

Equine anaesthesia Consensus of the Jury – March 2007

Introduction

This document has been written to provide guidelines on anaesthesia for non-emergency surgery of healthy horses over 6 weeks old. It should be noted that these are guidelines only, and if, in exceptional circumstances, there are good reasons for deviation from them, alternative methods can be used. The risk of death or complications associated with anaesthesia in horses is much higher than in other species (1 in 100 horses dies within 7 days of anaesthesia compared with around 1 in 1000 dogs. Non fatal complications are more common). Any anaesthetic in any species carries a risk of death, as anaesthesia always depresses vital function to some extent. The causes of the increased risk in horses are not entirely understood, but appropriate preparation before anaesthesia should reduce them to the minimum for the species. The horse's anatomy and physiology lead to problems of hypoxaemia, hypercapnia and hypotension during anaesthesia. Its weight and temperament may cause problems in recovery. These potential problems must be taken into account in preparing for anaesthesia. For instance, the weight of the horse and its temperament cannot be changed, but appropriate management may help to limit the associated problems. A trained, experienced person should take responsibility for the anaesthesia.

The extent and complexity of the proposed procedure dictate whether it can be carried out in the field. Short and straightforward procedures such as routine castration can be carried out in the field, whereas longer, more complex and invasive procedures such as arthroscopy and abdominal surgery should, other than in very exceptional circumstances, only be carried out under the conditions of a fully equipped equine clinic.

The requirements and costs of field anaesthesia are different to those in the operating room. Field anaesthesia is only suitable for simple procedures expected to last no more than around 60 minutes. Field anaesthesia conditions range from anaesthesia out of doors on grass to the use of a stall, indoor riding arena or anaesthetic recovery box.

Under some circumstances it may be better to perform the surgery on a standing horse as long as adequate analgesia and restraint can be supplied.

Q1. How should we prepare for equine general anaesthesia?

Pre anaesthetic considerations

Before anaesthesia, history, including vaccination status and antiparasitic treatment of the horse should be obtained, and a thorough physical clinical examination carried out. Particular attention should be paid to the cardiovascular and respiratory systems, in order to identify any additional abnormalities which may affect the course of anaesthesia. If the clinical examination reveals abnormalities, these should be investigated further by techniques appropriate to the abnormality detected. The proposed anaesthetic protocol should be adjusted according to pre operative findings that may affect the course of anaesthesia.

Anaesthesia may cause acute cardiorespiratory failure, and at least minimal means of resuscitation must be available, even in the field.

Horses should be anaesthetized with an empty stomach: 7-12 hours without food is generally sufficient, but water should be freely available. The mouth should be empty of food material before anaesthesia, most easily ensured by carefully rinsing the mouth with water before induction. This is particularly important when the horse is to be intubated.

Shoes may be removed before anaesthesia; this may reduce injury to horse and personnel but is most commonly done to prevent damage to the recovery box floor.

Use of an intravenous (IV) catheter is essential. This ensures all drugs really are given IV, and that any further drugs may be given easily as soon as they are required. The jugular vein is most convenient and commonly used; both right and left sides and with the catheter pointing either against or with the blood flow are all acceptable.

Field anaesthesia

When contemplating field anaesthesia, an appropriate location should be chosen for induction of anaesthesia and the subsequent operation. Material for restraint of the recumbent horse should be available.

Since anaesthesia is likely to depress respiration, means of supporting ventilation is desirable. This is most easily supplied by an endotracheal tube and demand valve if available. However, for field anaesthesia it is not always necessary to place an endotracheal tube for short procedures, as the horse is generally able to maintain its airway when in lateral recumbency.

Anaesthesia in the clinic

Rooms suitable for induction, surgery and recovery must be available. An operating surface with appropriate padding must be used. Oxygen supply, appropriately sized endotracheal tubes and anaesthetic breathing systems, and a means of supplying intermittent positive pressure ventilation (IPPV) must be available. IPPV can be supplied manually using the reservoir bag or by a ventilator. For clinics undertaking long and complex surgery a ventilator is desirable.

All equipment must be cleaned and checked regularly, and monitoring devices calibrated as recommended by the manufacturer.

Premedication

Premedication is strongly advised. There is evidence that combinations including acepromazine (ACP) reduce the risk of death from cardiac arrest. A number of agents are routinely used, most commonly a combination of one or more of ACP, alpha2 agonists and opioids. The effect of premedication should be assessed before induction of anaesthesia. Analgesics, including non steroidal anti inflammatory drugs (NSAIDs), are most effective if given before surgery, either before or after induction of anaesthesia. Anticholinergics are not used routinely, but may be valuable to prevent vagal effects in some types of surgery. They are usually given after induction of anaesthesia.

