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**CLINICAL USE OF COMBINED XYLAZINE AND  
KETAMINE ANAESTHESIA IN THE DROMEDARY**  
(With 2 Figs.)

By  
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الاستخدامات الأكلينيكية للتخدير بخليط الزيلازين والكيتامين

في الجمال

عاطف بلبول

تم تقييم التخدير العام باستخدام خليط من الزيلازين (رومبون - بايبر) والكيتامين (كيتالار - بارك دافيز) في 27 جملًا. ولقد تم إعطاء العقار بالحقن العضلي أو الوريدي. وتم الحقن العضلي للزيلازين بجرعة مقدارها 2 مجم/كيلوجرام قبل التخدير. بعد حوالي 10 - 20 دقيقة من الحقن المبدئي تم حقن الخليط من الزيلازين (0.15 مجم/كيلوجرام) والكيتامين (1 - 2 مجم/كيلوجرام) بالحقن العضلي أو الوريدي ولقد كان الحقن العضلي ذو تأثير وفعالية أكثر من الحقن الوريدي. وتم إجراء عدة طرق جراحية تحت تأثير التخدير بهذا الخليط بنجاح تام وقد أعطى التخدير أمانًا وعمقًا استمر لمدة ساعة على الأقل.

**SUMMARY**

General anaesthesia produced by a combination of xylazine (Rompun, Bayer) and ketamine (Ketalar, Parke Davis) was evaluated in 27 camels. The drugs were given by intramuscular or intravenous injection. Xylazine was given i.m. in a dose rate of 0.2 mg/kg b.w. for premedication. The mixture of xylazine (0.15 mg/kg) and ketamine (1.5-2 mg/kg b.w.) intramuscularly was superior than intravenous route. Various surgical procedures were performed under the effect of xylazine and ketamine mixture which provided satisfactory, safe deep anaesthesia persisting for up to one hour.

**INTRODUCTION**

Xylazine HCl (Rompun, Bayer) produces excellent sedation with muscle relaxation which was sufficient for clinical examination and treatment of the animals. It has been shown to be effective in a wide range of species especially in ruminants which are sensitive to very small doses (MOTTELIB and EL-GUNIDI, 1975; KNIGHT, 1980 and BOLBOL and KABBANY, 1984).

The use of xylazine in camels was first reported by DENNING (1972) using high doses of xylazine (2 mg/kg) intramuscularly. KHAMIS, *et al.* (1973) and BOLBOL, *et*

al. (1980) found that 0.25 mg/kg intramuscularly was adequate for clinical use and superior to chlorpromazine and propionyl promazine (Combelen, Bayer). SHARMA, et al. (1982) reported successful use of xylazine as anaesthetic and muscle relaxant for caesarian section in a camel.

Ketamine HCl (Ketalar, park Davis) is used as a short acting injectable general anaesthetic. It is a dissociative agent of cyclohexanone derivative related to phenylcyclidine and tilatamine. The use of ketamine alone had some major disadvantages in its tendency to cause excitement, muscle rigidity, convulsions and unpredictable recoveries. The incidence and severity of which are species related (HALL and CLARKE, 1983).

Use of the combined xylazine and ketamine reduces the side effects of ketamine and retaining its anaesthetic effect (AMEND, 1973) in cats. HIGGINS and KOCK (1984) and WHITE, et al. (1987) have recommended the combined use of xylazine and ketamine in camels.

The purpose of the present study is to evaluate the clinical use of xylazine/ketamine combination in the dromedary and to determine base line values for monitoring the anaesthetized animal.

### **MATERIAL and METHODS**

Twenty-seven one-humped camels (10 females and 17 males) of different ages, and body weights were included in the study.

The onset, maximum effect, duration, recovery time from anaesthesia and clinical responses were determined and recorded.

Food and water were withheld 24-36 hours before administration of drugs. The animals were restrained in sternal recumbency with their front legs tied. The drugs were administered either by deep intramuscular injection into the neck or the gluteal region or interavenously into the jugular or the ventral abdominal veins.

