

# **Pain Management In Horses: New & Rediscovered Techniques**

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Effective peri-operative pain management is justified on ethical, legal, medical and practical grounds. In large “fight-or-flight” animals like horses, the latter are particularly important. Medical reasons may be more important in foals. Pre-operative analgesia may be required to facilitate examination and preparation of the animal. Intra-operative analgesia lowers the dose of anaesthetic required to permit surgery and so preserves cardiopulmonary function (providing the analgesic depresses cardiopulmonary function less than the anaesthetic). Intra-operative analgesia prevents the arousal and reflex limb movement that intense noxious stimulation can evoke. Post-operative analgesia is important, as it unequivocally shortens the duration and improves the quality of recovery.

Over recent years there have been few major developments in the provision of perioperative analgesia beyond a greater acceptance of its desirability, and the concepts of pre-emptive analgesia (PEA) and polymodal pain therapy (PMPT) – none of which are unique to equine anaesthesia. Much work has been performed injecting established analgesic drugs in different anatomical sites, at different doses and in different combinations with other drugs. The benefits of this have often been difficult to establish because rarely are these “novel” techniques challenged by the conditions of “real” surgery. Basic research continues into the pharmacology of analgesics in horses, and their interaction with anaesthetics, but the results are often at odds with what is encountered in the clinical situation. This may arise because a) experimental animals rarely experience the same noxious stimulation as those undergoing “real” surgery and b) experimental animals may not receive the same anaesthetics as their conspecifics facing surgery in practice. It is possible that major interactions between the analgesic under test and the anaesthetics used account for some of these discrepancies.

### **Local Analgesia: Techniques**

Several complex local anaesthetic techniques have been developed and detailed in the literature over the last few years, but do not appear to have earned clinical acceptance. Most aim to provide conditions for laparotomy in the standing horses and include: paravertebral thoracolumbar anaesthesia; segmental dorsolumbar anaesthesia; and segmental thoracolumbar

subarachnoid anaesthesia. All are technically difficult to perform and the latter two require specialized catheters.

Two modifications of the well-established caudal (coccygeal) epidural technique have been developed: continuous coccygeal epidural anaesthesia and continuous coccygeal subarachnoid anaesthesia. The latter is technically straightforward to perform although a specialized catheter is still required.

### **Local Analgesia: Drugs**

Many studies have investigated the effects of new local anaesthetics,  $\alpha_2$  agonists, opioids and ketamine in the extradural (and subarachnoid) space. However, systemic absorption of drugs to produce sedation and ataxia, slow onset, imperfect analgesia and other disadvantages have limited their clinical application. Of particular concern is that the means of testing analgesia, electrical stimulation, or needle prick, yield different results and do not indicate whether the techniques allow surgery to be performed or not.

Epidural xylazine ( $0.17 \text{ mg kg}^{-1}$  diluted in sterile water to a volume of 1 ml  $100 \text{ kg}^{-1}$ ) produces analgesia but the onset time was 32 minutes). Mixing xylazine with lidocaine ( $0.22 \text{ mg kg}^{-1}$ ) shortens the onset time and prolongs analgesia. As an adjunct to general anaesthesia with halothane, epidural xylazine  $0.15 \text{ mg kg}^{-1}$  diluted in  $0.15 \text{ ml kg}^{-1}$  saline does not appear to confer any advantages.

Detomidine  $60 \mu\text{g kg}^{-1}$  produced analgesia from S1 to coccyx in addition to marked sedation, ataxia and cardiopulmonary depression (though horses did not fall over). Atipamezole  $120 \mu\text{g kg}^{-1}$  IV antagonised all the analgesia, but only partly reversed sedation, ataxia and cardiopulmonary depression.

Xylazine versus detomidine Xylazine  $250 \mu\text{g kg}^{-1}$  expanded to 10 ml with saline and injected at Co1-Co2 was compared with detomidine  $60 \mu\text{g kg}^{-1}$ . Perineal analgesia was better and longer-acting after xylazine, There was less sedation and ataxia. Both drugs produced only minor cardiovascular effects.

Romifidine. A dose of  $0.08 \text{ mg kg}^{-1}$  failed to produce conditions for perineal surgery

Lignocaine / butorphanol. When butorphanol  $40 \mu\text{g kg}^{-1}$  is mixed with lignocaine  $0.25 \text{ mg kg}^{-1}$  there is a significant prolongation in both cutaneous and visceral analgesia without ant cardiopulmonary effects or ataxia. A bizarre gait – high stepping, with pointed hooves – was noted.

