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RESEARCH ARTICLE

TOTAL INTRAVENOUS ANAESTHESIA WITH PROPOFOL AND KETAMINE IN DOGS

Saikia B[1]., Sarma K.K[2]., Kalita D[3]., Sarmah B.K[3]., Phukan A[2] and Goswami S[2]

Department of Veterinary Surgery & Radiology College of Veterinary Science,
AAU, Khanapara, Guwahati-781022, Assam

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ABSTRACT

Inhalation anaesthesia is routinely used for maintenance of anaesthesia in dogs. Sophisticated anaesthetic machine is prerequisite to administer inhalant anaesthetic. So, the non –availability of anaesthetic machine in the field makes its use practically unfeasible for the field veterinarians. Total intravenous anesthesia (TIVA) can provide a valuable alternative to this method, whereby several different drugs or drug combinations and different means of administration can be used.

INTRODUCTION

Surgical management of canine patients considered to be painful & produce an inflammatory response always necessitate an ideal anaesthetic, which produces sleep, amnesia, analgesia and muscle relaxation to facilitate well-being of the surgical patient (Slingsby and Waterman-Pearson, 2000). Inability of a sole agent to achive aforementioned characteristics, a combination of drugs is used, which is reffered to as balanced (Thurmon and short, 2007).

Till recently, inhalation agents have remained the routine choice for maintenance of anaesthesia. One of the principal requirements is the availability of sophisticated delivery system for gaseous and volatile anaesthetic, which allows the anaesthetists to have a fine degree of control on the concentration administered to the patient. In spite of all these advantages, major limitation of inhalation anaesthesia are it require the use of a cumbersome and costly anaesthetic machine, including a suitable breathing system and vaporizer (Matthews, 2007). Another of the major disadvantages when using volatile anaesthetics is the exposure of operating-room personnel to the pollution in the ambient air. Replacing mask induction for induction of the anaesthesia by adapted intravenous agents reduces the occupational exposure of anaesthesiologists to anaesthetic gases drastically (Hasei *et al*., 2003), since the operating room air is contaminated by vaporizer filling, by leaks in the patient breathing circuit and by the spillage of liquid agent (Steffey and Mama, 2007).

The non –availability of sophisticated anaesthetic machine and necessary equipment to administer inhalant anaesthetic in the field makes its use practically unfeasible for the field veterinarians. In field conditions intramuscular or intravenous anaesthesia is usually the method of choice, as it can be performed with limited facilities at hand in the animal hospital (Kumar *et al*.2014).

Total intravenous anaesthesia (TIVA) is a technique of general anaesthesia that uses agents given solely by the intravenous route, and in the absence of all inhalation agents (Campbell *et al*., 2001). The concept of total intravenous anaesthesia (TIVA) is simple. An i/v line is the only prerequisite, and everything needed for general anaesthesia is supplied through this line.

TIVA always involves the delivery of a bolus dose or a fast loading infusion to achieve an adequate blood concentration of the anaesthetic drug. Maintenance of anaesthesia can be obtained by administering intermittent boluses injection (IBI),

Corresponding author:* **Saikia B
Department of Veterinary Surgery & Radiology College of Veterinary Science, AAU, Khanapara, Guwahati-781022, Assam

by continuous rate infusion (CRI) or by target controlled infusion (TCI). The IBI of a drug may result in high peak plasma concentrations and excessive depth of anaesthesia and alternating with periods of inadequate anaesthesia (Musk *et al*., 2005). Both infusion techniques, on the other hand, aim at achieving a more stable plane of anaesthesia. When continuous infusion is used, the aesthetics can be administered as a continuous rate infusion (CRI), either with or without manual adjustment (variable rate infusion or VRI), or by using a volumetric infusion pump or a syringe driver (Kästner, 2007). Since drug effect is more closely related to blood concentration than to infusion rate, another and probably more accurate way of achieving TIVA is the so-called target-controlled infusion or TCI (van den Nieuwenhuyzen *et al*., 2000). This technique involves computer- controlled administration of the anaesthetic by means of an infusion pump. The result is approximate a stable plasma concentration of the drug, which can easily be adjusted in response to its clinical effects, more or less like the end tidal concentration of a volatile anaesthetic is adjusted.

