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Xylazine-Lidocain Combination for Retrobulbar Block in Goats

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Abstract

Objective- This study was performed to investigate the analgesic effects of lidocaine, xylazine and lidocaine/xylazine combination in eye regional anesthesia.
Design- Experimental Study.
Animals- Twenty adult goats were randomly designed in 4 groups.
Procedures- In group L: 10 ml mixture of lidocaine 2% (5 mg/kg bw) and normal saline, In group LX: 10 ml mixture of lidocaine 2% (5 mg/kg bw), xylazine 2% (0.05 mg/kg bw) and normal saline, In group X: 10 ml mixture of xylazine 2% (0.05 mg/kg bw) and normal saline and In group C: 10 ml of normal saline were injected into the retrobulbar space of left eyes via four point method. Onset and duration of eyelids analgesia and glob analgesia/akinesia were compared between the groups.
The images were studied serially and compared anatomically with two dissected head and intact goat skulls.
Results- The results of this study demonstrated that eye regional anesthesia have not been observed in group C. In group X, sedative effect of xylazine without complete loss of eyelids and glob anaesthesia was observed. There was no significant difference in onset of eyelids and glob anaesthesia between groups L and LX ($p>0.05$). Duration of eye regional anesthesia in group LX was significantly more than group L ($p<0.05$). The animals in groups X and LX were sedated during the study but in group L the animals were alert and nervous.
Conclusion and Clinical Relevance- According to results of present study, addition of xylazine to lidocaine for retrobulbar block causes a sedative effect and increased duration of eye regional anesthesia.
Key Words- Retrobulbar block, Lidocaine, Xylazine, Goat.

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Introduction

Local analgesia techniques are highly useful in sheep and goat practice because equipment involved is inexpensive, cardiovascular and respiratory depression are less than produced by general anesthesia, and the risk of regurgitation and aspiration is decreased.[1] Goats have a low pain threshold and require analgesia and sedation for surgical and manipulative procedure.[2]
Regional anesthesia is desensitization by blocking the major nerve(s) to a given region with analgesic agent. One of the most analgesic agents that most commonly used in ruminants is (2%) lidocaine hydrochloride.[2,3]
Many of ophthalmic surgery in food animal are performed under regional anesthesia such as retrobulbar block. Retrobulbar injection of local anesthetic provides akinasia of extraocular muscles (motor paralysis of oculomotor, trochlear and abducent nerves) and also analgesia of cornea, nictitans, conjunctiva and eyelids (paralysis of trigeminal sensory nerve branches) as these nerves emerge from the foramen orbitorotundum.[1,4]
Xylazine is used mainly intravenously or intramuscularly. These routes of administration frequently cause untoward effects, such as bradycardia, hypotension and hypoxaemia in ruminant. These side effects are only minimally exhibited after epidural administration.[5]
Recently, combination of a local anesthetic agent and an alpha-2 adrenergic agonist have been administered in order to achieve analgesia with a longer duration in human,[6-9] and veterinary medcine.[5,10-13]
Combination of xylazine and lidocaine was routinely administered for epidural analgesia in some animal species such as dogs, cows, horses, sheep, goats and llamas.[5,10,12,14-17] Administration of mixture of clonidine (alpha-2 adrenergic agonist) and local anesthetics prolongs anesthesia and analgesia in various neural block, as well as duration of retrobulbar block in human medicine.[7,8]
To date, however, there is no document about the effects of combination of alpha-2 adrenergic agonist (Xylazine hydrochloride) and local anesthetics (Lidocaine hydrochloride) drugs on eye regional anesthesia in animal practice.
The aim of this study was to compare the effects of the retrobulbar administration of xylazine and lidocaine mixture in goats with regard to onset time, duration of retrobulbar block and patients' comfort.

