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Surgical diseases affecting the thoracic wall include exploration of animals with penetrating wounds, often bites; treatment of animals with flail chest secondary to vehicular trauma, and removal of chest wall masses. Surgical diseases affecting the lung include primary lung tumors, rupture of pulmonary bullae causing “spontaneous” pneumothorax, and lung lobe torsions.

In areas with poor leash laws, dogs frequently present with bite wounds over the thoracic cavity. These animals require a thorough physical examination and often emergency stabilization. The wounds should be filled with a water soluble gel to prevent further contamination and bandaged until the animal is stabilized. Thoracic bite wounds are often associated with pneumothorax and rib fractures. However it is important to remember that the absence of pneumothorax on thoracic radiographs does not rule out the possibility of penetrating chest injuries. The respiratory compromise in these animals is usually secondary to the pain associated with rib fractures that limits respiratory excursions and pulmonary contusions. This is also true in dogs with flail chest secondary to vehicular trauma. As impressive as the paradoxical movement of the flail segment appears, the flail itself causes minimal respiratory compromise.

Once stabilized, the animal is anesthetized, intubated, and the wounds clipped and cleaned. The wounds are explored and devitalized tissue removed. Rib fractures are stabilized using cerclage wire placed through holes drilled near the fractured ends. The lungs are evaluated and severely contused lobes removed. Intercostal nerves of fractured ribs are blocked to provide pain relief. Large chest wall defects may require reconstruction with mesh and omentum. A chest tube is placed to evacuate air and deliver local anesthetic postoperatively.

Masses arising on the chest wall are most often chondrosarcomas or osteosarcomas. Fibrosarcoma, hemangiosarcoma, mast cell tumor, and hemangiopericytoma are also reported. Lung metastasis is frequent with osteosarcoma and hemangiosarcoma. The prognosis for chondrosarcomas is much better than for osteosarcomas after complete resection. Diagnostic work-up should therefore include thoracic radiographs to evaluate for the presence of metastatic disease, and a biopsy of the mass.

Malignant and locally invasive neoplasms are removed by wide enbloc resection of the involved thoracic wall. Reconstruction of the chest wall is by muscle flaps (latissimus dorsi cranially), cranial transposition of the diaphragm in the caudal thorax, or insertion of a polypropylene mesh sutured intra-pleurally in the mid-thoracic region. With large soft tissue defects, an omental pedicle flap is advanced from the abdomen (and sutured over the mesh) to create an air tight seal.
Primary Lung Tumors

Primary lung tumors are somewhat uncommon in the dog. Most primary lung tumors in dogs are malignant, with adenocarcinoma the most common type. The most common primary clinical signs associated with this condition include cough (52%), dyspnea (23%), lethargy (18%) and weight loss (12%). These signs will be seen in majority of dogs with primary lung tumors, although a significant fraction (25%) of dogs in one study had no clinical signs related to the tumor.

When a mass lesion is detected on thoracic radiography, every effort should be made to exclude the existence of a primary tumor elsewhere in the animal. A thorough physical examination and abdominal ultrasound are indicated to rule out a primary neoplasm elsewhere. Thoracic radiographs (including opposite laterals) should be examined carefully for the presence of more than one mass, or enlarged peribronchial lymph nodes. Both of these factors have been shown to be associated with a shorter survival after surgery. Aspiration or needle biopsy can be performed either blindly or with either ultrasonic or fluoroscopic guidance.

Exploratory thoracotomy and lung lobectomy should be considered when no other disease is found. The surgical approach is usually via an intercostal thoracotomy. In cases with large tumors, particularly in smaller animals, a rib resection should be considered. At surgery, the affected lung lobe is removed either manually or with a surgical stapling device. The remaining lung lobes are examined for evidence of neoplastic disease, and the peribronchial lymph nodes are biopsied. Dogs with differentiated adenocarcinomas have the longest postoperative survival times. Dogs should be rechecked every 3-6 months after surgery, and thoracic radiographs made to check for recurrent disease.

