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THE ELECTROMYOGRAPHIC EFFECTS OF TOLAZOLINE AFTER XYLAZINE TREATMENT ON THE GIT OF GOATS

(With 9 Figs.)

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تأثيرات المعالجة بالتولازولين بعد الزيلازين
على النشاط الكهربي لعضلات بعض أجزاء الجهاز الهضمي
في الماعز

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لقد تمت دراسة تأثير المعالجة بعقار التولازولين بعد حقن عقار الزيلازين على النشاط الكهربي لعضلات جدار الكرش والقلنسوة والأنفحة والعفج في عدد ٦ من الماعز. وقد سُجلت النتائج باستخدام الكمبيوتر بعد مرور الموجات خلال قناطر تكبير وتنقية مناسبة وبمساعدة برامج خاصة، وذلك عن طريق ثمانية مجاميع تتكون كل منها من ثلاثة أقطاب من اسلاك من الحديد الذى لايصدأ والمغلف بمادة التيفلون ، تمت زراعتها جراحيا في جدار تلك الأعضاء. بينما كان للزيلازين تأثير تثبيطي شديد على نشاط الكرش والقلنسوة والجزء القاعي للأنفحة كان ذلك التأثير طفيفاً على الجزء البوابي لها. هذا وقد أمكن باستخدام عقار التولازولين التخلص السريع من ذلك التاثير التثبيطي للزيلازين.

SUMMARY

The electromyographic effects of tolazoline (1mg/Lb. BWt., I/V) after xylazine (0.05 mg/Lb. BWt., I/V) administration on the rumen, reticulum, abomasum and duodenum were evaluated in 6 goats.

While xylazine had a drastic inhibitory effect on the myoelectric activity of the rumen, reticulum, duodenum and abomasal fundus, the effect on the activity of the abomasal antrum was very slight. Tolazoline quickly reversed the xylazine-induced inhibition of those organs. The xylazine-induced sedation could be also antagonized in goats by tolazoline.

INTRODUCTION

Goats are more susceptible to the effects of xylazine (HALL, 1971). The drug was administered alone or with other drugs to goats in different dosages (MOTTELIB

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and EL-GINDI, 1974; KUMAR, et al. 1976; BECKER, et al. 1978; KELLER and BAUMAN, 1978; AMER and MISK, 1980; BAFIYEBOA and MUVOS, 1980 and YOUSSEF, et al. 1988).

Xylazine- induced depression is mediated by alpha$_2$ adrenoceptors (HSU, 1981). Various antagonists are used in animals to reverse xylazine- induced CNS depression and sedation as well as other xylazine- related effects (MOHAMMAD, 1987; BRONDKE and KOWOLLIK, 1988 and GREENE and THURMON, 1988). Tolazoline is a combined alpha$_1$ and alpha$_2$ adrenergic receptor antagonist (GROSS and TRANQUILLI, 1989). The drug as an alpha$_2$ blocker is one of the specific pharmacologic antagonists to xylazine which reverse the reduction in the sympathetic outflow caused by xylazine (GOLDBERG and ROBERTSON, 1983). Its use was discussed in many of the animal species (SCHMITT, et al. 1974; HSU, 1981; ZINGONI, et al. 1982; ROMING, 1983; RUCKEBUSCH and TOUTAIN, 1984; TRANQUILLI, et al. 1984; BENSON, 1985; ALLEN, 1986; ALLEN and OSTERHUIS, 1986; HARTSFIELD, 1986; KREEGER, et al. 1986; VAN WYK and BERRY, 1986; HSU, et al. 1987; BONATH, et al. 1987; ROMING, 1987 and THURMON, et al. 1988).

The present study was designed to assess the effect of tolazoline after xylazine treatment on the myoelectric activity of the rumen, reticulum, abomasum and duodenum in goats, which reflects the motility of these organs.

MATERIAL and METHODS

A number of 6 adult non pregnant, clinically healthy female goats weighing 90 to 135 lbs., were used in the present study.

