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Sedative selection, protocols and techniques for equine dentistry and standing surgery

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Sedation techniques for standing equine dentistry procedures

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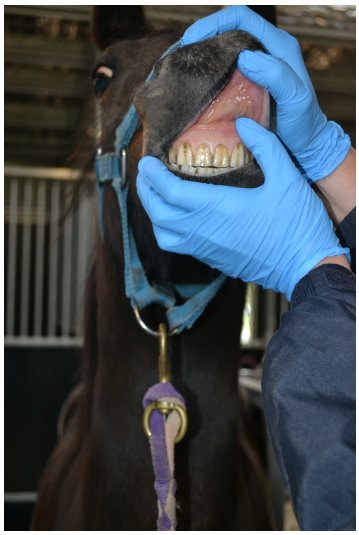
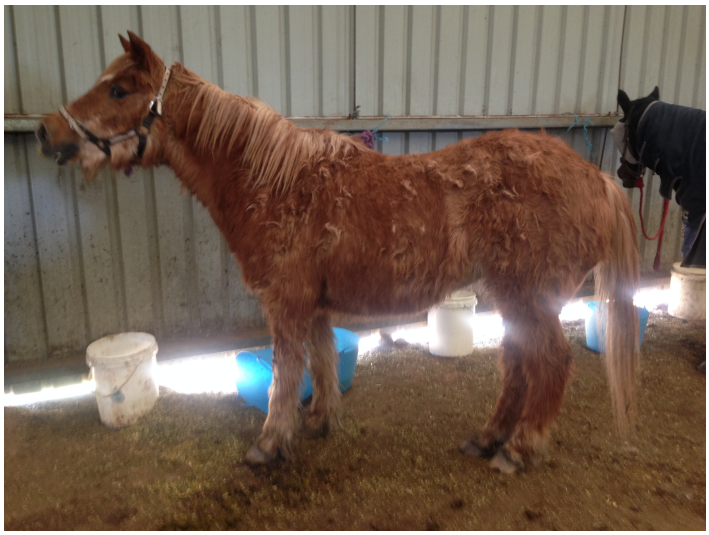
The goal of sedation for standing equine dentistry procedures is to provide chemical restraint, sedation, and analgesia so that oral procedures and surgeries can be performed safely while minimising discomfort to the patient. Procedures can range from a comprehensive oral examination, odontoplasty (including removal of sharp enamel points), treatment of periodontal disease, intra-oral exodontia to surgical exodontia, fracture repairs and orthodontic surgery. The safety and comfort of the patient, practitioner, and support staff are linked to the appropriate chemical restraint of the patient.[1] All patients undergo a physical examination and assessment of their signalment and temperament to allow accurate determination of drug choices and dosages.

Multimodal anaesthesia includes combining analgesics that act at different points along the pain pathway, through different mechanisms, allowing lower doses of each drug. This generally includes NSAIDS, opioids, α2 agonists, regional, and/or local nerve blocks.[2]

Environment

Ideally, the horse should be restrained in stocks with the use of a hanging dental halter





or headstand. Using staff or owners to balance the horse's head on their shoulder is both an occupational health and safety risk and uncomfortable, and is no longer acceptable in veterinary practice.

If stocks are unavailable, practitioners should choose an area free from obstacles and potential hazards, sheltered from sun, wind, or rain, and as quiet as possible. Even well-sedated horses may react unpredictably in high-stimulus environments. Sedation protocols are more effective and require lower total drug volumes when patients are calm and in a low-stress environment before sedation is administered.

Duration of procedure
Short procedures (e.g. oral examinations or performance floats): Often require 20–30 minutes of sedation. Bolus injections "off the needle," with top-ups as needed, are generally sufficient.

Longer or painful procedures: A constant rate infusion (CRI) provides steadier sedation and analgesia, improving safety and efficiency.