Premedication

An appropriate selection of premedication drugs can significantly improve intraoperative cardiovascular stability, perioperative analgesia and the quality of recovery. Cardiovascular stability is mainly improved by premedication since the quantity of potentially more dangerous drugs used to produce general anaesthesia can be decreased. In order to optimize the advantages of premedication, it is important to select drugs based upon the needs of the individual patient and its physical status (Murrell, 2007). For procedures associated with peri- and postoperative pain, premedication should always include an analgesic (Bednarski, 2007). The same principles are legitimate for TIVA, and they should be taken into account.

Induction and Maintenance Agent

The ideal intravenous anaesthetic agent for TIVA should be water soluble and have a long period of stability when stored at room temperature. It should be painless and non-irritant on injection, while rapidly inducing sleep with a minimum of respiratory and cardiovascular side effects. In addition, the potential for anaphylactoid and other allergic reactions should be very low (Morton, 1998).

Propofol is a newer generation injectable anaesthetic agent which was introduced in veterinary medicine in the 1990's (Tsai *et al.*, 2007). It is a hypnotic alkyl phenol, it is formulated in a lipid emulsion containing extracts of soya and egg protein, which makes it an ideal culture medium for bacteria (Morton, 1998; Kästner, *2007)*. In general, propofol induces a rapid, smooth induction, followed by a short period of unconsciousness (Morgan and Legge, 1989). Propofol is rapidly redistributed from the brain to other tissues and is also efficiently eliminated from plasma by hydroxylation by one or more hepatic cytochrome P- 450 isoforms, which explains its short action and the rapid recovery (Zoran *et al*., 1993). Due to these pharmacokinetic properties, it is considered to be a suitable drug for the maintenance of anaesthesia by continuous rate infusion (Musk *et al*, 2005). One important issue is that propofol has only minimal analgesic properties. This explains the need for concurrent administration of analgesics when propofol is used during painful procedures.

Ketamine is a dissociative anaesthetic as it interrupts ascending transmission from those parts of the brain responsible for unconscious and conscious functions Antagonism of the N-methyl-Daspartate (NMDA) receptor has been proposed as the most likely molecular mechanism responsible for most of its actions (Lin, 2007). Ketamine possibly increases muscle tone and it induces spontaneous movement and, occasionally, convulsions. To reduce these undesirable effects, it is often used in conjunction with propofol, benzodiazepines, acepromazine or α2-agonists. Recovery from ketamine anaesthesia is often associated with hyper excitability. To minimize these excitatory central nervous system effects, a concurrent infusion of a benzodiazepine has to be considered (Morton, 1998).

Combinations with propofol and medetomidine have also been reported in dogs (Hellebrekers and Sap, 1997 and Hellebrekers *et al*., 1998).Concerning cardiovascular parameters during a ketamine-based TIVA, a significantly higher heart rate was reported in a group of dogs receiving ketamine compared to a group of dogs receiving propofol (Hellebrekers *et al.*, 1998 Ketofol (ketamine/propofol combination) was used for procedural sedation and analgesia. Ketamine and propofol are physically compatible at 23^0 C with no increase in particle content at site of injection (Trissal *et al* 1997). Ketamine and propofol administered in combination have offered effective sedation for gynaecologic, ophthalmologic and cardiovascular procedures. The opposing haemodynamic and respiratory effects of each drug may enhance the utility of this drug combination, increasing both safety and efficacy and allowing reduction in the dose of propofol required to achieve sedation.(Daabiss *et al.* 2009) (Kumar *et al*.2014).

CONCLUSION

Total intravenous anesthesia provides the veterinarian with a useful alternative for inhalation anesthesia in dogs, with a propofol- or ketamine- or ketofol based protocol as the most evident choice. Furthermore, premedication and the administration of analgesics should not be overlooked, and the depth of the anesthesia should be assessed to avoid unwanted complication.

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