Proceedings of the 8th International Symposium on Canine and Feline Reproduction
ISCFR

June 22-25, 2016
Paris, France

In a joint meeting with the XIX EVSSAR Congress

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Evaluation of respiratory function from birth to 24 hours of life in newborn puppies delivered by vaginal eutocia and elective cesarean section


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One of the biggest challenges the newborn has to overcome at birth is to make a fast transition from fluid-filled lungs to lungs filled with air. In human medicine, respiratory morbidity as a result of failure to clear fetal lung fluid is not uncommon, and can be particularly problematic in some infants delivered by elective cesarean section without being exposed to labor\(^1\). In this context, this study aimed to compare the respiratory function during the initial 24 hours of life of newborn puppies delivered vaginally or by elective cesarean section. Neonates of distinct breeds and weights were allocated into 2 groups: vaginal eutocia - EUT (n = 9) and elective cesarean section - CS (n = 8). Immediately after birth, neonatal airways were cleared and neonatal physical examination was performed by the Apgar score (0-10; adapted for canine neonates) and rectal temperature at 0, 5, 60 minutes after birth. Heart rate, respiratory rate and rectal temperature were also evaluated at 12 and 24 hours after birth. Venous blood gas evaluation (pH, pO\(_2\), pCO\(_2\) and SO\(_2\)) and lactataemia were attained immediately after birth and 1, 12 and 24 hours later. Thoracic X-rays were performed at 5 minutes of life, 12 and 24 hours after birth. The interactions between groups and time were estimated by ANOVA, and the effect of groups was analyzed using the Student t test or Wilcoxon (p≤0.05). CS puppies showed lower vitality, with Apgar score significantly lower (5.8±0.5) than EUT group (8.3±0.3). At 60 minutes, all newborns had a satisfactory Apgar score (8.6±4.1). Hypothermia was present at birth in CS group (33.3±0.3°C) and at 5 minutes in EUT puppies (34.5±0.3°C) and persisted until 60 minutes in both groups. CS group had significantly lower SO\(_2\) (19.5%±1.2), pO\(_2\) (14.3 mmHg±0.8) and pH (7.2±0.02), but had higher pCO\(_2\) (50.4 mmHg±2.5) compared to EUT group (24.2%±1; 17.5 mmHg±0.5; 7.3±0.01; 39.5 mmHg±0.8, respectively). These findings indicate a more intense hypoxemia in CS groups, as a consequence of the cardiopulmonary depression caused by anesthetic agents or the impairment process of pulmonary clearance. At birth, EUT group had significantly higher respiratory rate (50.2 mpm±4.5) and lactate value (10 mmol/L±1) than CS puppies (41.5 mpm±5.4; 6.4 mmol/L±0.8, respectively). After 60 minutes, EUT group showed a decrease in respiratory rate (41.5 mpm±5.4) and lactate concentration (4.1 mmol/L±0.5) with lower lactate values than CS (5.9 mmol/L±1.2). The combination of physiological hypoxia during birth and the initial efforts for filling the pulmonary alveoli with oxygen resulted in anaerobiosis, with the development of lactic acidosis \(^2\). Radiographic findings revealed a significant difference (p=0.04) between groups, as a mild to moderate diffuse opacification of pulmonary parenchyma was noted in CS puppies, regardless of the moment of evaluation, demonstrating decreased lung fluid reabsorption. In conclusion, all newborn puppies had tissue hypoxia at birth, hypothermia at 5 and 60 minutes and a satisfactory Apgar score at one hour of life. However, cesarean section newborns required a longer time to perform lung fluid clearance, compromising initial respiratory function.