Anxiolytics
Acepromazine (ACP) is a phenothiazine sedative commonly used as a premedication before dental procedures. Its mechanism of action is by dopamine receptor blockade. It has a slow onset of action, and recommended dosage range is 0.02-0.1mg/kg IV. ACP reduces neutrophil degranulation (mild anti-inflammatory effect). It has no analgesic properties, so it is not part of pain management. While not a true anxiolytic, its mild sedation helps reduce anxiety and lowers additional sedation needs.

One potential disadvantage of ACP is hypotension due to vasodilation. Because of this, ACP should be used judiciously in stallions, geriatrics, debilitated or otherwise compromised patients (I recommend using a half dose or less for these patients). ACP has been linked to priapism in entire males, although evidence is anecdotal rather than scientific.

α2 adrenergic agonists
All of the drugs of this class exert their effects by way of stimulation of α_2 receptors and reduction of neurotransmitter release. The commonly available α2 adrenergic agonists are xylazine, detomidine, medetomidine, and romifidine.

Xylazine has a rapid onset and relatively short duration of action. Romifidine has less ataxia and a longer duration. Detomidine produces longer, deeper sedation than xylazine. Medetomidine is 30-40 times as potent as xylazine, and has a shorter duration than detomidine.

Common side effects of all a2-agonists include bradycardia, second-degree AV block, biphasic hypertension followed by hypotension, increased urine production, mild hyperglycemia, sweating, and reduced gastrointestinal motility. Xylazine produces more ataxia than romifidine

or detomidine; romifidine appears less sedating than xylazine or detomidine. Increased myometrial contractility and intrauterine pressure have been shown to occur with xylazine; therefore, it should not be used during the last trimester of pregnancy. Conversely, detomidine has been shown to reduce intrauterine pressure, and therefore, it represents the sedative of choice in pregnant mares at late stages of pregnancy.

Practitioners need to be aware of '*rompun rage*' or '*xyla-meanies*' as these drugs can reduce the threshold for aggression, with normally calm/nice horses being dangerously aggressive, even when appearing outwardly sedated.

Opioids

Opioids act at opioid receptors, producing variable degrees of analgesia and sedation. Morphine is a mu-receptor agonist, resulting in both analgesia and sedation. Butorphanol is a mu-antagonist (binds to the mu-receptor but without activation) and a kappa-agonist. Butorphanol provides good analgesia with less sedation and respiratory depression than morphine.[2]

A single intravenous bolus of butorphanol has a short duration of action, between 30 and 60 minutes. A loading dose of 0.02 mg/kg IV followed by an infusion rate of 0.024 mg/kg/h, will produce both sedative and analgesic effects, without causing behavioural changes.

A single dose of butorphanol (0.1 mg/kg, IV) in one study resulted in a significant increase in locomotor activity and ataxia (ie it makes them want to push or walk forward). The use of butorphanol has been associated with increased head shaking and twitching, so it is not ideal for procedures requiring the head to be static however when combined with a2-agonists, butorphanol produces a potent synergistic effect. Opioid-mediated excitement based on research conducted on non-painful horses at dosages higher than those used clinically. Butorphanol is a mu-antagonist (binds to the mu-receptor but without activity) and a kappa-agonist. It provides more analgesia with less sedation and respiratory depression as compared with morphine.

Butorphanol's analgesic effects are dose-related, with a wide margin of safety. The has a ceiling effect, so higher doses do not necessarily increase sedation or analgesia. It can also increase heart rate (though this varies between individuals).

Morphine at 0.1 to 0.2 mg/kg intravenously produces sedation and analgesia of longer duration than butorphanol. The effect lasts 4 to 6 hours. Methadone at 0.15 mg/kg intravenously produces a similar degree of sedation to morphine, CRI dosing has not been determined.

