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# *INTRAOCULAR PRESSURE AFTER XYLAZINE AND XYLAZINE-KETAMINE INJECTION IN GOATS*

*(With 3 Tables & 2 Figs.)*

*By*

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ضغط العين بعد حقن مركب الزيلازين والزيلازين مع الكتامين في الماعز

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تم قياس ضغط العين في ٢٣ من الماعز في عيون سليمة اكلينيكيا بجهاز شيوتس لقياس ضغط العين وذلك باستخدام مخدر موضعي للقرنية فقط . ثم أستخدم ١٦ ماعز منهم قسمت الى مجموعتين (١٠، ٦) وتم قياس ضغط العين في المجموعة الأولى بعد حقن مركب الزيلازين ثم مركب الزيلازين مع الكتامين في المجموعة الأخرى وكان متوسط الضغط الطبيعي للعين في الماعز ٢ر٣٦ مجم زئبق بانحراف قياسي قدره ٩٩ر١. وقد ثبت أن مركب الزيلازين يحدث نقص في ضغط العين بمقدار ١٠مجم زئبق بعد ٢٠ دقيقة من الحقن أما مركب الكتامين فأحدث ارتفاع في ضغط العين بالرغم من حقن الحيوان مسبقا بالزيلازين. ومن هذا يمكن النصح باستخدام مركب الزيلازين لتخدير الماعز في العمليات الجراحية داخل العين .

## *SUMMARY*

Tonometery of 23 goats with clinically normal eyes were recorded, with Schiotz tonometer, using only topical corneal anaesthesia. 16 goats served as the source for two groups (10 and 6 goats), and the procedure was repeated using xylazine in group I and xylazine-ketamine in group II.

The average of normal intraocular pressure (IOP) in goats was 36.2 mmHg with a standard deviation of 1.99. Xylazine reduce the IOP till 10.00 mmHg at the lowest value, 20 minutes after administration. Ketamine elevate the IOP, in spite of previous injection of xylazine. The latter was recommended for anaesthesia in goats for intraocular surgery.

## *INTRODUCTION*

Tonometry refers to the measurment of intraocular pressure (IOP), which is the resultant of the pressures or volumes of aqueous humor, vitreous body and blood vessels within the globe. Three methods have been practiced for estimation of IOP,

in veterinary ophthalmology; 1- digital palpation, 2- indentation tonometry and 3- applanation tonometry.

GELATT (1981) mentioned that the indentation tonometers were developed as early as 1863 by VON GRAEFE, DONDERS, GRADLE, McLEAN and in 1905 by schiotz. Schiotz tonometer is available and is commonly used in veterinary practice. It is a simply constructed instrument that is portable, inexpensive and easy to use.

MAGRANE (1951) described the uses of Schiotz tonometer in canine patients. LEADER, et al. (1969) calibrated the Schiotz tonometer and developed a conversion table, during their early studies in buphthalmia in the rabbit. PEIFFER, et al. (1977) developed a conversion table of Schiotz tonometer for dogs.

GELATT (1981) advised that the Schiotz tonometer must be held vertically and placed in the center of the cornea to obtain the optimum results. BRYAN (1965) concluded that the most accurate recordings of Schiotz tonometer are made when the needle reads between 2 and 8 on the scale.

Intraocular pressure values of some domestic animals (dogs, cats, horses and cattle) were recorded in the available literatures (MAGRANE, 1951; LOVEKEIN, 1964; STARTUP, 1969; COHEN and REINKE, 1970; McCLURE, et al. 1976; SEVERIN, 1976 and TRIM, et al. 1985).

Many intraocular surgical procedures especially cataract's surgery required ocular hypotomy during operations to prevent presentation of the vitreous body and retinal detachment. These ophthalmic operations required oftenly general anaesthesia. Most of the measures and mangements available to adjust, IOP must be known to the anaesthetist during such ophthalmic surgical procedures to avoid the risk of expulsion of the intraocular contents.

