpated along the dorsum.

Abnormal hematologic findings included mildly high serum alanine aminotransferase activity (145 U/L; reference range, 10 to 100 U/L), mild anemia with a PCV of 29%, and mild hypoalbuminemia (2.6 g/dL; reference range, 2.7 to 3.8 g/dL). Thoracic radiography was performed (Figure 1).

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page →

Figure 1—Right lateral (A) and ventrodorsal (B) radiographic views of the thorax and abdomen of an 8-year-old 4.5-kg (10-lb) castrated male Chihuahua evaluated following a dog attack.
Radiographic Findings and Interpretation

On the lateral radiographic image, an air opacity is superimposed over the dorsal aspect of the sixth thoracic vertebra, extending to the ninth thoracic vertebra (Figure 2). On the ventrodorsal radiographic image, this corresponds to a large, slightly angular air opacity extending across the thoracic wall at the sixth and seventh intercostal spaces on the left. This area has linear soft tissue opacities compatible with vascular structures, which are contiguous with the pulmonary vessels of the left caudal lung lobe. The mainstem bronchus extending to the left caudal lung lobe can be seen extending into the structure and is laterally displaced. The left cranial lobar bronchus is not visible. A concurrent increase in soft tissue opacity superimposed over the heart at the fourth and fifth intercostal spaces on the ventrodorsal view is evident; this finding is compatible with atelectasis of the caudal subsegment of the left cranial lung lobe. On the lateral view, this corresponds to increased soft tissue opacity dorsal to the cranial aspect of the thoracic trachea located between the second and fifth intercostal spaces. A marked mediastinal shift to the left is present, as indicated by displacement of the heart and diaphragm on the ventrodorsal view. Subcutaneous emphysema is present lateral to the left shoulder joint and humerus. The margins of the diaphragm on the left are slightly indistinct, but overt evidence of a diaphragmatic hernia is not detected. No obvious rib fractures are seen. The stomach contains air and mineral material. The radiographic changes are diagnostic for herniation of the left caudal lung lobe through the left seventh intercostal space.

Treatment and Outcome

Surgical exploration was performed by means of a left thoracotomy. The left caudal lung lobe was found to be herniated between the seventh and eight ribs and appeared bruised and edematous. Upon entry into the thoracic cavity, the left cranial lung lobe (both segments) was found to be severely atelectic and did not reinflate despite positive pressure ventilation. A complete left pneumonectomy was performed. The remainder of the thoracic cavity appeared unremarkable, and the right hemithorax was not viewed. Routine closure was performed, and a thoracic tube was placed. The wound over the dorsal aspect of the right shoulder area was probed and found to contain a large subcutaneous dead space that extended bilaterally to the level of the elbow joints. Penrose drains were placed bilaterally, and a thoracic bandage was applied. The dog was placed in an oxygen cage and recovered uneventfully. Oxygen therapy was discontinued, and the thoracic tube and left Penrose drain were removed after 2 days. Daily bandage changes were performed, with the right Penrose drain removed after 5 days. The dog was discharged 6 days after initial examination with instructions for the owner to administer meloxicam, tramadol, amoxicillin-clavulanic acid, and enrofloxacin.

Comments

Any wound that extends from the outside of a cavity or lumen to the inside can be defined as a pen-
etrating wound. Most of these injuries in dogs are bite wounds and frequently involve the thoracic wall. Subdermal tissues, muscles, and internal organs are often injured without appreciable superficial skin defects as a result of a combination of shearing, tensile, and compressive forces of a bite and the mobility of the overlying skin. In the dog of the present report, the actual tear in the intercostal muscles was located caudal to the superficial wound and was not connected to the subcutaneous dead space when explored.

The most common radiographic signs seen with bite wounds of the thoracic wall include subcutaneous emphysema, pulmonary hemorrhage, pneumothorax, rib separation or fracture, and, in many instances, a combination of these signs. Other radiographic signs may include pleural effusion, pulmonary contusion, and diaphragmatic hernia. Lung herniation is defined as the abnormal protrusion of lung beyond the confines of the thoracic cavity. The main radiographic sign is the presence of air opacity in the overlying soft tissue of the thoracic wall. The use of clinical findings can help differentiate lung herniation from other differential diagnoses, such as subcutaneous emphysema, lipoma, and angioma. Intercostal lung hernias are typically seen as bulges in the thoracic wall that vary in size with the respiratory cycles and can occasionally be manually reduced.

When comparing surgical findings with radiographic imaging, radiographs may not adequately show the extent of thoracic wall injury and pulmonary damage. In the case described in the present report, during exploration of the thoracic cavity, both segments of the left cranial lung lobe were found to be severely atelectic, which could not be completely appreciated on thoracic radiographs. The lack of a radiographically visible cranial lobar bronchus and an increased opacity in the middle portion of the left side of the thorax supported severe collapse of the entire left cranial lung lobe. Because of the presence of air opacity in the left cranial aspect of the thorax, it would be difficult to make a definitive radiographic diagnosis of severe atelectasis. Pulmonary contusion would also be less likely owing to the presence of a mediastinal shift, which can occur with atelectasis. Differential diagnoses for the cause of atelectasis include torsion, occluding embolus, congenital abnormalities, bronchial obstruction, and positional obstruction of blood supply. No definitive cause of the atelectic lungs could be determined during surgery. Computed tomography may have provided additional information as to the cause of the atelectasis.

Thoracic wall trauma is a common occurrence with dog fight injuries. Proper stabilization followed by radiographic imaging is warranted in most cases. Regardless of radiographic findings, thoracic wounds should be explored to determine whether thoracic cavity entrance has occurred. Radiographic interpretation for the dog of the present report corresponded to a left caudal lung lobe herniation, but a definitive radiographic sign of severe atelectasis of the left cranial lung lobe was not evident.

References