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MANAGING DISORDERS OF THE PLEURA, THORACIC WALL AND DIAPHRAGM

Thoracic wall injuries can result in a wide variety of life threatening sequelae as indicated in the table below.

- Superficial soft tissue injury
- Subcutaneous emphysema
- Fractures of the ribs, sternum and vertebrae *(Ultrasonography is more sensitive than radiography for detection of rib fractures)*
- Pneumothorax *(Right pleural sac is vulnerable to deep puncture wounds because it extends up the neck, to 2-3 cm beyond the first rib)*
- Pneumomediastinum
- Pleural effusion
- Haemothorax *(causes haemorrhagic shock rather than respiratory failure)*
- Infections *(pleural infection, pleuropneumonia, pulmonary abscess)*
- ARDS
- Pulmonary contusion or laceration *(predisposes to bacterial pneumonia)*
- Diaphragmatic herniation or laceration
- Involvement of other systems *(pericardial puncture, intestinal perforation/rupture, vertebral fractures, splenic or hepatic rupture)*

Open external wounds should be closed, ideally by primary closure following local intercostal nerve blocks and aseptic preparation. In emergency situations, further ingress of air may be prevented by manual compression with a gloved hand or application of a non-porous pressure pad such as cling film. Large and complex thoracic defects may require surgical repair under general anaesthesia. Penetrations into the pleural cavity may warrant pleural lavage and drainage.

Pneumothorax and pneumomediastinum; causes are listed below.

- Penetration of thoracic wall, trachea, oesophagus or stomach
- Fractured ribs
- Blunt external trauma causing tearing of visceral pleura
- Bronchopleural fistula following pleuropneumonia and pneumonia
- Wounds of axilla and ventral neck
- Leaking thoracic drains
- Complication of tracheostomy, percutaneous trans-tracheal aspiration, lung biopsy, thoracostomy
- Excessive positive pressure ventilation in foals (barotrauma)
- Idiopathic

Simple uncomplicated closed pneumothorax without dyspnoea may be treated conservatively, with stall rest and close observation. Air is absorbed from the pleural space, albeit slowly, because the venous blood within the pleural vessels contains a lower total pressure of dissolved gases than does the alveolar air or atmospheric air. If there is dyspnoea, air is aspirated from the pleural cavity via a 10cm blunt teat cannula or 8-10 French catheter inserted in the dorsal lung field at the level of thirteenth intercostal space, using a suction apparatus or a large syringe utilizing a 3-way stopcock. Drainage may be performed intermittently, or employing a continuous aspiration system with a Heimlich valve or an underwater seal device, with or without suction. Bilateral pneumothorax is usually resolved by aspiration from only one hemithorax. However, in severe bilateral pneumothorax, and tension pneumothorax, bilateral tube thoracostomy should be performed. Ultrasonography can be used to assess restoration of lung inflation. Failure of thoracostomy to alleviate the respiratory distress should prompt examination for concomitant injuries such as fractured ribs or diaphragmatic hernia, or continued leakage of air into the pleural cavity. The latter may result from (a) tension pneumothorax, (b) iatrogenic lung puncture during insertion of chest drain, which is rare, (c) leakage around the thoracostomy tube or one way valve, or (d) failure to adequately close external thoracic wounds. Supplemental intranasal oxygen, analgesia to reduce pleurodynia and to minimise chest splinting and its detrimental sequelae, and antimicrobial treatment are warranted. Pleural lavage may be indicated in horse with penetrating thoracic wounds to minimize secondary bacterial pleuritis.

RESPIRATORY DISORDERS

Haemothorax; Defined as pleural fluid haematocrit more than 50% that of peripheral blood. Horses with acute intra-pleural haemorrhage present with haemorrhagic shock rather than with respiratory failure, because the volume of blood loss which causes death due to acute haemorrhagic shock (approximately 15 litres for a 500kg horse) is insufficient to cause life threatening pulmonary tamponade. Thus the prime therapeutic consideration is replacement of blood volume. The underlying cause of haemothorax should also be sought, because this is an important determinant of subsequent case management and prognosis. The author's preference is to avoid draining a haemothorax. Rapid auto-transfusion of blood from the pleural cavity via the diaphragmatic lymphatics may lead to restoration of circulating blood volume and rapid resolution of haemothorax.

Pleural effusions; the causes are listed below

- pleural infections (pleuropneumonia; bacterial, mycoplasma, viral or fungal)
- thoracic neoplasia
- penetration of chest wall, oesophagus, diaphragm and stomach
- thoracic trauma
- extension of peritoneal effusion
- liver disease
- congestive heart failure
- hypoproteinaemia
- diaphragmatic hernia
- pulmonary hydatidosis
- pulmonary granulomas
- idiopathic

Pleuropneumonia; Ultrasonography is the best diagnostic modality for detecting and evaluating suspected pleural disease. Ultrasonography can be used assess the nature of pleural fluid (echodense, echolucent, gas echoes), volume of fluid, determine whether it is unilateral or bilateral, identify sequel such as fibrin deposition, loculi formation, pleural adhesions and pneumothorax, and select the optimal site for thoracocentesis. Gas echoes within pleural effusion have been described with anaerobic infections, gangrenous pneumonia, bronchopleural fistulae and iatrogenic leakage or air during thoracocentesis. Ultrasound can also detect concurrent cardiopulmonary lesions, such as pulmonary consolidation (hepatisation), compression atelectasis, abscesses, infarction and pericardial effusions.

Treatment of pleuropneumonia requires early recognition and prompt initiation of appropriate treatment. Ideally treatment should be commenced within 48h of a predisposing event to prevent significant bacterial invasion of pulmonary parenchyma.

Treatment involves;

- Prompt administration of systemic, broad spectrum, bactericidal antibiotics
- Drainage of pleural effusion + pleural lavage
- Ancillary treatments including intrapleural fibrinolytics and DNAase, Supplemental oxygen may be administered to horses with significant hypoxaemia. Pleurodynia may be alleviated using NSAIDs, morphine, fentanyl patches or intercostal nerve block. Fluid and oncotic support may be required to counteract significant losses of fluid and protein into the pleural space. The effects of bacterial toxaemia may be minimised by administration of polymixin, NSAIDs, hyperimmune plasma, colloid support and pentoxifylline.
- Prompt recognition and appropriate treatment of sequelae including cranial thoracic masses, bronchopleural fistulae, pericarditis, laminitis, pleural adhesions, pleural empyaema, pneumothorax, catheter associated-jugular thrombophlebitis, disseminated intravascular coagulation, colitis and colic.