The aim of the present study is to estimate the normal IOP in goats which according to the available literatures are not established. As anaesthesia in domestic goats, is usually induced for surgical procedures, using xylazine and ketamine or combination of them, the effect of these drugs on the IOP will be additionally evaluated.

## *MATERIAL and METHODS*

The Schiotz tonometer was used to record intraocular pressure, in 23 native goats of different ages (2-5 years), sexes (17 females and 6 males), and weight (13 to 40 kg). The animals were clinically healthy and free from ocular diseases.

Before each trial food and water were withheld for 12 hours. All goats were handled with minimal restraint and placed in a lateral recumbency in a quite

environment. Both eyes of each goat were topically anaesthetized with eye instillation of 1% novesine* twice approximately 2-3 minute before the measurment of the pressure. Three readings of the Schiotz tonometer scale were taken from each eye at approximately 15- second intervals. The readings were converted to mm Hg in reference to the canine calibration table and averaged.

Ten goats (Group I) were injected with xylazine** i.m. in a dose of 0.5 mg/kg b.w. (YOUSSEF, et al. 1988). The IOP of both eyes were measured, 5, 20, 35, 50 and 65 minutes post injection.

Another six goats (Group II) were injected with xylazine i.m. at a dose rate of 0.2 mg/kg b.w. and 10 minutes later by ketamine i.v. at a dose rate of 11 mg/kg b.w. (KUMAR, et al. 1976 and 1983). The IOP were measured 5 minutes after xylazine injection and just after ketamine injection. After that, the IOP was repeatedly measured at 5 minutes intervals for 25 minutes after ketamine administration.

## *RESULTS*

The average of three readings of intraocular pressure for the conscious 23 goats having only topical corneal anaesthesia (Table 1) ranged from 33.9 to 40.0 mm Hg in the right eye with an average of 36.3 mm Hg, and from 32.6 to 40.0 mm Hg in the left eye with an average of 36.1 mm Hg. The range for both eyes in all animals (46 eyes) was 33.9 to 40.0 mm Hg, with an average of 36.2 mm Hg.

Intraocular pressure values for goats of the group (I), given topical novesine and xylazine (Table 2 and Figure 1) were decreased. The readings ranged, at the lowest value 20 minutes after xylazine administration, from 21.9 to 27.4 mm Hg in the right eye, and from 21.9 to 30.3 mm Hg in the left eye. The range for both eyes was from 25.11 to 25.10 mm Hg, with an average of 25.10 mm Hg. After administration of xylazine, at the lowest value, the average decrease in intraocular pressure was 10.00 mm Hg.

Intraocular pressure values for animals of group (II), given topical novesine, xylazine and ketamine, were decreased at the first 5 minutes after xylazine injection, then gradually increased after ketamine injection (Table 3 and Fig. 2). The average intraocular pressure of both eyes 5 minutes after xylazine administration was 28.6 mm Hg, with an average decrease of 9.5 mm Hg.

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* Wander Ltd., Berne, Switzerland.

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Just after ketamine administration the average intraocular pressure of both eyes became 35.2 mm Hg, with an increase of 6.6 mm Hg from the last readings 5 minutes before, under the effect of xylazine. The intraocular pressure increased gradually, till it became normal 25 minutes after ketamine injection.

## *DISCUSSION*

Tonometry has a significant diagnostic value in many ocular conditions of man and domestic animals. It can be most useful in diagnosis and managment of glucomatous canine patients and follow up of the response to medical and/or surgical therapy (GELATT, 1981). It can also, be used a diagnostic measure in case of equine periodic ophthalmia, iris bombe and synechiae (COHEN and REINKE, 1960).

Although curvature of the cornea, ocular rigidity and the size of eye in goat may vary from that in dog, use of the available canine calibaration tables for the normal caprine eye is reasonable at this time, especially when GELATT, et al. (1977) used the human tables for dog and SLATTER (1981) used the canine tables for cat. However, we believe that, the eyes of dog are more similar to those of goat in the above mentioned character, than that of cat.

