

Etomidate/Alfentanil Anaesthesia in Dogs and Its Effects on Pulse Oxymeter, Electrocardiography and Haematological Parameters*

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Abstract: In this study, the anaesthetic effects and reliability of the combination of etomidate, which is a non-barbiturate injectable anaesthetic, and alfentanil, which is a strong narcotic analgesic, in anaesthesia induction in dogs were investigated. Twenty dogs were used in this study. Following intramuscular administration of atropine at a dose of 0.05 mg/kg, diazepam was given intravenously at a dose of 0.5 mg/kg. Following tranquillisation, etomidate at a dose of 2mg/kg and alfentanil at a dose of 0.02mg/kg were injected intravenously.

With this anaesthetic protocol, anaesthesia lasting approximately 15 min was produced.

When haematological parameters (haemogram and ALT, AST, BUN, TP, GLU, Na, K) at minutes 0 and 10 were compared, no significant change was determined exceeding normal physiological limits during anaesthesia. In the electrocardiographical examination, while no significant arrhythmia was encountered during anaesthesia, neither did hypoxemia develop in the oxygen saturation data.

In conclusion, this combination can be relied on both for the induction of anaesthesia and for brief surgical procedures in dogs.

Key Words: Etomidate, alfentanil, dog, anaesthesia, electrocardiography, pulse oxymeter, haematological parameters.

Köpeklerde Etomidate/Alfentanil Anestezisinin Hematolojik, Elektrokardiografik Parametreler ve Pulse Oksimetre Üzerine Etkileri

Özet: Bu çalışmada, bir non-barbitürat enjektabl anestezik ajan olan etomidate ile güçlü bir narkotik analjezik olan alfentanil kombinasyonunun köpeklerde anestezi induksiyonunda kullanımının güvenilirliği ile oluşturduğu anestezik etkiler incelenmiştir. Çalışma 20 köpekte gerçekleştirilmiştir. 0,05 mg/kg dozunda atropine İM yapıldıktan sonra 0,5 mg/kg dozunda diazepam İV. yolla verilmiştir. Tranquilizasyon oluştuktan sonra 2 mg/kg dozunda etomidate ve 0.02 mg/kg dozunda alfentanil İV. olarak uygulanmıştır.

Bu anestezik protokolle ortalama 15 dakikalık bir anestezi oluşturulmuştur. 0. ve 10. dakikadaki hematolojik parametreler (hemogram ve ALT, AST, BUN, TP, Na, K) birbiriyle kıyaslandığında, anestezi esnasında normal fizyolojik limitleri aşan önemli bir değişiklik saptanmamıştır. Elektrokardiografik incelemede anestezi boyunca ciddi bir kardiyak ritim bozukluğu şekillenmemiş aynı şekilde oksijen saturasyonu verilerinde de hipoksemiye rastlanılmamıştır.

Elde edilen veriler eşliğinde, bu kombinasyonun gerek anestezi induksiyonunda, gerekse kısa süreli cerrahi prosedürler için köpeklerde güvenle kullanılabileceği sonucuna varılmıştır.

Anahtar Sözcükler: Etomidate, alfentanil, köpek, anestezi, elektrokardiografi, pulseoksimetre, hematolojik parametreler.

Introduction

Etomidate is an imidazole derivative which was synthesised in 1965 and first used for the induction of anaesthesia in people in 1975. The brainstem reticular formation appears to be the site of hypnotic activity. It is not a good analgesic. Single injections produce relatively

brief hypnosis. In dogs, doses of 1.5 and 3.0 mg/kg last 8 ± 5 and 21 ± 9 min, respectively (1).

The duration of hypnosis is dose related. Etomidate is rapidly hydrolysed in the liver and excreted in the urine. Induction and recovery are rapid. Etomidate does not depress the cardiovascular and respiratory systems or

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release histamine. When used alone in dogs it produces no change in heart rate, blood pressure or myocardial performance. Etomidate is recommended for induction of anaesthesia for Caesarean section, for traumatised patients and for those with myocardial disease, liver disease or unstable haemodynamics. Side effects include sneezing, retching, myoclonus, pain on injection and phlebitis, but these can be minimised by use of adequate sedative premedication. Etomidate is compatible with other common preanaesthetic agents (2-5).

Alfentanil is a tetrazole derivate of fentanyl. Many of the pharmacological effects of alfentanil are similar to those of fentanyl and sufentanil, but of quicker onset than those of fentanyl and sufentanil.

Alfentanil may cause less intense respiratory depression than equianalgesic doses of fentanyl. Clinical trials indicate alfentanil can be used effectively as an analgesic, an analgesic supplement to anaesthesia, an anaesthetic induction agent, and as the major component of a general anaesthetic. Its short duration of effects makes it attractive as an analgesic supplement for short ambulatory surgical procedures (5,6).