Antibiotics may be required for surgery, but can interfere with the effect of sedative and anaesthetic drugs, can cause hypotension, and are best given well in advance of induction.

Q2. What should be considered during equine anaesthesia?

During anaesthesia, the aim must be to keep the horse's physiological function as near normal as possible. Abnormalities will be more likely to lead to problems if sustained.

Induction

Induction of anaesthesia is best performed in a well sedated horse. Common ways of restraining horses for induction range from free fall with a head rope to squeeze doors and tilt tables. Only people familiar with the process should handle the horse during induction, and attention to safety of all personnel is essential throughout anaesthesia.

Ketamine is most commonly used for induction, after suitable premedication as above, and generally combined with a muscle relaxant such as a benzodiazepine or guaiphenesin. Thiopental is also still used for induction, but is less suitable for repeated injections.

Maintenance

Field anaesthesia

Induction agents may provide sufficient duration of anaesthesia for the short procedures anticipated. Repeat injections of induction agents or infusion of drug combinations such as "triple drip" (alpha2 agent, ketamine, guaiphenesin) may be used to prolong anaesthesia if necessary.

Clinic anaesthesia

Inhalation anaesthesia is most commonly used and is easier to control than total intravenous anaesthesia (TIVA) for prolonged anaesthesia. TIVA is acceptable for procedures of up to 2 hours. Isoflurane is the most commonly used, but halothane is still acceptable while it is still available. Sevoflurane is becoming popular for horses.

Support during maintenance

Volatile anaesthetics cause cardiovascular (CV) depression, and some support is generally required. Inotropes such as dobutamine should be available to support the CV system. Anaesthesia always depresses respiration and supplemental oxygen should be given with both volatile agent anaesthesia and TIVA. IPPV may be needed to counteract respiratory depression and maintain smooth anaesthesia. IPPV is essential if neuromuscular blocking drugs are used.

The horse should be appropriately positioned on the padded table to minimize damage from abnormal posture.

It has become common practice to supplement inhalation anaesthesia with intravenous agents to reduce the volatile agent requirement. Infusions are generally preferred over bolus injections and various combinations of ketamine, lidocaine, morphine, benzodiazepines and alpha2 agents have all been used. Appropriate regional local anaesthetic and analgesic techniques are also valuable.

IV electrolyte solutions are commonly infused during anaesthesia to counteract haemodynamic changes and evaporation.

Waste anaesthetic gases should be removed from the operating room as they may be harmful to personnel.

Monitoring

A written record of the whole process of preoperative examination, premedication and anaesthesia must be kept, even if this is minimal under field conditions.

The wellbeing of the animal under anaesthesia must be assessed throughout the procedure wherever it takes place. Even in the field, this is undoubtedly best done with a knowledgeable assistant concentrating on monitoring anaesthesia; when only the surgeon is present, effort must still be made to assess the wellbeing of the anaesthetized animal.

Clinical monitoring is sufficient for field anaesthesia: the pulse should be palpated, chest movement observed, a clear airway confirmed and mucous membrane colour assessed in addition to confirming the adequacy of anaesthesia. In extreme climates, body temperature is best measured; this is easily accomplished with a thermistor and digital display used in the rectum or pharynx.

In the clinic, for longer anaesthesia and complex surgery, some additional monitoring equipment is highly advisable. Anaesthesia under these circumstances must be supplied and monitored by an appropriately experienced individual.

The minimum monitoring that should be expected in an equine clinic, particularly with volatile agents, is arterial blood pressure; CV depression is the most serious life threatening aspect of anaesthesia in horses. Arterial blood pressure is easily measured in horses by direct catheterization of a superficial artery (such as facial, transverse facial or metatarsal) which is connected to an electronic or aneroid manometer level with the heart. It is common practice to aim to keep the mean arterial blood pressure at or above 70 mmHg. This may usually be achieved with inotropes, by preventing bradycardia and by reducing the volatile agent concentration where possible; blood flow will not be improved by vasoconstriction.

Capnography supplies valuable information about adequacy of respiration and enables rational decisions about whether to ventilate and to assess the effect of IPPV. It also helps to assess that the breathing circuit functions normally, and indirectly helps to assess cardiovascular function. Capnographs often include facility to measure oxygen and volatile anaesthetics. These provide valuable additional information.