Materials and Methods

Twenty adult male and non gravid female of Rayan goats with body weight ranged from 18.500-22.00 kg were used in the trial. The animals were housed in a goat pen and maintained on grass (hay) supplemented with concentrate. Drinkable water was mad freely available. Just before the commencement of the experiment, the goats were judged to be in good health based on clinical and ophthalmic examination and hematological evaluation.
Twenty goats were randomly designed in four groups. Group L involved retrobulbar administration of lidocaine hydrochloride 2% (Pasteur Institute of Iran, Batch No: 86-347), Group LX involved retrobulbar administration of mixture of lidocaine and xylazine hydrochloride 2% (Alfasan, Woerden-Holland, Batch No: 087238-3), Group X involved retrobulbar administration of xylazine hydrochloride 2% and Group control (C) involved retrobulbar administration of sterile saline. Retrobulbar injection was carried out on the left eyes of all cases and then eye regional anaesthesia in the left eyes was compared with right eyes.

In group L, the animals were treated with lidocaine (5 mg/kg bw), in group LX, they were treated with combination of lidocaine (5 mg/kg bw) and xylazine (0.05 mg/kg bw) and In group X, the animals were treated with xylazine (0.05 mg/kg bw). The medications dosage in groups L, LX and X was diluted in sterile saline to a final volume of 10 ml. In group C, the goats were treated with 10 ml of sterile saline.

For each trial, the goat was positioned in lateral recumbency. The eyelids regions were prepared for aseptic retrobulbar injection. The four-point retrobulbar block was performed by injecting through the eyelids, both dorsally and ventrally, and at the medial and lateral canthi. A 20 – gauge, 7.5 cm, slightly curved needle was directed to the apex of the orbit. 10 ml of medications were injected, divided into 2.5 ml per site. After drug injection, the goats were placed on standing position and observed for any drug-induced side effect.

In this study, eyelids analgesia and glob analgesia/akinesia were considered as indices for eye regional anaesthesia following retrobulbar block.

To evaluate eyelids analgesia the palpebral reflex was tested. The presence of the palpebral analgesia was taken as lack of responses to haemostat pressure or pinching (haemostat was closed to the first ratchet) on the skin of both the medial and lateral canthi. In normal eyelids, the painful stimulus to the canthi should result closure of eyelids.

To assessment of glob analgesia/akinasia, the corneal reflex was tested by touching the cornea with sterile cotton tip swap. In unanesthetized cornea this test should result in closure of the eyelid and retraction of glob.

These indices that calculated for each goat were defined as follows:

1- Time to onset of regional anesthesia: time interval (in minute) from retrobulbar injection of drug to loss of corneal and palpebral responses.

2- Duration of analgesia: time interval (in minute) from the onset of loss of responses to return of responses.

The mentioned indices were evaluated immediately after injection and then repeated every five minutes until sensation returned. When the animal showed positive response to the reflexes, the time was recorded as return of sensation (end of anaesthesia).

Data were expressed as means (± SE) for each group. Time to onset and duration of eye regional anesthesia were compared using One Way ANOVA between the groups. A p value less than 0.05 were considered significant.

Twenty four hours and one week after experiment, all goats' eyes were inspected clinically and using ophthalmic examinations by direct ophtalmoscopy for probably ophthalmic disorders due to the retrobulbar injection.

Results

No side effects such as eyelids and glob paralysis, visual disorders, intraocular and intraorbital hemorrhage were observed 24 hours and one week after retrobulbar injection in all goats, based on clinical and ophthalmic examinations by direct ophtalmoscopy. During the experiment, all goats were in standing position and no recumbent case was observed.

Results of this study showed that in group C, there weren't any corneal, palpebral analgesia in the left eye following injection of 10 ml normal saline and also the right eyes were completely normal.