Buprenorphine has recently been studied in horses and appears to provide satisfactory analgesia for 8 to 12 hours at 0.005 to 0.01 mg/kg IV. It provides adequate analgesia in combination with a2-agonists for standing laparoscopy. The onset is slow with the peak effect at 45 to 60 minutes after bolus administration. Given the long duration of action of buprenorphine, no constant infusion for this agent has been investigated. Buprenorphine is a mu-receptor agonist opioid with a longer duration of effect than butorphanol.

Oral examination and performance float

Pre-medication with a low dose sedative and anxiolytic should be administered with a phenothiazine such as acepromazine. This has a slow onset of action and should be administered 15-20 mins prior to beginning the procedure either IM or IV. In general practice where it is time-constrictive to add an additional 20 minutes for the pre-med, acepromazine should be administered immediately after the clinical examination and before setup. Further sedation can then be administered just prior to the external head and oral examination. A popular choice is an α2-agonist such as detomidine or xylazine, often with the addition of an opioid such as butorphanol or methadone. If the patient is not in stocks, butorphanol should only be administered as a top up, rather than initial dose to minimise the side effect of horses wanting to walk or push forward.

Acepromazine 0.01-0.05 mg/kg IV Detomidine 0.01-0.02 mg/kg IV Butorphanol 0.01 - 0.02 mg/kg IV

For a typical patient of a 500kg thoroughbred the author's general guide is 1ml (10mg) ACP, 0.5 mls (5mg) detomidine, 0.5mls (5mg) butorphanol IV, with top-ups (if needed) of 0.4mls (4mg) detomidine, then an additional top up of 0.4mls (4mg) detomidine with 0.4mls (4mg) butorphanol. These drugs can be mixed in a single syringe for administration.

If the horse is excited, this increases to 1ml (10mg) ACP, 0.7mls (7mg) detomidine, 0.7mls (7mg) butorphanol IV for the initial dose. If stocks are not available, reduce to 1ml (10mg) ACP, 0.4mls (4mg) detomidine and 0.4mls (4mg) butorphanol IV.

In geriatrics, stallions and debilitated horses, reduce the dose of acepromazine to 0.5mls (5mg) or less.

An alternate protocol is the use of xylazine or romifidine:

Acepromazine 0.01-0.05 mg/kg IV (Xylazine 1.1 mg/kg IV **OR** Romifidine 0.04-0.120 mg/kg) Butorphanol 0.01-0.02mg/kg

Standing surgical procedures (longer than 40-60 mins)
The use of a constant rate infusion (CRI) has many benefits over repeated bolus dosing, including the ability to maintain steady sedation without repeated IV injections. Detomidine has greater potency than medetomidine and romifidine, lasts longer than the α2-agonist xylazine, and results in profound standing sedation and analgesia when combined with butorphanol.[3]

If surgery or painful procedures are performed, regional nerve blocks should also be administered. Practitioners are advised not to attempt surgery without adequate analgesia from nerve blocks. Similarly, NSAIDs should be given prior to any potentially painful procedure.

A 14G catheter is placed in the jugular vein (some prefer the cephalic) after skin preparation, then glued or sutured. The veterinarian can use a syringe pump or a 1-litre bag of IV fluids (e.g., Hartmann's or saline) with a giving set fed by gravity. Detomidine and butorphanol can be added, and dosage depends on flow rate. Patients must be given a loading dose before starting CRI. It is the author's preference to load a 1-litre bag with 50 mg (5 ml) detomidine and 50 mg (5 ml) butorphanol and administer IV to effect.

<u>Constant rate infusion example</u> Detomidine 50mg (5mls) Butorphanol 50mg (5mls) In 1 litre saline Administered IV to effect

Other options
Other drugs may be used to provide sedation and analgesia in dental patients. Examples include low-dose ketamine, fentanyl, gabapentin, morphine, buprenorphine, and lignocaine as a CRI. Reversal agents have mostly fallen out of favour, as they reverse ataxia but not cardiorespiratory effects. If a horse is difficult to sedate, practitioners should investigate potential underlying causes before reaching for unfamiliar medications.

