Combined intravenous anaesthesia with midazolam and propofol for performing abdominal surgery in sheep

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The aim of this study is to evaluate the combination of midazolam and propofol anesthesia as a safe anesthetic protocol for performing abdominal surgery in sheep. To achieve this purpose, five mature non-pregnant ewes were administered intravenously with a dose of 3mg/kg propofol, 10 min after administration of 0.6mg/kg midazolam as a premedication. During the period of anaesthesia, these animals were subjected to the standard rumenotomy technique. The evaluation criteria included changes in heart and respiratory rates, rectal temperature, different body reflexes, and changes in hepatic enzymes activities. Scoring for sedation, induction and recovery were also recorded. The result showed that midazolam induced good sedation in 4/5 of the injected sheep. In addition, propofol induced profound smooth anaesthesia in 4/5 of the injected sheep. The average full recovery time was 48.6 minutes and the average period of surgical rumenotomy was 28 minutes. The heart rate was significantly increased after propofol anesthesia while the respiratory rate was significantly reduced. Rectal temperature was not significantly changed. These parameters returned to normal values after recovery. Serum hepatic enzymatic activities of ALT and AST were non-significantly increased during the period of anaesthesia and then return to decline at the recovery time (start with the walking and swallowing). It was concluded that, the intravenous anesthesia with midazolam / propofol combination in sheep, is a feasible protocol to perform short term surgical procedures under field conditions with smooth, rapid recovery and without causing adverse effects on clinical status and the hepatic enzymatic activities of the anaesthetized sheep.

Introduction

Sedatives used for calming small ruminants include α_2 adrenoceptor agonists, such as xylazine, phenothiazines (like acepromazine), benzodiazepines (like diazepam) and midazolam and opoids (like butorphanol) **(8)** and **(33).** Sedatives are used pre-operatively to induce sedation, improve the quality of induction of anaesthesia and more importantly, minimize drug-related adverse effects by reducing the amount of injectable or inhalation anaethetics required to induce and maintain general anaesthesia **(17), (20)** and **(35).**

Midazolam is water soluble benzodiazepines that are considered to be fast acting with a short elimination half-life **(3)** and **(20)**. Unlike diazepam, it can be administered by intramuscular route as well as the intravenous route **(8)** and **(20).** Midazolam has mild cardiovascular and respiratory effects and is commonly used as a mild tranquilizer, muscle relaxant and anticonvulsant **(20)** and **(24).** Benzodiazepines have agonistic effects on specific benzodiazepines receptors located in the postsynaptic nerve endings within the central nervous system **(3)** and **(24).** The resultant increase in availability of the inhibitory neurotransmitter glycine leads to the anxiolytic and muscle relaxant effects. The sedative and hypnotic effects of midazolam are dose-dependant as well as dependant on route of administration. Midazolam can produce maximal sedative effects in 20 minutes after intramuscular administration of 0.6 mg/kg and 5 minutes after intravenous administration of the same dose **(38)**. Midazolam has more hypnotic, anticonvulsant muscle relaxing and amnesic effects than other benzodiazepines; it is 1.5-2 times as potent as diazepam **(25)** and **(40).** Furthermore, midazolam in comparison with diazepam, it is 4 times more potent in goats **(37)**. The administration of midazolam premedication in small ruminants has greatly led to overcoming and preventing occurrence of many adverse effects that encountered when an anaesthetic administered without such premedication **(26).** Salivary levels appeared to be related to depth of sedation. This has been particularly noted with benzodiazepines sedation, in which sedation is significantly correlated with saliva level **(5)**. Benzodiazepines are known to infrequently, cause dry mouth **(14)**.

Propofol (2, 6-diisopropyl-phenol) is one of the induction agents commonly used in goats because it has a rapid, smooth onset of action and is cleared rapidly from the tissues **(12), (18)** and **(33)**. Propofol is slightly soluble in water and is marketed as an aqueous emulsion containing 10 mg of propofol, 100 mg of soyabean oil, 22.5 mg of glycerol and 12 mg of egg lecithin per ml. Propofol emulsion is capable of supporting microbial growth and endotoxin production **(18).** Propofol has been used extensively in human beings and animals. It has a high volume distribution, rapid metabolism and rapid clearance when given by repeated doses or continuous intravenous (IV) infusion. **(2), (30)** and **(39).** The administration route has little effects on the magnitude of propofol uptake into titration to effect, rather than producing more aneasthesia for a given dose (**1**) and **(21).** The rapid onset and short duration of action, with rapid recoveries make the drug potentially useful in ruminants, in which these features are particularly desirable **(4), (28)** and **(30).** Propofol causes a dose- related decrease in blood pressure due to peripheral vasodilatation and myocardial depression, bradycardia, epileptic form, seizures and true convulsions **(16), (22)** and **(36).** The indicated dose of 3mg/kg of propofol was sufficient for induction of anaesthesia. Propofol when administered at a dose 4-7 mg/kg intravenously in unpremedicated goats and sheep induces sufficient anaesthesia for endotracheal intubation **(10), (27), (29)** and **(32),** while a dose of 3mg/kg was proved sufficient in premedicated goats **(8).** In a very few studies in sheep, propofol was studied from some certain aspects and experimented either alone or with other anaesthetic or premedication. The anaesthetic propofol infusion was used either alone or combined with ketamine in sheep **(26).**

The objective of this study is to evaluate the effect of the combination of midazolam and propofol anesthesia as a safe anesthetic protocol in sheep for performing abdominal surgery with minimal risk and without adverse effect on the clinical and biochemical status of the anaesthetized animals.

Material and Methods

Animals

Five mature non-pregnant ewes were used in this study, their body weight ranged from 38-47 kg. The animals were deprived of food for at least 12 hours but had access to water for up to 2 hours before the anaesthesia. The skin overlying the left jugular vein was clipped and a catheter was introduced into the jugular vein and fixed in place by adhesive bandage.