

RESPIRATORY DISTRESS IN THE NEONATAL FOAL

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The neonatal foal should have pink mucus membranes within 15-20 seconds of birth consistent with the first few breaths. Respiratory stertor should not be present and the thoracic cavity should have normal inspiratory and expiratory excursions. If abnormalities in respiration are observed intranasal oxygen at 8-10 L/minute should be delivered until the clinical signs abate or in preparation for hospital referral.

Respiratory compromise to the neonate can be divided into upper and lower respiratory disorders. These insults may be primary or secondary such as congenital anomalies and neurological insults, respectively. The most common neonatal compromise affecting both upper and lower airways is the neonatal maladjustment syndrome (hypoxic ischemic encephalopathy, HIE). This disorder of the central nervous system can clinically result in collapsed airways and aspiration pneumonia as motor dysfunctions, and idiopathic tachypnea, or perinatal asphyxia as respiratory center failures of the foal to oxygenate. Neonatal foals with HIE can be preceded by various infectious diseases, abnormal placental function, toxicities (kernicterus), Mare Reproductive Loss Syndrome (MRLS), cesarean section delivery, dystocia, placental suffocation during or following birthing, prolonged hypothermia/hypoglycemia, and gestational trauma. These problems may cause associated cerebral metabolic dysfunction, cerebral edema, cerebral hemorrhage and meningitis. The prognosis is generally favorable with appropriate treatment.

UPPER RESPIRATORY: Upper respiratory disorders can be secondary to HIE and perinatal asphyxia syndromes, or mechanical lesions of the nasopharynx and esophagus.

Collapse of the nares causing occlusion of the nasal orifices can be life threatening in the obligate nasal breathing equine neonate. The treatment of choice is to grasp the loose fold of skin between the rostral nares until sufficiently tented for the nares to be pulled into open abduction and then place a temporary horizontal suture for retention. The suture can be removed at a later date when predisposing clinical signs are no longer present. The prognosis is considered to be favorable if not complicated by a more extensive systemic illness.

Collapse of the pharyngeal walls or arytenoids cartilages can similarly occur with systemic insults or brainstem lesions. Often stertor is present and the diagnosis is confirmed by endoscopy revealing pharyngeal paresis. The dorsal pharynx appears pulled downward and occluding the arytenoids cartilages. In severe cases the arytenoids may similarly be collapsed and dorsal displacement of the soft palate persistent. Systemic anti-inflammatory medications should be administered and the foal may require naso-tracheal intubation or a tracheostomy. The prognosis is principally favorable with the clinical acquisition or eventual restoration of nerve function.

Congenital defects such as wry-nose, choanal atresia and cleft palates may be moderate to severe compromises. Humane euthanasia may be the most favorable option in severe cases. Wry-nose rarely compromises respiration and the most common clinical problem is the inability to nurse. Surgery can be performed to remove a wedge of nasal bone and has been clinically, but not cosmetically, successful in a limited number of cases. Choanal atresia is usually unilateral and numerous surgical procedures, including laser ablation to create a more open nasal lumen, have been attempted without known successes. Cleft palates can be of the soft or hard palate and oftentimes, asymmetrical. Soft palate lesions that cause stertor and dysphagia are amenable to surgical intervention while those of the hard palate maintain a poor prognosis for repair. Small asymmetrical clefts may be non-compromising with neither stertor or dysphagia, however they are considered lesions that may limit future performance.

Congenital anomalies of the esophagus include defects in milk passage such as strictures and diverticulum. These lesions can result in reflux dysphagia and lead to secondary aspiration pneumonia. The differential diagnosis of laryngeal or esophageal paresis can be ruled out by endoscopy or contrast radiography of the esophagus revealing esophageal defects. Surgical intervention is recommended for esophageal lesions and the prognosis may be considered guarded to good. Some esophageal strictures may be self-limiting and not require intervention.

Meconium aspiration is most consistently recognized in conjunction with fetal diarrhea. These foals are most commonly born with meconium or fecal staining of the fetal membranes and coating of the neonatal foal. Aspiration of meconium contaminated fluid during foaling is most often a clinical diagnosis and the foal treated subjectively with antibiotics and anti-inflammatory medications, including steroids. In severe cases, suction should be utilized to remove excessive fecal contaminants.

Foals may present with perinatal asphyxia most commonly associated with HIE. These neonates often fail to breath spontaneously at birth or shortly thereafter and were noted as a common clinical feature of MRLS. The use of resuscitation and doxapram HCL (Dopram 2cc IV) is utilized as immediate respiratory stimulant followed by caffeine (10mg/kg loading and 2.5mg/kg PO, BID, maintenance, or 4cc of Dopram per liter of fluid therapy). Foals with severe compromise to normal breathing patterns often are associated with a poor prognosis, regardless of treatment. Other forms of breathing dysfunction include Biots and Cheyne-Stokes respiratory breathing patterns whereas periods of apnea are consistently present, often following brief periods of normal to rapid respirations.

Idiopathic tachypnea is a rarely observed feature of neonatal foals. The patient is most often clinically normal with the exception of profound tachypnea. Endoscopy usually reveals inflammation of the tracheal without aspiration or mucus. Foals are treated symptomatically for 5-7 days with antibiotics and anti-inflammatory medications with a favorable prognosis. Idiopathic tachypnea can be considered responsive to treatment or may represent a self-limiting central hypothalamic syndrome.

LOWER RESPIRATORY: Lower respiratory disorders entail disease of the lungs, chest cavity and thoracic wall. Infectious aspiration pneumonias are often secondary to primary problems of the upper airways or dysphagia and, as with any neonatal pneumonia should be considered serious. Pulmonary infection is common in the neonate and is often responsive to antimicrobial treatment, however mortality caused by pneumonia should be appreciated as the most common organ system of death losses.