Ketamine
Ketamine can be administered at sub-anaesthetic doses in standing horses for analgesia, particularly with inflammatory disease. The duration of a sub-anaesthetic bolus (0.1–0.5 mg/kg IV) is short (~30 minutes). At these doses, ketamine provides somatic analgesia and rapid-onset sedation.

A ketamine infusion may be useful in prolonged procedures when analgesia from α2-agonists or opioids is insufficient. Dose: 0.3–0.6 mg/kg/hr IV, with minimal side effects.

Lignocaine
Lignocaine can be administered systemically in horses to provide analgesia and sedation, along with anti-inflammatory, prokinetic, and anti-endotoxaemic effects. The mechanisms are not fully understood but may involve peripheral and central sodium channels. After a loading dose of 1–2 mg/kg IV over 5–10 minutes, lignocaine is infused at 0.025–0.05 mg/kg/min.

Benzodiazepines
Diazepam is an anxiolytic, sedative, and muscle relaxant. Its mechanism is binding GABA receptors and potentiating GABA's inhibitory effects.

Diazepam provides sedation and muscle relaxation, useful for horses that will not stop chewing or moving the tongue. The main disadvantage in adults is ataxia, less problematic if restrained in stocks. Dosage: 5–10 mg slow IV.

Midazolam is another benzodiazepine option. It is more potent and shorter-acting than diazepam.

Benzodiazepines cannot be mixed in the same syringe as other drugs (they precipitate) and will leach into plastic. They should be drawn up and administered immediately, not used in a CRI. Do not use in pregnant mares. Administer slow IV (rapid dosing can cause bradycardia or cardiac arrest). Provides ~15 minutes of stillness, most useful for keeping the tongue still.

Special considerations

1. *Geriatric horses* - reduce acepromazine dose, and consider NSAIDs before routine dentals. Be aware of the high incidence of EOTRH, which may present as resistance and head tossing when the speculum is in place.
2. *Horses that have excessive tongue movement* - give additional sedation if needed; if unsuccessful, add benzodiazepines (e.g., diazepam 5–10 mg) slow IV. Provides ~10–15 minutes of tongue stillness. Only administer if restrained in stocks due to risk of profound ataxia and possible recumbency
3. *Breeds* - Warmbloods and draft breeds generally require a lower dose on a mg/kg basis as compared to thoroughbreds.
4. *Donkeys* - usually require higher doses (50–100% more than horses). IM sedation is often preferable as thick skin can make IV access difficult, especially in unhandled or stressed donkeys.
5. *Anxious or painful horses* - often require higher drug doses (mg/kg). Be prepared to administer regional nerve blocks even for non-surgical procedures such as periodontal disease.
6. *Pregnant mares* - detomidine is the sedative of choice as it reduces intrauterine pressure (xylazine increases it). Avoid sedation or elective procedures in the first or last 6 weeks of gestation, when complications are most likely.
7. *Horses with cardiac disease* - avoid elective procedures in undiagnosed or uncompensated disease. In emergencies, afterload can be reduced with acepromazine, and low-dose xylazine (slow IV) is the sedative of choice. If decompensated, reverse sedation and administer frusemide.
8. *Horses that are uncomfortable/head toss/are 'naughty'* - EOTRH is a common cause of dental pain in horses >15 years. Take incisor radiographs before placing the speculum if there's a history of difficult sedation. Horses often resist oral exam with a mirror; instead, float teeth first, then examine. Start with caudal lower cheek teeth. When using motorised instruments, avoid frequent stopping. Horses may also become uncomfortable if needing to urinate; consider urinary catheterisation for long procedures.
9. *Horses that are needle-shy* - administer detomidine paste sublingually. Ideally desensitise on a day separate from dentistry. If not possible, many horses behave better if the owner is removed.

There is large individual variation in sedation response. Most practitioners select drugs they are familiar with. Be prepared to alter the sedation plan if the patient does not respond well to the initial protocol.

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