Serious complications, such as anterior vitreous presentation and iris prolaps may follow increased intraocular pressure during surgical procedure. Acute increases in IOP can be avoided by proper choice of drugs for sedation and general anaesthesia.

Most sedatives, tranquilizers and central nervous system depressents reduce IOP to a variable degree (ROBERT, 1981 and TRIM, et al. 1985). The fall in IOP may result from depression of diencephalic centers, fall in arterial blood pressure, relaxation of extraocular muscles, and changes in pupil size (SELF and ELLIS, 1977) or the depression effects of the central controlling areas for IOP, and increased facility for aqueous drainage has also been observed (STONE and PRIJOT, 1955 and KORNBIUETH, et al. 1959).

In the present investigation, the IOP was reduced significantly after xylazine injection in the animals of group I in agreement with the same results documented by GELATT, et al. (1977) in dog and by McCLURE, et al. (1976) and TRIM, et al. (1985) in horse.

In the animals of group II, previously injected with xylazine, the IOP began to increase gradually just after the administration of ketamine. The same elevations of the IOP have been demonstrated by GELATT, et al. (1977) in dogs and by CORSSEN and HOY (1967) and DUNCALF (1975). It is known that, ketamine is a hypertensive drug in human and in domestic animal. The correlation between IOP

and systemic blood pressure were studied and discussed by some authors (CORSSEN and HOY, 1967; HEILMANN, 1974 and GELATT, et al. 1977).

CORSSEN and HOY (1967) found no statistical correlation between increases in arterial pressure and increases in IOP after ketamine in human. SLATTER (1981), stated that ketamine possibly inducing spasm of the extraocular muscles which increased the IOP. Therefore, when TRIM, et al. (1985) blocked the auriculopalpebral nerve in horse, in combination with ketamine and xylazine injection may be eliminate the eyelid tension and no change in IOP occured, but in some cases the IOP decreased.

Other factors which increase IOP are hypercapnia and hypoxaemia (TRIM, et al. 1985), xylazine and ketamine anaesthesia in horses results in only a small increase in Pa $CO_2$ and decrease in Pa $O_2$ (MUIR, et al. 1977). This reason may be also, lead to increase of IOP after ketamine injection.

In conclusion it should be emphasized that ketamine must not be indicated for animals prepared for intraocular surgery, while xylazine can be recommended as a good anaesthetic agent at a dose rate of 0.5 mg/kg b.w. for goats with optimum lowering of IOP for anterior segment ophthalmic operations.

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Table (1)
Average of normal intraocular pressure in mmHg in goats

| No. | O.S. | O.D. | Average |
|---|---|---|---|
| 1 | 33.9 | 33.9 | 33.90 |
| 2 | 35.4 | 33.9 | 34.65 |
| 3 | 38.5 | 38.5 | 38.50 |
| 4 | 38.5 | 36.8 | 37.65 |
| 5 | 36.8 | 36.8 | 36.80 |
| 6 | 33.9 | 35.4 | 34.65 |
| 7 | 35.4 | 36.8 | 36.10 |
| 8 | 38.3 | 38.3 | 38.30 |
| 9 | 35.4 | 33.9 | 34.65 |
| 10 | 38.3 | 40.0 | 39.15 |
| 11 | 40.0 | 40.0 | 40.00 |
| 12 | 40.0 | 40.0 | 40.00 |
| 13 | 38.3 | 38.3 | 38.30 |
| 14 | 35.4 | 32.6 | 34.00 |
| 15 | 36.8 | 35.4 | 36.10 |
| 16 | 33.9 | 35.4 | 34.65 |
| 17 | 35.4 | 35.4 | 35.40 |
| 18 | 35.4 | 35.4 | 35.40 |
| 19 | 34.1 | 33.9 | 34.00 |
| 20 | 33.9 | 34.1 | 34.00 |
| 21 | 34.1 | 34.1 | 34.10 |
| 22 | 36.8 | 36.8 | 36.80 |
| 23 | 38.3 | 36.8 | 37.55 |
| Av. | 36.38 | 36.20 | 36.29 |
| S.D. | 1. 99 | 2. 14 | 1. 99 |