Ten sets, each of 3 electrodes of strainded steenlessteel wires coated in teflon, 28 gauge (Biomed Wire, Cooner Wire Company, Chatsworth, CA, USA) were implanted seromuscularly in the wall of the rumen, reticulum, abomasum and duodenum, of every animal. Two sets in the wall of the rumen, about 5 cm apart, and 2 sets in the wall of the reticulum. In the wall of the abomasum; 2 sets were implanted in the fundus and 2 sets in the antrum. The rest 2 sets were implanted in the wall of the duodenum. The electrodes within every set were fixed in a triangle and about 2 mm apart. The wires were washed, left to dry and sterilized before implantation.

The operations were carried out under halothane general anaesthsia after induction with thiamylal sodium. After the aseptic preparation of the operative site, about 15 cm, midline laparotomy incision was done. The electrode wires were implanted seromuscularly with the aid of an appropriate curved canula. Into a fold of the organ wall the canula was inserted seromuscularly. The wire electrode was introduced through the canula in the reverse direction. Then the canula with the wire in its lumen were withdrawn backwards. About 3 cm teflon coat was taken off the wire to get a non

isolated part for implantation. The wires were directed to exit from the abdominal wall at the distal part of the left flank. They were tunneled subcutaneously to exit from the skin ventral to the cranial lumbar transverse processes.

The wire electrodes were connected with the connection elements, on the fifth postoperative day, where the junction parts were isolated with silicone rubber pieces (Silastic tubes).

For recording the electical activity, 8 sets were chosen; one from the rumen, one from the reticulum, 2 from the abomasal fundus, 2 from the abomasal antrum and 2 from the duodenum. The bipolar potential changes were measured between 2 electrodes of each set, and the third electrode act as a ground one. The signals were recorded as 8 channels charts by the computer, using CODAS software (Dataq Instruments, Inc., 825 Sweitzer Ave., Akron, Ohio 44311 USA), after passing through the appropriate bridges and amplifiers. The animals were restrained in an elevated stall with a head lock. Although, the time spent in preparing the connection parts allowed the animals to become conditioned to the research environment, a sufficient time was given to become quiet before recording the base line values (control data).

For every animal, the electrical activity of the organs was recorded for one hour as a control data, then xylazine was administered intravenously in a dose rate of 0.05 mg/lb. BWt. and monitoring was continued for another hour. After the elapse of one week the same animals were used again to record one hour control data, then the same dose of xylazine was injected. After the appearence of the maximal electromyographic effect of xylazine, tolazoline in dose rate of 1 mg/lb. BWt. was administered intravenously, and monitoring was completed for one hour.

The grouped spike bursts in 5 minute-periods (between 5 and 10 minutes, 15 and 20, 25 and 30, 40 and 45, and 55 and 60 minutes) were counted. Comparisons were made between the mean values observed during the base line period and those after drug administratioin. The records were also examined to detect the changes in the myoelectric profile.

RESULTS

Xylazine in a dose rate of 0.05 mg/Lb. BWt. intravenously produced a pronounced inhibitory effect of ruminal myoelectrical activity to the degree that no spike activity was noticed within 15 minutes after the drug administration (Fig. A_1 and B_1). The inhibitory effect appeared within 5 minutes after the intravenous injection of the drug and persisted for more than one hour. The depressant effect of xylazine was also noticed on the strength of the spikes. Administration of tolazoline (0.1 mg/lb. BWt., I/V) after xylazine treatment, greatly improved the activity of the rumen (Fig. A_1

and B_2). The inhibitory effect of xylazine could be reversed by tolazoline within 20 minutes.

Xylazine had also a prominent inhibitory effect on both the frequency and strength of the myoelectric activity of the reticulum (Fig. A_2 and B_1). Although the spike activity did not stop completely, its strength appeared to be greatly diminished. Tolazoline quickly reversed the depressant effect of xylazine on the reticulum. Although, tolazoline quickly improved both the frequency and strength of the spike activity of the reticulum, the effect on the frequency appeared earlier.

