FOAL SEDATION, ANALGESIA AND ANESTHESIA

Carolyn L. Kerr, DVM, DVSc, PhD, DACVA
Ontario Veterinary College, Guelph, Ontario, Canada

Key Points:

1. Benzodiazepines and α-2 agonists are recommended for use as sedatives in the foal.
2. Systemic administration of the opioid analgesic butorphanol is suitable for soft-tissue associated pain while morphine is an appropriate analgesic for orthopedic injuries.
3. In the foal less than 2 weeks of age, diazepam and ketamine provide a smooth induction of anesthesia with less cardiovascular alterations than a xylazine and ketamine combination in the foal.
4. Epidural anesthesia and analgesia can facilitate therapeutic interventions and improve pain management in the foal.

Drugs most commonly recommended for sedation of the neonatal foal include the benzodiazepine diazepam (0.2 mg/kg IV) or the α-2 agonist xylazine (0.3-0.5 mg/kg IV). Although the cardiopulmonary effects of a benzodiazepine versus an α-2 agonist administered alone has not been directly compared in the foal, in adult horses the benzodiazepines have been shown to have minimal adverse cardiovascular effects while the α-2 agonists have been shown to induce moderate to marked changes in heart rate, blood pressure and cardiac output in both adult horses and foals.[1,2,3] In foals less than 2 weeks of age, diazepam generally provides excellent sedation and muscle relaxation and based on its cardiopulmonary effects, it is a logical first choice when a sedative is required. In older healthy foals, xylazine is recommended as it provides more reliable sedation, however, a benzodiazepine may be a suitable option in a critically ill foal greater than 2 weeks of age.

Optimizing analgesia in the equine patient is always a challenge due in large part to the side effects of the available analgesic agents. The inclusion of butorphanol (0.04 mg/kg) IV with either a benzodiazepine or an α-2 agonist improves the quality of analgesia and sedation of the latter agents with minimal adverse effects. In general, mu agonists are not routinely administered systemically for prolonged analgesia in the foal due to their gastrointestinal effects. The administration of butorphanol as a CRI in the adult horse is well tolerated and it is a reliable adjunct in foals when prolonged sedation is required.[4] As an alternative to systemic administration, the mu agonists such as morphine can be administered locally. In particular, morphine administered epidurally can provide prolonged analgesia for orthopedic injuries with minimal risk of systemic side effects.

In addition to sedation, foals may require general anesthesia in the first few weeks of life to facilitate diagnostic procedures or emergency surgical interventions. Unfortunately, the anesthetic related mortality rate is higher in this age group, compared with that reported in adult horses.[5] Induction and maintenance of anesthesia have historically been performed with an inhalant anesthetic alone in the foal due to the perception that it offered the greatest safety as the plane of anesthesia could be changed rapidly and recovery from anesthesia was independent of hepatic and renal maturity. The

superiority of using an inhalant anesthetic alone has been brought into question with the detection of a higher mortality rate with this technique versus techniques that use multiple agents. A balanced anesthetic regimen that uses injectable and inhalant agents may therefore offer a safer alternative. In the foal less than 2 weeks of age, the induction of anesthesia with diazepam combined with ketamine compared to xylazine with ketamine is as effective and associated with less cardiopulmonary depression.[6] This technique offers a viable alternative to inhalant-based induction techniques. Inhalant anesthetics however have advantages over injectables for the maintenance of anesthesia as they are easy to administer and are associated with a rapid recovery. When necessary however, injectable agent combinations of sedative/analgesics/anesthetics such as dexmedetomidine, butorphanol and propofol are feasible alternatives. Irrespective of the drug regime used, oxygen supplementation and the ability to provide ventilatory support if needed should be included in the anesthetic management.

Epidural injection of local anesthetic drugs can produce either a cranial or a caudal epidural anesthetic block. The type of block produced is based on the cranial extent of the regional block, not necessarily the location in which the epidural injection is performed. Specifically, caudal epidural anesthesia produces anesthesia of the tail and perineum while cranial epidural anesthesia also produces anesthesia of the hind-limbs and caudal abdomen. Cranial epidural anesthesia can be a viable option over general anesthesia to produce anesthesia of the hind-limbs and caudal abdomen in the neonatal foal as hind-limb paralysis and recumbency can be easily managed, unlike in the adult horse. Epidural analgesia and cranial or caudal epidural anesthesia are generally produced in the equine with the delivery of drugs into the epidural space at the first intercoccygeal space.

References:

1. Muir WW, Sams RA, Huffman RH, Noonan JS. Pharmacodynamic and pharmacokinetic properties of diazepam in horses. *Am J Vet Res* 1982; 43: 1756-1762
2. Carter SW, Robertson SA, Steel CJ, Jourdenais DA. Cardiopulmonary effects of xylazine sedation in the foal. *Equine Vet J* 1990; 22: 384-388
3. Wagner AE, Muir WW III, Hinchcliff KW. Cardiovascular effects of xylazine and detomidine in horses. *Am J Vet Res* 1991; 52: 651-657
4. Sellon DC, Roberts MC, Blikslager AT et al. Effects of a continuous rate infusion of butorphanol on physiologic and outcome variables in horses after celiotomy. *J Vet Intern Med* 2004; 18: 555-563
5. Johnston GM, Eastment JK, Wood JLN, et al. The confidential enquiry into perioperative equine fatalities (CEPEF): mortality results of Phase 1 and 2. *Vet Anaesth Analg* 2002; 29: 159-170.
6. Kerr CL, Boure LP, Pearce SG, McDonell WN. Cardiopulmonary effects of diazepam-ketamine-isoflurane or xylazine-ketamine-isoflurane during abdominal surgery in foals. *Am J Vet Res* 2009; 70: 574-580