O.S. = Right eye
O.D. = Left eye
Av. = Average

IOP

Table (2): IOP in normal and after xylazine injection in goats

| No | Normal | | 5 Min.Postinj. | | 20 Min.Post inj. | | 35 Min.post inj. | | 50 Min.Post inj. | | 65 Min.Postinj. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. |
| 14 | 35.4 | 32.6 | 25.5 | 25.5 | 23.9 | 23.4 | 24.2 | 23.4 | 25.1 | 24.6 | 31.4 | 31.4 |
| 15 | 36.8 | 35.4 | 28.8 | 30.3 | 25.5 | 24.6 | 28.8 | 26.8 | 28.8 | 27.4 | 32.6 | 31.4 |
| 16 | 33.9 | 35.4 | 28.8 | 31.4 | 27.4 | 30.3 | 26.8 | 26.8 | 27.4 | 27.4 | 30.1 | 30.1 |
| 17 | 35.4 | 35.4 | 27.4 | 28.8 | 27.4 | 26.8 | 26.8 | 28.8 | 31.4 | 30.1 | 34.1 | 34.1 |
| 18 | 35.4 | 35.4 | 22.7 | 22.7 | 24.2 | 23.9 | 24.2 | 23.9 | 24.2 | 23.9 | 25.1 | 25.1 |
| 19 | 34.1 | 33.9 | 27.4 | 26.8 | 26.1 | 25.1 | 24.6 | 24.6 | 25.1 | 27.4 | 32.6 | 31.4 |
| 20 | 33.9 | 34.1 | 23.4 | 24.2 | 23.9 | 23.4 | 23.4 | 23.9 | 24.6 | 25.5 | 31.4 | 32.6 |
| 21 | 34.1 | 34.1 | 24.6 | 23.9 | 21.9 | 21.9 | 22.7 | 23.4 | 24.2 | 24.6 | 32.6 | 33.9 |
| 22 | 36.8 | 36.8 | 30.1 | 28.8 | 23.4 | 24.2 | 25.5 | 25.1 | 27.4 | 30.1 | 32.6 | 32.6 |
| 23 | 38.3 | 36.8 | 31.4 | 30.3 | 27.4 | 27.4 | 24.6 | 24.2 | 27.4 | 27.4 | 31.3 | 30.1 |
| Av. | 35.41 | 34.99 | 27.01 | 27.27 | 25.11 | 25.10 | 25.36 | 25.09 | 26.56 | 26.84 | 31.38 | 31.27 |
| | 35.20 | | 27.14 | | 25.10 | | 25.22 | | 26.70 | | 31.32 | |

Table (3): IOP in normal and after xylazine and ketamine injection in goats

| No | normal | | 5 Min.Post xylazine inj. | | just post ketamine inj. | | 5 Min.Post ketamine inj. | | 10 Min.Post ketamine inj. | | 15 Min. Post ketamine inj. | | 20 Min.Post ketamine inj. | | 25 Mint.Post ketamine inj. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. | O.S. | O.D. |
| 7 | 36.8 | 36.8 | 24.6 | 24.6 | 30.1 | 31.4 | 31.4 | 31.4 | 32.6 | 34.1 | 35.4 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 |
| 8 | 38.3 | 38.3 | 28.8 | 27.4 | 31.4 | 30.1 | 33.9 | 32.6 | 33.9 | 32.6 | 33.9 | 32.6 | 35.4 | 35.4 | 36.8 | 36.8 |
| 9 | 35.4 | 33.9 | 25.5 | 25.5 | 34.1 | 32.6 | 33.9 | 32.6 | 34.1 | 34.1 | 35.4 | 36.8 | 35.4 | 36.8 | 36.8 | 36.8 |
| lo | 38.3 | 40.0 | 31.4 | 32.6 | 33.3 | 38.3 | 35.4 | 36.8 | 35.4 | 35.4 | 35.4 | 35.4 | 36.8 | 38.3 | 38.3 | 38.3 |
| 11 | 40.0 | 40.0 | 30.1 | 31.4 | 38.3 | 38.3 | 38.3 | 38.3 | 38.3 | 38.3 | 38.3 | 38.3 | 38.3 | 38.3 | 40.0 | 41.6 |
| 12 | 40.0 | 40.0 | 30.1 | 31.4 | 40.0 | 40.0 | 36.8 | 38.3 | 36.8 | 36.8 | 38.3 | 38.3 | 40.0 | 40.0 | 41.6 | 41.6 |
| Av. | 38.1 | 38.2 | 28.4 | 28.8 | 35.4 | 35.1 | 35.0 | 35.0 | 35.2 | 35.2 | 36.1 | 36.3 | 37.1 | 37.6 | 38.4 | 38.7 |
| | 38.1 | | 28.6 | | 35.2 | | 35.0 | | 35.2 | | 36.2 | | 37.3 | | 38.5 | |