All animals were premedicated with 2% solution of xylazine administered at a dose rate of 0.20 mg/kg b.w. by i.m. injection. After 15-20 minutes, camels received xylazine (0.15 mg/kg b.w) mixed with ketamine (1-2 mg/kg b.w). About half of the animals were injected intramuscularly (Group I) and the other half were injected intravenously (Group II).

The body weights were calculated from their abdomen contour measurements by the method described by BUCCI, et al. (1984) using the following formula:

$$Y = 3.06 \times X - 290.6$$

where Y = calculated weight

X = abdomen contour

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Certain surgical procedures were performed on camels admitted to the Veterinary Teaching Hospital at King Faisal University, Saudi Arabia suffering from various surgical affections (Table 1).

**RESULTS**

Administration of Rompun at a dose rate of 0.20 mg/kg b.wt. intramuscularly produced a good sedative effect in camels with pronounced muscular relaxation. When the drug was administered 15-20 minutes prior to injection of xylazine/ketamine combination, induced a state of deep surgical anaesthesia accompanied by complete analgesia and excellent muscle relaxation highly sufficient for performing surgical interferences.

It was observed that the optimal dose for baby camels was given at a dose rate of xylazine 0.15 mg/kg b.w. and ketamine (2 mg/kg b.w), while older camels were given a dose of (0.15 mg/kg b.w) and (1-1.5 mg/kg b.w) ketamine.

The onset time, duration and recovery period were shortest when the drugs were given intravenously and longest when the drugs given by intramuscular route (Table 2).

Clinically, the effect started early and manifested itself by salivation, dropping of the lower lip, relaxation of the upper lip, lowering or closure of the upper eyelids and stretching the neck on the ground (Fig. 1). All animals had tendency to assume lateral recumbency (Fig. 2). Complete hypoesthesia of the skin and slight lacrimation were recorded. The palpebral and conjunctival reflexes were completely abolished while the corneal reflex still showed a sluggish response. The pupil was dilated and become insensitive to light. The ear, jaw, tongue, skin, pedal, and tail reflexes were completely abolished. During the earlier stages of induction the respiration was increased. Gradually, respiration became slower and regular. With xylazine and ketamine combination the heart rate remained somewhat stable while increased in baby camels. Temperature showed insignificant decrease during anaesthesia. During the anaesthetic period, rumination ceased temporarily.

All animals tolerated the dose well. However, in lateral recumbency 2 camels developed slight bloat and another two regurgitated copious amounts of rumenal contents.

Smooth recovery period were recorded which persisted for shorter time in camels anaesthetised intravenously.

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## DISCUSSION

Based on experience with anaesthetizing 27 camels with xylazine/ketamine combination, the combination would be the agent of choice for any surgical procedure. This combination produced deep state of anaesthesia and good analgesia for periods up to one hour approximately.

In accordance with results of WHITE, *et al.* (1987), camels which received xylazine and ketamine exhibited fewer effects on their cardiac and respiratory rates than camels received any agent alone. It also showed better muscle relaxation, less central nervous system irritability and faster recovery times than camels sedated with ketamine.

SAMY and OTHMAN (1985) studied the effect of ketamine and xylazine for anaesthesia in cats. They reported that ketamine when injected alone caused tachycardia and xylazine caused bradycardia, while injection of both drugs together maintained the heart beats of the animal at nearly the normal level. The matter which interprete somewhat the stability of heart rate in camels anaesthetised with xylazine and ketamine combination in the present work.

Another advantage of the mixture as mentioned by WHITE, *et al.* (1987) is the deeper level of analgesia obtained. It is worthy to mention here that the i.m. injection of the combined ketamine xylazine mixture (1.5-2 mg/kg - 0.15 mg/kg) 15-20 minutes after previous premedication with xylazine (0.2 mg/kg) was found to be extremely effective and safe.