The ECG provides information about cardiac electrical activity but not whether cardiac output is sufficient. It is the only way to characterise dysrhythmias accurately.

Arterial blood gas tensions and pH provide further information about the wellbeing of the anaesthetised horse, and it is now quite feasible to measure these with modern, handheld affordable equipment.

Pulse oximetry is of value in assessing peripheral pulse and oxygenation. If the animal is breathing a high oxygen fraction it does not necessarily provide information about adequacy of the respiration to eliminate carbon dioxide tension.

Q3. How should the post operative period be managed?

This document is concerned with anaesthesia, hence post operative here is considered restricted to care of the horse during recovery from anaesthesia until it is standing back in its stall.

The horse is a flight animal, likely to run from anything that distresses it, therefore may try to stand too soon or when disturbed, and damage itself and personnel. The aim for the recovery period is that the horse remains calm and does not injure itself or others. It is impossible to guarantee that no injury will occur, but some measures can be taken to reduce the likelihood.

In the field, the horse can be restrained in lateral recumbency until deemed ready to stand. Assistance on the tail and head may help if there is space for the handlers. The veterinarian should not leave the premises until the horse is standing.

In the clinic, more interventional control of the recovery period is possible, although again, this does not guarantee an uneventful recovery. As in the field, the horse can be restrained in lateral recumbency physically and with the use of sedatives, usually alpha 2 agents. Assisted recovery with head and tail ropes may be used but requires both appropriate equipment and well experienced handlers. More sophisticated systems such as those using a pool or slings are not commonly available. The decision whether to assist recovery and what technique is used will depend on the type and duration of surgery, the temperament of the horse and personal preference. Whatever method is used, a recovering horse must not be left unattended until it is standing unaided.

A horse recovering from anaesthesia will be more calm if the environment is quiet, warm and peaceful, the airway is clear, there is no pain, and the bladder is not full.

A clear airway is most easily maintained with a naso-pharyngeal or endotracheal tube left in place until the horse stands. However, this may itself damage the airway, and is not universally used. Vasoconstrictive nasal spray helps to reduce nasal mucosal swelling and nasal airway maintenance. Whether a tube is used or not, scrupulous attention to maintaining a clear airway is essential until the horse is returned to its stall. Oxygen is commonly administered into the pharynx or tube, but at least 15 L/min are required.

Adequate analgesia should be provided in the recovery period, and NSAIDs, opioids and local anaesthetic techniques are all appropriate. Regional nerve blocks high up the limb may interfere with the horse's ability to stand and are probably best restricted to below stifle and elbow.

For surgery over one hour catheterization of the urethra will ensure an empty bladder.

Self inflicted injuries may be reduced by the use of limb boots and bandages and head hoods, but some horses will not tolerate these. Soft padding may improve the quality of recovery and effort to keep the floor dry and non slippery is beneficial.

The horse should generally be allowed to recover with an operated limb uppermost, particularly if this has been the position during surgery. Opinion is divided on the best position for the horses whose operated limb was underneath. Turning the horse at the end of anaesthesia is likely to lead to poorer oxygenation during recovery.

Q4. How should we communicate with clients about equine anaesthesia?

The owner should be made aware of the risk of anaesthesia in horses. He/she should also be made aware of the proposed level of care available, and that short procedures are acceptable in the field, but means of monitoring and interventional resuscitation are limited. If the risks of what is offered are considered unacceptable, an alternative should be sought.

If preoperative assessment reveals some abnormality that may affect the course of anaesthesia, the owner should be made aware of this and a mutually acceptable change of plan agreed.

The owner should sign to demonstrate that he/she understands the risk of anaesthesia and the proposed procedure in his/her horse.

Informed consent for the use of drugs without Market Authorization for the horse nor in Annex II (Council Regulation (EEC) 2337/90) should be obtained. For horses intended for human consumption, most anaesthetic drugs without Market Authorization and not in Annex II are now covered by the "positive list" (Commission Regulation (EC)1950/2006) and are allowed. An exception, lidocaine, commonly used intravenously in equine anaesthesia, is still allowed for horses not intended for human consumption.

If the horse is insured, the owner must be responsible for informing the insurance company that the horse is to be anaesthetized, and comply with any requirement of the insurance company.

When the horse returns to the owner's care after recovery, he/she should be made aware of any potential complications and special treatment or observation required.