In group X, complete loss of corneal and palpebral anaesthesia didn't occurred following retrobulbar injection of xylazine (0.05 mg/kg bw), but severity of responses to palpebral and corneal reflexes remarkably were decreased in left eyes. In the right eyes a little decrease in sensation level was observed in cornea and eyelid after injection of xylazine in left eye.
There were no significant differences in time to onset of corneal and palpebral anaesthesia between groups L and LX ($p>0.05$). Regional eye anaesthesia occurred immediately after 4th injection in four point method in the left eyes of all cases in these two groups. The right eyes in group L were normal but in group LX slight decrease in corneal and palpebral sensation was observed during the study.
The calculated retrobulbar anesthetic indices showed that onset of corneal response after injection was significantly shorter with lidocaine (114±10.17 min) than lidocaine/xylazine mixture (144±13.07 min) ($p<0.05$). Onset of palpebral reflex was significantly shorter with lidocaine (77±3 min) than Lidocaine/xylazine mixture (102±5.61 min) ($p<0.05$) (fig 1, 2).
The animals that treated with xylazine and also lidocaine/xylazine mixture were calm and sedated with easy to manipulation during the study but animals that treated with lidocaine were nervous and turbulent.

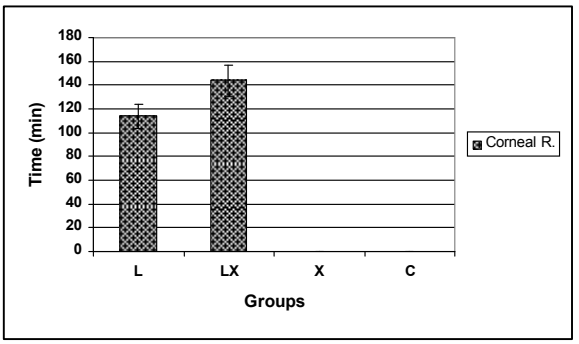

Figure 1. Mean (± Std Error) duration of glob analgesia/akinesia (min) following retrobulbar injection of lidocaine (L), xylazine (X), lidocaine/xylazine mixture (LX), normal saline (C).

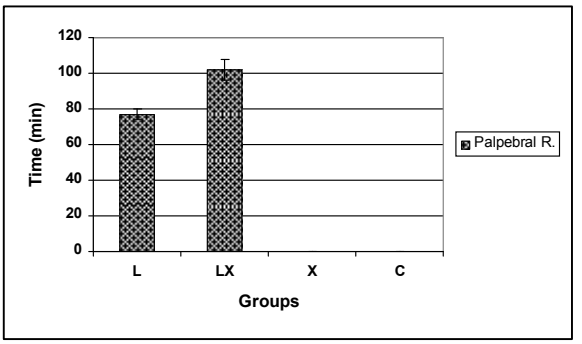

Figure 2. Mean (± Std Error) duration of palpebral analgesia (min) following retrobulbar injection of lidocaine (L), xylazine (X), lidocaine/xylazine mixture (LX), normal saline (C).

Discussion

A proper technique in retrobulbar regional anesthesia blocks all structures for sensory and motor function of the eye, except for the lid. Paralysis of the eyelids (akinasia) is performed by desensitizing the auriculopalpebral branches of facial nerve that runs from the base of the ear along the facial crest.[1,17] In the present study, the medications were injected just in the retrobulbar space and eyelids akinasia (auriculopalpebral nerve block) was not performed.
Following the retrobulbar injection of anesthetic agents, eyelids and glob analgesia occurs by blocking of the ophthalmic and zygomatic branch of the trigeminal sensory nerve. These branches innervate the skin of upper and lower eyelids and glob. Retrobulbar anesthesia also blocks trochlear, oculomotor and abducens motor nerves that are responsible for glob movement. Lack of corneal reflex following retrobulbar injection of anesthetics occur due to the blocking of

trigeminal sensory nerve (corneal analgesia) and also blocking of trochlear, oculomotor and abducens motor nerves (glob akinasia).[4]

In current study, eyelids analgesia was determined by palpebral reflex and glob analgesia/akinasia was tested by corneal reflex. These reflexes were considered as indices for regional eye anesthesia.

In this study, following induction of pain in normal eyelid, the goats were showing blink reflex associate with head shaking, and also in response to the cornel touching with swap were showing blink reflex, glob retraction. But, all reflexes immediately were lost after retrobulbar injection of lidocaine and lidocaine/xylazine mixture.

