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Comparative Study for Neonatal Outcome and Umbilical Cord Blood Gas Parameters in Balanced and Inhalant Anesthesia for Elective Cesarean Section in Dogs

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Abstract : The goal of the cesarean section (CS) is the delivery of healthy, vigorous pups with the provision of surgical plane anesthesia, appropriate analgesia, and rapid recovery of the dam. In human medicine, spinal or epidural anesthesia is preferred for a cesarean section as associated with a lower risk of neonatal asphyxia and the need for resuscitation. Nevertheless, the specificity of veterinary patients makes the application of regional anesthesia as a sole technique impractical, thus to obtain patient compliance the general anesthesia is required. This study aimed to compare the influence of balanced (inhalant with epidural) and inhalant anesthesia on neonatal umbilical cord blood gas (UCBG) parameters and vitality (modified Apgar scoring). The bitches (31) undergoing elective CS were enrolled in this study. All females received a single dose of 0.2 mg/kg s.c. Meloxicam. Females were randomly assigned into two groups: Gr I (Isoflurane, n=16) and Gr IE (Isoflurane plus Epidural, n=15). Anesthesia was induced with propofol at 4-6 mg/kg to effect, and maintained with isoflurane in oxygen; in IE group epidural anesthesia was also done using lidocaine (3-4 mg/kg) into the lumbosacral space. CSs were performed using a standard mid-line approach. Directly after the puppy extraction, the umbilical cord was double clamped before the placenta detachment. The vessels were gently stretched between forceps to allow blood sampling. At least 100 mcl of mixed umbilical cord blood was collected into a heparinized syringe for further analysis. The modified Apgar scoring system (AS) was used to objectively score neonatal health and vitality immediately after birth (before first aid or neonatal care was instituted), at 5 and 20 min after birth. The neonates were scored as normal (AS 7-10), weak (AS 4-6), or critical (AS 0-3). During surgery, the IE group required a lower isoflurane concentration compared to the females in group I (MAC 1.05±0.2 and 1.4±0.13, respectively, $p<0.01$). All investigated UCBG parameters were not statistically different between groups. All pups had mild acidosis (pH 7.21±0.08 and 7.21±0.09 in Gr I and IE, respectively) with moderately elevated pCO2 (Gr I 57.18±11.48, Gr IE 58.74±15.07), HCO3- on the lower border (Gr I 22.58±3.24, Gr IE 22.83±3.6), lowered BE (Gr I -6.1±3.57, Gr IE -5.6±4.19) and mildly elevated level of lactates (Gr I 2.58±1.48, Gr IE2.53±1.03). The glucose levels were above the reference limits in both groups of puppies (74.50±25.32 in Gr I, 79.50±29.73 in Gr IE). The initial Apgar score results were similar in I and IE groups. However, the subsequent measurements of AS revealed significant differences between both groups. Puppies from the IE group received better AS scores at 5 and 20 min compared to the I group (6.86±2.23 and 8.06±2.06 vs 5.11±2.40 and 7.83±2.05, respectively). The obtained results demonstrated that administration of epidural anesthesia reduced the requirement for isoflurane in dams undergoing cesarean section and did not affect the neonatal umbilical blood gas results. Moreover, newborns from the epidural anesthesia group were scored significantly higher in AS at 5 and 20 min, indicating their better vitality and quicker improvement post-surgery.

Keywords : apgar scoring, balanced anesthesia, cesarean section, umbilical blood gas
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