The abomasal fundus myoelectric activity was also markedly depressed both in frequency and amplitude by the administration of xylazine (Fig. A_3 and B_1). The effect of the drug appeared within 10 to 15 minutes after the drug injection and lasted for more than 60 minutes. Tolazoline reversed the inhibitory effect of xylazine on the abomasal fundus myoelectric activity within 5 minutes (Fig. A_3 and B^2). On the myoelectric activity of the abomasal antrum, xylazine had a slight depressant effect on the frequency of the spikes (Fig. A_4 and B_1). The amplitude of the spikes appeared to be more affected. Tolazoline had a short stimulant effect on the myoelectric activity of the abomasal antrum (Fig. A_4 and B_2). It could reverse the inhibitory effect of xylazine within 10 minutes.

On the duodenum, xylazine had a pronounced inhibitory efect on the myoelectric activity, that persisted for more than one hour (Fig. A_5 and B_1). Tolazoline administration quickly reversed the inhibitory effect of xylazine (Fig. A_5 and B_2).

Tolazoline reversed also some of the behavioral changes which occured after xylazine administration, such as the drug-induced recumbency, where all the animals could regain the standing position within 3 minutes.

DISCUSSION

Although xylazine had a drastic inhibitory effect on the myoelectric activity of the rumen reticulum, duodenum nad abomasal fundus, the effect on the activity of the abomasal antrum was very slight. The differences in the response between the various gastrointestinal tract compartments may be linked to a difference in the alpha$_2$-adrenergic receptors in the CNS, which may exist between the motoneurons which innervate the organs (BRIKAS, et al. 1986). It was also emphasized by MERRITT, et al. (1989) that an intraspecies difference may be found in addition to the interspecies variations with regard to the response of the specific gastrointestinal portions to these drugs.

It was demonstrated by RUCKEBUSCH and TOUTAIN (1984) that the inhibition of the reticulo-rumenal contractions by xylazine occured in a dose-dependant manner

and was related to its central action. Tolazoline is an efficacious xylazine antagonist (GROSS and TRANGUILI, 1989). Xylazine induced inhibition of the myoelectric activity of the rumen, reticulum, abomasum and duodenum in goats could be quickly reveresed by Tolazoline. The later drug was used to prevent or reverse the xylazine induced inhibition of ruminal and reticulo-ruminal contractions in sheep and cattle (RUCKEBUSCH and TOUTAIN, 1984; ROMING, 1984 and RUCKEBUSCH and ALLAL, 1987).

The xylazine-induced sedation which result primarily from stimulation of central alpha$_2$ receptors (HSU, 1981), could be antagonized in goats by the alpha$_2$ adrenoceptor antogonist; tolazoline.

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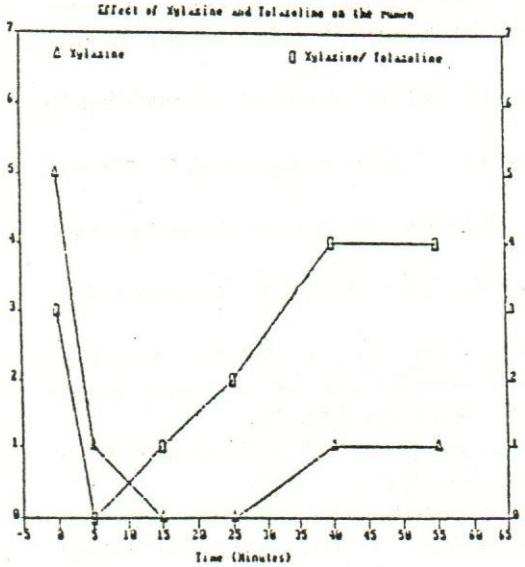
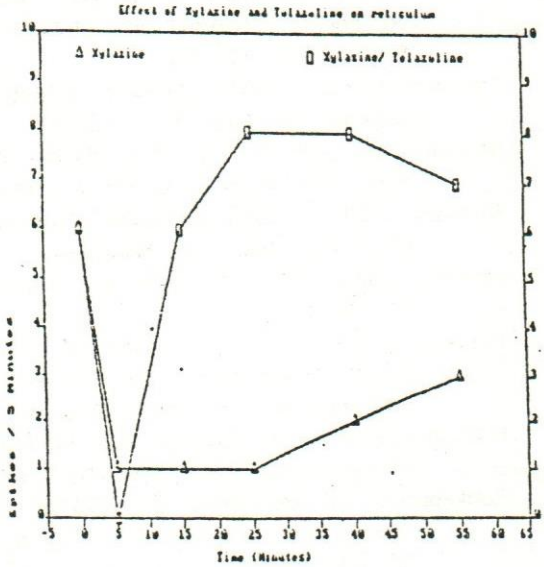