Morphine. Morphine  $100 \mu\text{g kg}^{-1}$  in 10 ml saline produces longer acting (18 hours) analgesia after a shorter onset (2.5 hours) than  $50 \mu\text{g kg}^{-1}$  when injected at Co1 - Co2. Dorsal branches of S1 - S5 and L1 - L6 were preferentially affected.

Ketamine. Three doses of ketamine 0.5, 1.0 and  $2.0 \text{ mg kg}^{-1}$  were injected into an extradural catheter placed 12 cms proximal to Co1-Co2. All doses produced similar degrees of analgesia of the tail, perineum and upper hind limb. The lower two doses lasted about 30 minutes,  $2.0 \text{ mg kg}^{-1}$  lasted for 75 minutes. Some sedation was also seen at 15 - 30 minutes post injection. The technique had no cardiopulmonary effects.

Xylazine – ketamine. Xylazine ( $0.5 \text{ mg kg}^{-1}$ ) and ketamine ( $1 \text{ mg kg}^{-1}$ ) produced analgesia (pin prick) in 9 minutes which lasted up to 2 hours.

Ropivacaine 1% solution combined with 1:200,000 adrenaline and given to a volume of  $18 \mu\text{L kg}^{-1}$  placed at the first intercoccygeal site worked in 17 minutes and lasted 285 minutes. This compared favourably (similar onset, longer duration of action and less ataxia) than lignocaine.. In another study, using 0.5% solution, 8 mL  $450 \text{ kg}^{-1}$  injected at S5 – Co1 or the first intercoccygeal space produced variable analgesia extending from the coccyx to S4. Perineal analgesia began after 10 minutes and lasted for 196.

Pethidine A 5% pethidine solution injected at S5 – Co1 at a dose of  $0.8 \text{ mg kg}^{-1}$  produced profound analgesia to deep needle prick in 27 minutes which lasted 300 minutes, and to electrical stimulation in 12 minutes which lasted over 5 hours.

### **Sub-arachnoid Drugs**

Ketamine, 12 - 15 mg  $100 \text{ kg}^{-1}$  produced analgesia in 5 minutes and lasted 35 - 65 minutes from T17 - L3, allowing abdominal wall and visceral surgery in the standing horse.

## Intra-articular Drugs

Opioids. The identification of opioid receptors in the synovial tissue of the horse provides a basis for the administration of intra-articular opioids, for example, after arthroscopy. Morphine and buprenorphine have been tested for tissue sensitivity in horses where they do not cause deleterious effects and their efficacy has been recently established.

$\alpha_2$  agonists. Ten ml of xylazine injected into the joints of unconscious horses before arthroscopy in horses reduced the need for top-ups and smoothed, though slightly prolonged recovery from anaesthesia.

### Morphine

In a recent study one group of horses undergoing surgery received morphine at 100–170  $\mu\text{g kg}^{-1}$  while a second group did not. There were no differences in the incidence of adverse events between the two groups. Mean recovery scores were greater (indicating better recoveries) in morphine recipients undergoing all operations, but the differences were statistically insignificant. The incidence of post-operative complications, e.g. box-walking and colic were similar in each group. Morphine doses of 100–170  $\text{mg kg}^{-1}$  do not appear to increase the risk of problems when used to provide peri-operative analgesia in horses with romifidine, ketamine and halothane. Furthermore, morphine is less expensive than the more commonly used alternatives.

Previous statements regarding morphine (and other opioid use) in horses have tended to overstate the importance of side-effects. Recommended doses of opioid analgesics in horses vary widely because the effective dose depends on numerous factors. Dosing should follow 4 general rules: 1) the more severe the pain (or the greater the surgical insult), the greater the dose of opioid analgesic required, and the lower the risk of excitatory side-effects. 2) In pain-free horses, giving appropriate doses of  $\alpha_2$  agonists matched for duration of action eliminates the risk of excitation. Acepromazine reduces, but does not eliminate risk. 3) Whilst opioid analgesics are described in terms of duration of action, they should be given to effect, i.e., when the desired level of analgesia has waned below acceptable levels, and not "by the clock". 4) Clinical signs of under dose, i.e. pain, may mimic signs of over-dosage.