Monitoring methods are used to check the effects anaesthetics produce on the organism. Cardiovascular and pulmonary parameters are the most important points of monitoring. Anaesthetic drugs and surgical procedures have the highest negative effect on these systems. The electrical activation of the heart is assessed using ECG, which is a monitoring parameter. During general anaesthesia as well as arrhythmia, forms such as sinus bradycardia and tachycardia, and supraventricular and ventricular ectopic pacemaker activity can frequently occur. Together with atrioventricular blocks, premature atrial and ventricular pacemaker activity and bundle branch blocks are the most common arrhythmia types (3-5).

A pulseoxymeter is a fast and non-invasive way of determining haemoglobin oxygen saturation. In these machines, which work under the microchip principle, the probe is attached to body parts such as the tongue, lip, ear and vulva. After placement of the probe, oxygen saturation is detected via photodetectors. If the animal is inhaling 100% oxygen, O₂ saturation must be between 95 and 100%. If saturation drops below 90%, this indicates hypoxaemia and shock, thus presenting the depression of respiration by the anaesthetic (4,5).

One other indication of the degree of effect by anaesthesia in tissue and organs is changes in blood parameters. For reliable anaesthetic management, it is necessary for changes occurring in blood parameters during anaesthesia to remain within physiological limits (7).

In this study, the anaesthetic effects and reliability of the combination of etomidate and alfentanil in anaesthesia induction in dogs were investigated in the light of blood parameters and the effects of monitoring on parameters.

Materials and Methods

Twenty dogs were used in this study. Following intramuscular administration of atropine (Atropine sulphate 0.1% sol. vial-Vetaş) at a dose of 0.05 mg/kg and diazepam (Diazem 5 mg/ml amp.-Deva) was given intravenously at a dose of 0.5 mg/kg.

Following tranquillisation, etomidate (Hypnomidate 2 mg/ml amp.-Jannsen Pharmaceutica) at a dose of 2 mg/kg and alfentanil (Rapifen 0.05 mg/ml amp.-Jannsen Pharmaceutica) 0.02 mg/kg were injected intravenously.

After anaesthesia was established, all reflexes, muscle relaxation, analgesia, duration of anaesthesia and complications of anaesthesia were investigated.

Before premedication, blood samples were collected from all dogs and red blood cell count (RBC), white blood cell count (WBC), packed cell volume (PCV), haemoglobin level (Hgb), alaninaminotransferase (ALT), aspartataminotransferase (AST), blood urea nitrogen (BUN), total protein (TP), serum glucose (Glu), sodium (Na) and potassium (K) levels were determined. The same parameters were measured 10 min after the intravenous injection of etomidate/alfentanil and data obtained at minutes 0 and 10 were compared. Intravenous fluids were not given in order to determine precisely the changes in blood parameters and to prevent haemodilution affecting the parameters. Likewise, changes in body temperature were also determined rectally. The results obtained were statistically evaluate using student's t test. Throughout, electrocardiography and pulse oxymeter readings were taken and heart rhythm and oxygen saturation values were recorded every 5 min by a portable bedside monitor PETAŞ PM 100. Pulse oxymeter readings were made using a special clip-on probe for the tongue.

Results

With this anaesthetic protocol, anaesthesia of approximately 15 min was produced (min: 7, max: 25 min) (Table 1). When anaesthesia was achieved, corneal and palpebral reflexes disappeared and protrusion occurred. To assess pain sensation, the abdominal region skin was stimulated using Allis forceps and a good analgesic effect was observed. In addition, muscle diastole level appeared was satisfactory. The jaw was opened easily. There was no pharyngolaryngeal reflex and the dogs were intubated.

When haematological parameters at minutes 0 and 10 were compared, no significant change was determined that exceeded normal physiological limits during anaesthesia (Table 2). However, there was a slight drop in body temperature during anaesthesia (Figure 1).

In the electrocardiographical examination, no significant arrhythmia was encountered during anaesthesia and hypoxemia did not develop in the oxygen saturation data (Figure 2).

No anaesthetic complications were seen in any of the dogs.

Discussion

As well as the possibility of routinely used injectable anaesthetic agents such as barbiturates and ketamine

Table 1. Duration of anaesthesia produced with etomidate/alfentanil combination.

Minimum	7 min
Maximum	25 min
Average	14.7 ± 4.7 min

PARAMETERS	BEFORE ANAESTHESIA	AFTER ANAESTHESIA	SIGNIFICANCE
RBC (10 ⁶ mL)	5.8 (± 0.24)	4.96 (± 0.24)	*
WBC (10 ³ mL)	11 (± 0.85)	8.8 (± 0.7)	ns
Hgb (g/dl)	13.3 (± 0.5)	11.6 (± 0.6)	ns
PCV (%)	40.9 (± 1.7)	35.6 (± 1.8)	*
GLU (mg/dl)	67.7 (± 6.3)	91.6 (± 8.1)	*
TP (g/dl)	6.2 (± 0.2)	5.7 (± 0.2)	ns
ALT (u/L)	49.9 (± 6.8)	48 (± 6.5)	ns
AST (u/L)	41.6 (± 3.3)	43.5 (± 3.4)	ns
BUN (mg/dl)	26.1 (± 2.2)	25.4 (± 2.1)	ns
Na (mEq/L)	153.3 (± 2.9)	150 (± 41.3)	ns
K (mEq/L)	5.93 (± 0.2)	4.97 (± 0.1)	*

n = 20

* = (p < 0.05)

ns = (non-significant).