O.S.= Right eye
O.D.= Left eye
inj.= Injection
Av. = Avarege

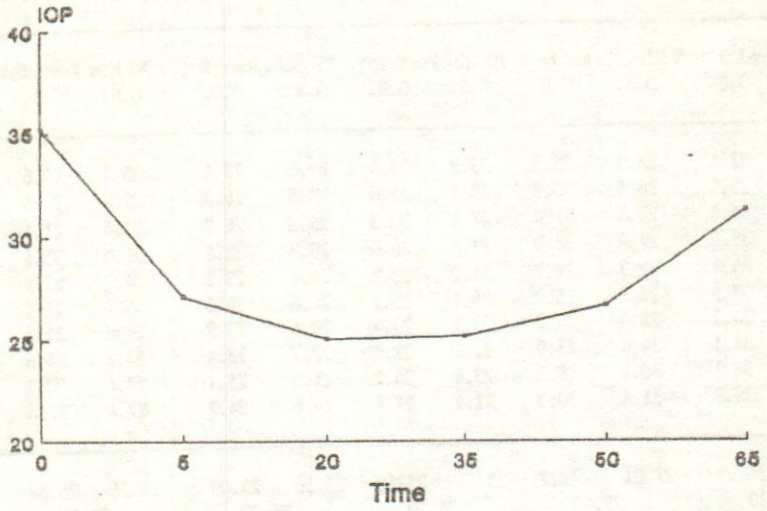


Fig. (1)
Showing the changes in IOP in goats (Group I received xylazine)

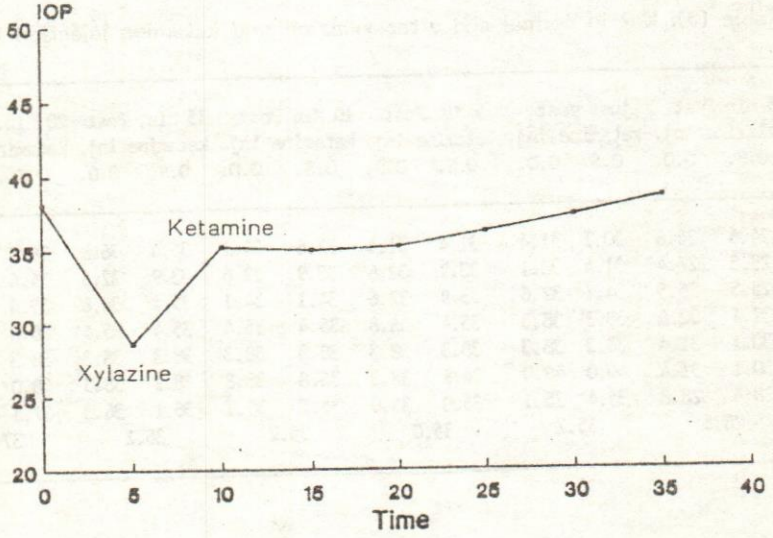


Fig. (2)
Showing the changes in IOP in goats (Group II received xylazine-ketamine)