Pneumothorax associated with air leakage from the lung can be traumatic or spontaneous. Traumatic leakage of air is usually caused by blunt trauma, such as motor vehicle accidents, but can also be secondary to chest taps, leaking chest tubes, or surgical procedures. A spontaneous pneumothorax is a "closed" pneumothorax in which the lung is suspected as the source of the leakage, and the animal has no history of trauma. It is considered primary when there is no clinical evidence of pulmonary disease, and secondary when overt pulmonary pathology exists.

Secondary spontaneous pneumothorax has been reported in association with several pulmonary diseases including bacterial pneumonia, chronic obstructive lung diseases (emphysema and chronic bronchitis), asthma, tuberculosis, and pulmonary neoplasia. Ruptured pulmonary abscesses secondary to plant awns and pleurobronchial communications secondary to heartworm thromboembolism have also been reported to cause pneumothorax. It should be emphasized that some of these are uncommon conditions in themselves, and most rarely cause
pneumothorax; bacterial pneumonia and primary lung tumors are quite common, but only occasionally associated with pneumothorax.

"Primary" spontaneous pneumothorax in dogs results from rupture of pulmonary blebs or bullae. Pulmonary blebs are local accumulations of air within the visceral pleura, whereas bullae are confluent alveoli. This condition has been reported most commonly in large, deep chested breeds of dog. The etiology of the pulmonary blebs and bullae are often unknown in dogs; however we have seen several cases where microscopic carcinoma was found when bullae were submitted for histopathology.

Treatment of spontaneous pneumothorax depends on identifying an underlying cause where possible, and in some cases, the owner's financial resources. If a pulmonary neoplasm, abscess, or infarcted area of lung lobe is identified, stabilization with thoracocentesis or a chest tube is indicated, followed by exploratory thoracotomy. Treatment options for primary spontaneous pneumothorax include intermittent aspiration of air via needle thoracocentesis or chest tube, continuous suction of the pleural space, or exploratory thoracotomy. Dogs treated with needle thoracocentesis or chest tube drainage usually have recurrent pneumothorax. Based on this clinical experience and recent published studies, immediate exploratory thoracotomy is now the preferred treatment. Exploratory thoracotomy is performed via a sterotomy. It is important to open the pleural reflection containing the accessory lung lobe as some dogs have bullae affecting this lobe only. Partial or complete lobectomy is performed in lobes containing bullae. All lesions should be submitted for biopsy, as some bullae are secondary to neoplasia. If multiple lung lobes are involved, omentalization may be considered as a treatment option.

Lung lobe torsion is an uncommon condition, but is reported in both dogs and cats. Dogs with narrow, deep chests appear to be more frequently affected. The right middle and right cranial lung lobes are most frequently involved. This condition is associated with chylothorax, trauma, thoracic surgery, neoplasia, and chronic respiratory disease. The cause of the torsion is not clear in many cases. It is speculated that pleural effusions "float" the lobes and make them more likely to twist. However, lung lobe torsion occurs only rarely in dogs and cats with pleural effusions.

Torsion causes obstruction of the bronchus and venous drainage, but a portion of the arterial bloods flow remains. Obstruction of venous drainage causes fluid to move into the interstitial tissues, alveoli and airways, resulting in congestion and consolidation of the affected lobe(s). Clinical signs are non-specific, but are related to the accumulation of pleural fluid, and the presence of a necrotic lung lobe. Animals are depressed, anorectic and often febrile. Patients may have variable degrees of dyspnea and coughing. Lung sounds may be muffled due to the consolidated lung lobe or the presence of pleural effusion. Thoracocentesis yields either a chylous or serosanguinous fluid. Cytology shows large numbers
of erythrocytes and neutrophils, but usually few bacteria. Thoracic radiographs show pleural effusion. Air bronchograms may be evident early in the disease process, but as air is re-absorbed from the affected lobe, it appears consolidated. The obstructed bronchus can be demonstrated by positive contrast bronchography or bronchoscopy.

The treatment of choice is total lobectomy of the affected lobe. In most animals, a surgical stapler is ideal for this purpose. Animals should be monitored carefully after surgery. Several dogs have developed severe pulmonary edema 6-12 hours after surgery. This could be associated with over-inflation of the lungs under anesthesia, or the systemic inflammatory response associated with the necrotic lung lobe.