Premature foals may succumb to immature pulmonary development and a lack of surfactant. In foals without sepsis, the initial use of mechanical ventilation may be beneficial in providing oxygenation during phases of lung maturation. Diagnostics include ultrasound evaluation revealing a ground glass, diffuse pattern to the lungs. Radiographs reveal a diffuse interstitial density, and blood gases are consistent with a failure to oxygenate with significant retention of carbon dioxide. Surfactant replacement has been utilized in premature foals without providing sustained clinical evidence of being critical for survival since blood gas parameters of oxygenation significantly improve, albeit only for short intervals of time. The use of corticosteroids to stimulate surfactant production in foals have similarly not been shown to increase phospholipids (lecithin and sphingomyelin) in normal ratios, and although not contraindicated, do not increase survival.

Neonatal foals with acute respiratory distress, ARDS (Acute Respiratory Distress Syndrome) clinically present as similar to the occurrence in other species and may reflect combinations of surfactant deficiency, immune dysfunction, pulmonary hypertension and pulmonary edema. Associated pathophysiology include trauma, reperfusion injury, and abnormal inducible to constitutive nitric oxide ratios. As with premature foals, ultrasound and radiographs reveal diffuse lung lesions. Equine Herpes I foals have ARDS-like pathology and are often born bright, alert but weakened without signs of respiratory distress. However, a rapid decline in respiratory function usually occurs within 24 hours of birth, often with an acute death following shortly thereafter. This scenario is a profound feature of EHV I infections and diagnostics would include a rapid FA (fluorescent antibody) test (no commercial test available: can be performed by university or state diagnostic lab) of postmortem tissues to alert affected farms to the Herpes infection which may be contagious to other foaling mares.

Pneumonia in the foals is a frequent clinical compromise and in the neonate represents consequences of systemic insults, aspiration, immature immunological resistance, and decreased mucociliary clearance. Diagnostics include the clinical signs, ultrasound with focal areas of lung consolidation, and radiographs with “patchy” areas of densities. Infections tend to be “mixed” and neonatal foals are most often treated with a wide spectrum of antibiotics without the use of a bacterial culture. Fungal infections may be opportunistic and non-responsive patients are often treated with oral or systemic antifungal medications as precautionary. Ancillary medications may include the use of bronchodilators, diuretics, anti-inflammatory medications, nasal oxygen insufflation, and nursing care including coupage and mucus suction in severe cases. The use of a

mechanical ventilator is rarely justified in infectious pneumonia and can further negatively affect the patient by cardiac compromise, barotrauma, and focal areas of the shunting of blood adding to the mismatching of ventilation and perfusion. While pneumonia is comparatively treated favorably in older foals and adults, the prognosis in declining lung function in neonates is usually grave.

Pleuropneumonia occurs infrequently in neonatal foals and when present is secondary to an infectious process. Foals may be dyspneic and ultrasound of the chest reveals intrathoracic fluid accumulation, often with fibrin, and associated areas of lung consolidation with focal lung lesions consistent with pneumonia. Treatment consists of fluid removal best performed by the use of an indwelling intrathoracic drain(s), antibiotics and supportive care including fluids, diuretics, and adjunct medications indicated for the treatment of pneumonia. If a rapid clinical improvement is noted with fluid removal, the prognosis for survival improves dramatically and a future respiratory performance limitation due to pleuropneumonia is not routinely known to occur.

Fractured ribs in foals should not be considered to be uncommon but are anticipated more frequently in large foals and dystocic deliveries. However, smaller foals should not be excluded from the complaint of chest trauma during parturition. Diagnosis consists of manual palpation, the presence of crepitus, asymmetrical sternal edema, reluctance to rise unassisted and the foal may grunt during ambulation. Ultrasound examination is strategically superior to thoracic radiographs as a diagnostic procedure although ultrasound diagnosis is a more learned skill. Treatment for non-complicated patients consists primarily of stall confinement for the first 2-3 weeks of life. Complications of fractured ribs include pulmonary contusion and laceration, hemothorax, pericardial and cardiac lacerations, and diaphragmatic hernia. The location of rib fractures are pivotal to the degree of compromise and multiple fractures with complete displacement will often present with a flail chest whereas the thoracic wall moves opposite the phase of inspiration or expiration. Severely compromised foals should be treated with nasal oxygen, naso-gastric feeding, sedation and placed recumbent with the fractured rib side “downward” for 2-3 days to allow hematoma formation to occur as a cushion protecting vital organs. This nursing management is followed by cautious handling without chest contact and stall ambulation during the period of callous formation. The mares can be turned out for exercise during this period of foal confinement. Foals subject to surgical intervention will have flail chest and life-threatening fractures over the heart, the presence of hemopericardium/hemothorax, and lacerations of the diaphragm. The prognosis in these patients is guarded although surgical repair is become more refined with increased frequency of survival.

Miscellaneous lesions of the chest and respiratory system usually involves misfortune trauma. Kicks and bites, either accidental or by foal rejection, can involve either the upper airways, trachea or thoracic wall. In most cases the traumatic incident has been observed while in others, contusions and abrasions of the skin may be noticeable. Treatment is usually symptomatic with changes in management if appropriate, including the use of a nurse or foster mare.

In summary, respiratory insults to the neonatal foal should always be considered to be significant in respect to prognosis since the neonatal foal is subject to more complex and progressive disease of the airways not encountered routinely in older, more mature patients. Diagnostics tools comprise a stethoscope, endoscope, ultrasound, radiography and laboratory support. Clinical services can entail oxygen support, the administration of appropriate medications, nursing services and surgical intervention when indicated.

References:

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