The unconscious camel on full feed may regurgitate copious quantities of stomach contents and there is a serious risk of pulmonary aspiration in this species (WHITE, 1986). The fact that only 2 animals regurgitated involuntarily is attributed to 2 factors as stated by the above author. First, the intramuscular administration of the drugs avoided the rapid onset and profound relaxation that would occur after intravenous administration and, secondly, the camels were physically restrained in sternal recumbency. However, this event was minimized by placing a mattress under the back and hump, as well as placing a long firm cushion under the base of the neck in lateral recumbency, if necessary; so that the first part of the oesophagus is higher than the cardiac sphincter. At the same time the head should be fixed on the ground to allow saliva or possible regurgitated fluid to escape from the mouth (SAYED, 1975).

It is of particular interest from the practical observation of the deep surgical anaesthetic stage to record the absence of all reflexes except the corneal reflex which persisted up to the point of respiratory failure. This phenomena has been previously observed in horses by WRIGHT (1952) and TAVERNOR (1961) and in camel by SAYED (1975). On the contrary, SAID (1964) and BHARGAVA and VYAS (1967) confirmed

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the absence of all reflexes including the corneal reflex during the surgical anaesthetic stage in camels.

The camels in this study were evaluated for sedation and tolerance to minor as well as major surgical interventions. It is concluded that the administration of ketamine/xylazine combination following premedication with xylazine provides satisfactory, deep general anaesthesia for the performance of most surgical procedures in the dromedary camels. Moreover, any marked abnormality in respiration should be regarded as an alarming signal.

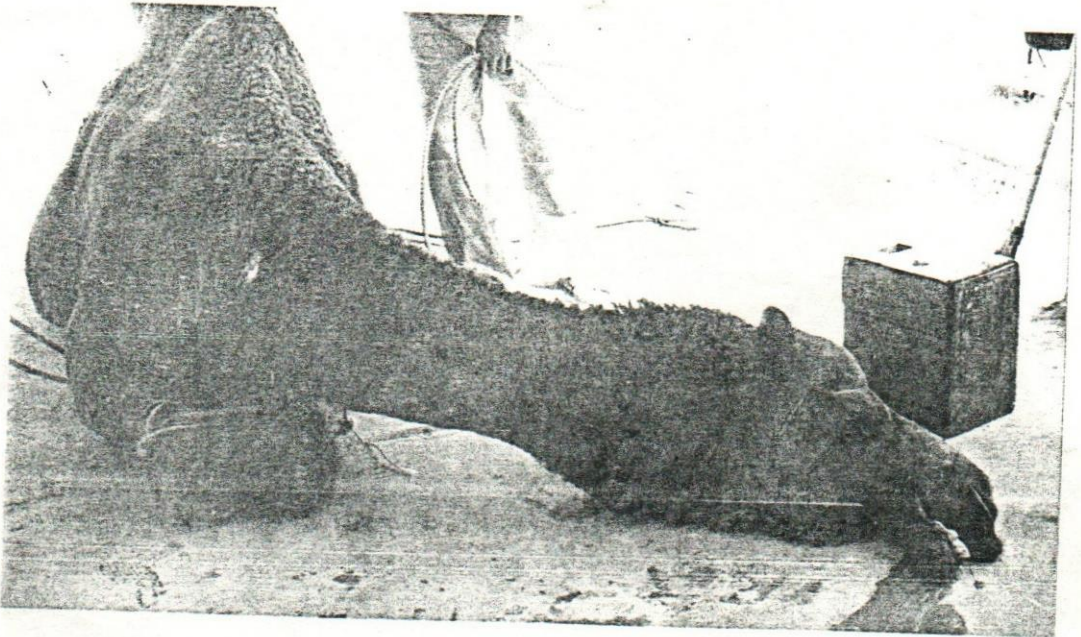
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### FIGURES

- Fig. (1):** Camel 5 minutes following i.m. injection of Xylazine-ketamine combination in sternal recumbency with A. stretching the neck on the ground and increased salivation and B. dropping the lower lip, relaxation of the upper lip and closure of the eye lids.
- Fig. (2):** The same animal assumed lateral recumbency within 15 minutes following injection.



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