In present study the dosage of lidocaine was 5 mg/kg and xylazine was 0.05 mg/kg for retrobulbar anesthesia in goats. It is important to use as small amount of lidocaine (maximum dose of 10 mg/kg) as possible in goats because of their extreme sensitivity to lidocaine toxicity.[18] In general, a dosage of 6 mg/kg of lidocain in goat found to be safe.[1] Smith (2009) stated that 5 mg/kg of lidocaine should be safe in goats.[3] Administration of lidocaine in excess of 10 mg/kg can result in sufficiently high blood levels to cause cardiovascular depression and central nervous system stimulation.[1]

Ruminants are very sensitive to xylazine injection. Sheep and goats are more sensitive than cattle to xylazine's sedative effects.[18] The adequate dose for intramuscular xylazine administration in goats is 0.1- 0.3 mg/kg and via intravenous is 0.05-0.1 mg/kg.[17] To the authors' knowledge there is no document in current veterinary surgery literatures about dosage of lidocaine and/or xylazine for retrobulbar block in goats. For this reason, in present study the low dosage recommended of lidocaine and xylazine in goat was applied.

The results of the present study showed that retrobulbar administration of xylazine with lidocaine mixture prolonged the eyelid analgesia and cornea analgesia/akinesia in compare with lidocaine alone, although there was no difference in onset time.

Lidocaine induced analgesia by inhibiting propagation and conduction of nerve impulses through blockade of sodium channels in the cell with subsequent prevention of depolarization,[19] while xylazine induces analgesia through local anesthesia action and an alpha-2-adrenergic mechanism.[20] Co-administration of alpha-2-agonists and local anesthetics provide prolonged analgesia in human, horses, llamas and doges.[21] The exact mechanism by which alpha-2-agonists induced prolongation of analgesia is not known.[5] The possible mechanism of an alpha-2-agonist induced prolongation of analgesia is through adrenoceptor mediated vasoconstrictors and inhibitions of local anesthetic vasodilatory effects and consequently delay subsequent vascular uptake.[21-24] The prolongation of sensory blockade could also be explained by synergism between the antinociceptive effects of xylazine and the neural blocking action of lidocaine.[10] Alpha-2-agonists induced analgesia may intensify and prolong the lidocaine-induced sensory blockade through a pre or post-synaptic alpha 2-mediated mechanism and/or an alpha 2-agonist effect on arterioles.[21,24]

In veterinary medicine, combination of lidocaine and xylazine was employed in various species. The mixture of lidocaine and xylazine was applied to local anesthesia of corneal nerve in large and unruly calves for dehorning operation.[18] The Combination of lidocaine and xylazine administered extradurally to buffaloes produced an effective, safe, with more rapid onset of longer perineal analgesia, when compared with either agent alone.[21] Epidural administered mixture xylazine/lidocaine was shown to induce safely prolonged analgesia in sheep and dairy cattle.[5,11,14] Subarachnoid administration of the combination of xylazine and lidocaine produce

prolongs analgesia in goats. Despite the prolong analgesia, using this combination is desirable for relieving postoperative pain.[12] The proposed mechanism of action of epidurally administered alpha-adrenergic agonists involves the binding to spinal cord receptors in the dorsal horn, resulting in the inhibition of noxious stimuli, mediated by substance P.[13]

In human medicine, there are many researches about addition of clonidine (as an alpha 2-agonist agent) to local anesthetics mixture in order to prolong the duration of anesthesia and analgesia of retrobulbar and peribulbar blocks. Mixture of lidocaine and clonidine for retrobulbar block casuse a decrease in intraocular pressure, a sedative effect and prolongation of eye anesthesia.[8] Addition of clonidine to the lidocaine mixture produces a significant increase in duration of anesthesia and analgesia with minimal side effects.[7,9] The interaction of clonidine with local anesthetics is dose-dependent prolongation of anesthesia and analgesia after neural block.[7]

