Proceedings of the 12th International Congress of the World Equine Veterinary Association WEVA

November 2 - 5, 2011
Hyderabad, India

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The real tricks and most useful TIVA tips in general anesthesia under ‘field’ conditions

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Indications for field anaesthesia are distal palmar annular ligament desmotomy, wound suturing or stitch removal, light cast change or removal, castration, tumor excision, umbilical hernia closure, etc, and the subjects are usually healthy horses.

General considerations
- Remember that you are responsible for the safety of the horse and the personnel around the horse.
- Use adjunctive local anaesthesia to improve the quality of general anaesthesia (e.g. ulnar n. block in PAL desmotomy)
- Work with persons who are familiar with horse handling and anaesthesia techniques.
- Oxygen supply, endotracheal tube, ventilation device (e.g. demand valve), drugs for cardio-respiratory resuscitation should be readily prepared when starting GA in equine practice.

Pre-anaesthetic evaluation of the horse
The anaesthesiologist should assess the risk of anaesthesia from the history and the clinical examination. Vaccination status, the use of the horse, feeding, previous anaesthesia, allergies (Penicillin), health problems in the past, conditions of the present surgical intervention should be cleared. A short clinical examination should be carried out focusing on the cardiovascular and respiratory systems and the weight should be evaluated. Field anaesthesia patients are usually elective cases, so food but not water can be withheld for 6-8 hrs to improve respiratory function. A large (12G or 14G) indwelling intravenous catheter should be placed and secured in the jugular vein. The surgery site should be clipped before induction to spare anaesthesia time.

Pre-anaesthetic medication
Antibiotics and NSAID can be administered before anaesthesia. Crystal penicillin and TMP-S can cause hypotension and bradyarrhythmias, therefore they should be given at least 30 mins before induction and not at the same time as the alpha2-agonists, which are the most commonly used sedatives. In our clinic, we use 1,1 mg/kg xylazine or 0,02 mg/kg detomidine IV to get a heavily sedated horse. For better analgesia we routinely give butorphanol (0.02 mg/kg IV) after alpha2-agonist.

Induction
5-10 mins after administration of sedatives we give ketamine (2,2 mg/kg IV +20-30%). Its duration of action is 10-20 mins, it maintains adequate cardiovascular function and cranial nerve reflexes (laryngeal reflex, palpebral reflex, ear and lip twitching). To improve muscle
relaxation, we include benzodiazepine into our protocol (diazepam 0.05 mg/kg IV)

**Maintenance**
- Ketamine provides good analgesia and it can be used to maintain anaesthesia, but prolonged administration of it can cause prolonged recovery time and make the quality of recovery worse. Top up every 10-15 mins with 1/3-1/2 of the induction dose of ketamine and alpha2-agonist. IV injection takes 1-2 mins to act, so when signs of lighter anaesthesia start, it may be too late and the horse may move before the onset of the effect. The horse may appear to be 'light' because the cranial nerve reflexes still remain. IV agents are cumulative, so increase your intervals after 3rd top up. Benzodiazepine also can be added at 0.025 mg/kg every 30 mins.
- Thiopental can be used as a fast-acting intravenous drug to induce (10 mg/kg iv.) or prolong (0.5-2 mg/kg) anaesthesia when the horse suddenly starts moving or arouse. Its duration is 10-15 mins, it is strong cardiopulmonary depressant; can cause transient apnoe, has good muscle relaxation, so as a bolus injection could be used to deepen the plane of anaesthesia swiftly. Avoid more than 30 mg/kg of total dose.
- Triple drip given in CRI:
  - GGE 5% (50 mg/ml with glucose) + xylazine (0.5mg/ml) + ketamine (2 mg/ml) i.e. 500 ml bottle 5% GGE add 250 mg xylazine + 1000 mg ketamine, infusion rate: 2-3 ml/kg/h.
  - GGE 5% (50 mg/ml with glucose) + detomidine (0.02mg/ml) + ketamine (2mg/ml) i.e. 500 ml bottle 5%GGE add 10 mg detomidine + 1000 mg ketamine, infusion rate: 1-2 ml/kg/h.

TIVA can be continued no longer than 90 mins due to the accumulation of the drugs, hypoxemia and prolonged or poor quality of the recovery. Visual and auditory stimuli should be reduced, so that infusion rates also can be lowered. Quiet and tepid environment, appropriate padding and positioning are necessary during the whole time of anaesthesia and recovery.

Monitoring anaesthetic depth can be difficult, because the blinking reflex and ear movement usually preserved and nystagmus can be present if ketamine has been used. Heart rate (HR) and respiratory rate (RR) are the best indicators of a lightening plane of anaesthesia, however, ketamine can change the respiratory pattern and cause periodic breathing. Check CRT and mucous membrane colour, HR and RR at least every 5-10 minutes.

**Recovery**
Assisted recovery is recommended. Restraining the head prevents early attempts to rise. Once the horse is judged to be awake enough, it should be allowed to stand up.

**References**