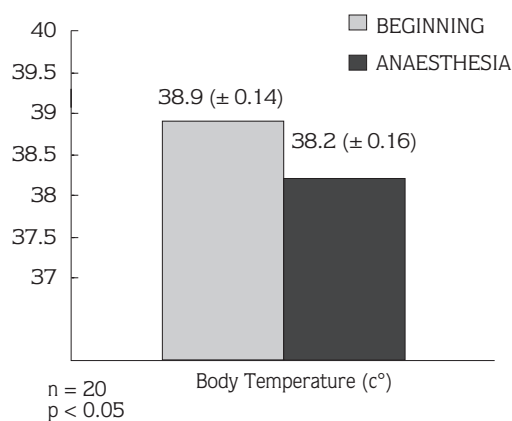


Figure 1. Body temperature differences.

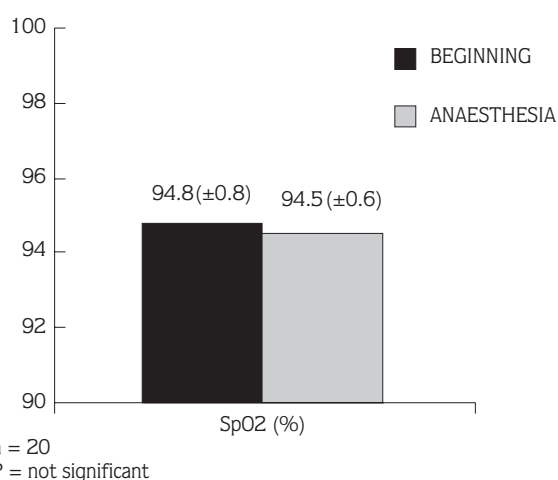


Figure 2. Pulseoxymeter findings.

Table 2. Haematological parameter values at 0 (before anaesthesia) and 10 min (after anaesthesia).

producing induction apnea, xylazine and premedicants belonging to the phenothiazine group also have cardiopulmonary depressing effects (4,5). The haemodynamics of etomidate, which derives from the non-barbiturate injectable anaesthetics group, causes minimal change in stability and is especially used for the induction of anaesthesia in risky patients (1,8,9). In this study, the induction agent etomidate was used for the first time in Turkey and its reliability was evaluated.

To lessen the side effects mentioned in the literature (3-5) when using etomidate on its own, atropine sulphate was the preferred choice among anticholinergics and diazepam among minor tranquilisers. To extend the analgesic effect, alfentanil derived from the tetrazole of fentanyl was used.

In this study, an average of 15 min continuous anaesthesia was achieved using etomidate in combination with alfentanil in dogs. In a similar study in 8 cross-bred dogs by Erhardt et al. (1) this time was 5-8 min. In another study with 141 dogs by Glardon et al. (8) etomidate with fentanyl was combined and they produced an anaesthesia lasting 6-8 min. In both these studies, we think that anaesthesia lasted only a short time because etomidate was given to the dogs at a rate of 1 mg/kg. However, the findings in both studies, the good relaxation of the muscles and the strong analgesia, show similarities to our results.

When compared with another study using dogs, the changes observed in the blood parameters caused by thiopental and ketamine anaesthesia were seen to be less significant than those occurring in etomidate/alfentanil

anaesthesia and did not exceed normal physiological limits.

A dehydrobenzperidol/fentanyl combination made and carried out by Perk et al. (10) and compared with another study on dogs showed similarities in blood parameter changes. In addition renal and hepatic functions were not affected. On the other hand, its a known fact that in the neuroleptanalgesic combination of dehydrobenzperidol/ fentanyl, consciousness and reflex activities exist, thus making atraumatic intubation more difficult. When compared with fentanyl, alfentanil derived from the combination of etomidate/alfentanil, which causes less breath depression, can be considered to be another advantage.

During anaesthesia in which cardiopulmonary functions were analysed, findings of continued ECG and pulseoxymeter monitorisation revealed no significant cardiac arrhythmia and oxygen saturation was within normal limits (2,4,5,8).

In one study by Pascoe et al. (9) carried out in hypovolemic dogs, etomidate caused minimal changes in cardiopulmonary functions. However, the dogs in our study were normovolemic.

During etomidate/alfentanil anaesthesia, a decrease in body temperature is seen just as in all anaesthesia methods in which the thermoregulation centre is affected due to hypothermic activities. These results are in line with other data (3,4,10).

In conclusion this combination can be relied on both for induction of anaesthesia and for brief surgical procedures on dogs.

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