Fig. (A_1)



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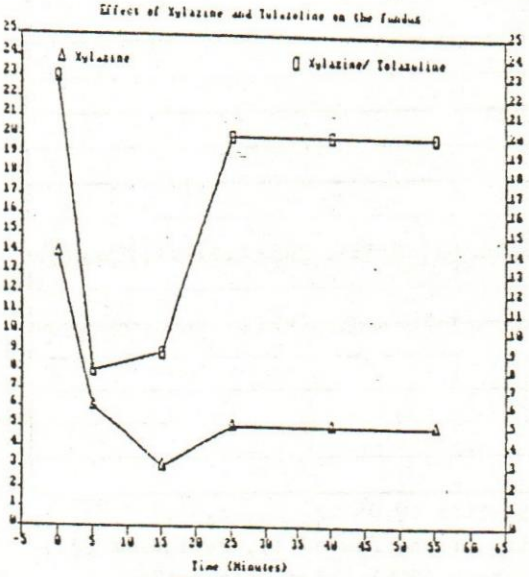

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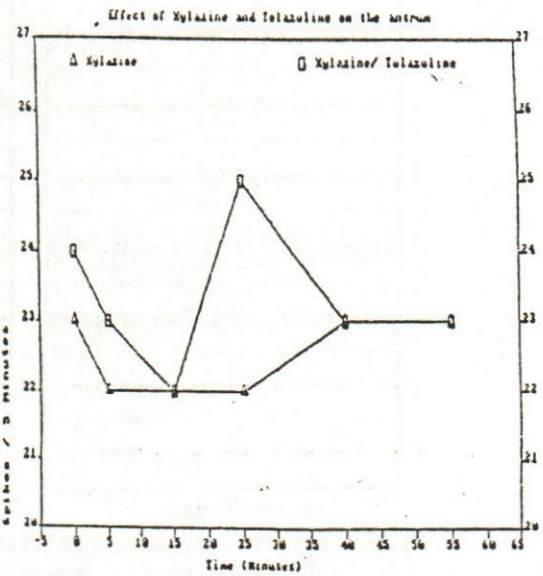

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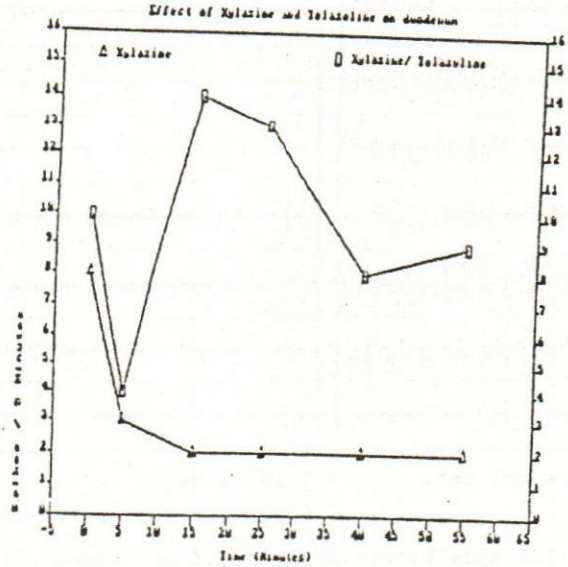

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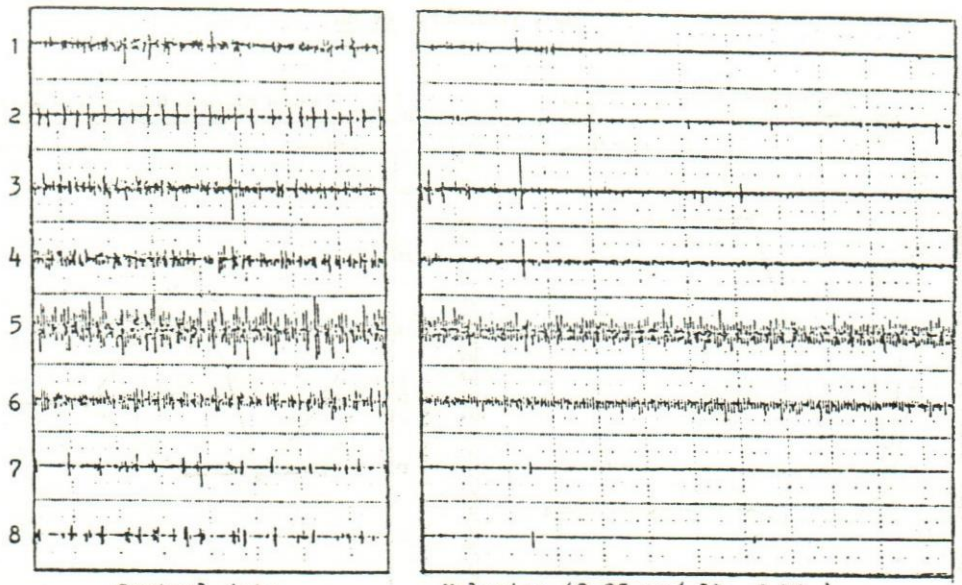

Fig. (B_1): The myoelectric activity of the rumen (1), reticulum (2), abomasal fundus (3&4), abomasal antrum (5&6) and duodenum (7&8).

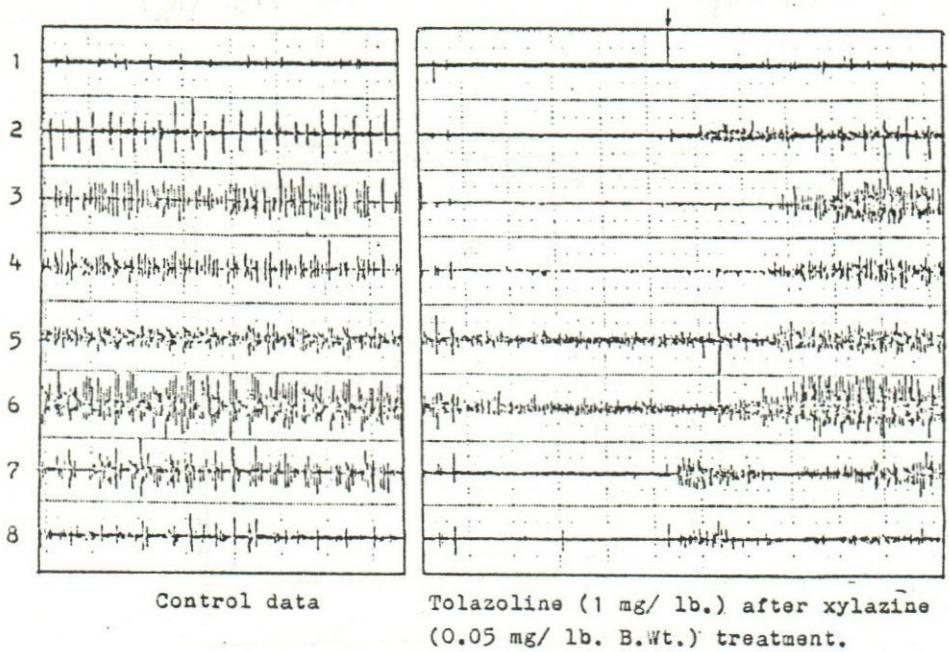

Fig. (B_2): The myoelectric activity of the rumen (1), reticulum (2), abomasal fundus (3&4), abomasal antrum (5&6) and duodenum (7& 8). Notice that the arrow is indicating the time where tolazoline was injected.