In the present study slight analgesia of right eyes in groups X and XL may be due to the systemic absorption of xylazine. Xylazine induce sedation and analgesia via their central effects.[1] In this study retrobulbar administration of xylazine was induced higher analgesia levels (in the left eyes) in compare with systemic absorbtion of xylazine (in the right eyes). The oral administration of clonidine alone in compare with peribulbar administration of clonidine, did not enhance anesthesia or analgesia in human eye, suggesting a local mechanism of action of clonidine.[25] Caron and Leblanc showed that analgesia level of perineum due to the IM administration of xylazine was significantly less than epidural administration of xylazine in cattle.[26]

Retrobulbar injection of 10 ml normal saline could not induce any regional eye anesthesia. Therefore injection of 10 ml of solution didn't make pressure on the nerves that located in retrobulbar space. Consequently, in this study solution volume didn't play a major role for induce of eye regional anesthesia.

In veterinary ophthalmic surgery adequate restrain of patients during the accurate ophthalmic examination and critical operation such as corneal suturing to prevent of iatrogenic trauma is very important. Based on the results of current experiment, addition of xylazine to local anesthetics provide a better condition for the surgeon to do a fine operation and/or examination because of sedative effect of xylazine and its prolongation effect in eye regional anesthesia. Furthermore, in retrobulbar injection of xylazine, systemic absorption of this agent decreases and risk of its side effects diminishes in ruminant.

According to the results of present study addition of xylazine to lidocaine for retrobulbar block causes a sedative effect and increased duration of regional eye anesthesia without any ophthalmic disorders.

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چکیده:

مطالعه اثر ترکیب داروهای زایلازین و لیدوکائین بر بی حسی موضعی در بی حسی خلفی کره چشم (Retrobulbar block) در بز

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هدف- این مطالعه به منظور بررسی اثر ترکیب دارویی لیدوکائین و زایلازین در مقایسه با تزریق لیدوکائین به تنهایی در بی حسی ناحیه خلفی کره چشم در بز نژاد انجام شد.

طرح مطالعه – مطالعه تجربی بر روی موجود زنده

حیوانات- در این مطالعه از ۲۰ راس بز نژاد رائینی سالم و بالغ که به طور تصادفی به ۴ گروه ۵ تایی تقسیم شدند استفاده گردید.

روش کار- در گروه L میزان ۱۰ میلی لیتر از ترکیب لیدوکائین ۲٪ (۵mg/kgbw) و نرمال سالین، در گروهLX میزان ۱۰ میلی لیتر از مخلوط لیدوکائین ۲٪ (۵ mg/kg bw) و زایلازین ۲٪ (۰/۰۵mg/kg bw) به همراه نرمال سالین، در گروه X میزان۱۰ میلی لیتر از مخلوط زایلازین ۲٪ (۰/۰۵mg/kg bw) به همراه نرمال سالین و در گروه C میزان ۱۰ میلی لیتر از نرمال سالین در فضای خلفی کره چشم تزریق به روش Four point صورت گرفت. زمان شروع و مدت زمان بی حسی پلک ها و بی حسی و بی حرکتی کره چشم بعد از تزریق داروها در بین گروه ها مورد مقایسه قرار گرفت.

نتیجه گیری و کاربرد بالینی- نتایج حاصل از این مطالعه نشان داد که تزریق نرمال سالین در ناحیه خلف کره چشم هیچ اثری در بی حسی چشم و پلک ها نداشته است. همچنین تزریق زایلازین نیز تاثیر چندانی در ایجاد بی حسی چشم و پلک ها نداشت، ولی علائم آرام بخشی در حیوانات مشاهده شد. در این مطالعه بلافاصله بعد از تزریق داروی لیدوکائین به تنهایی و همچنین ترکیب لیدوکائین و زایلازین در خلف کره چشم، اثر بی حسی شروع شد و هیچ تفاوت معنی داری در زمان شروع بی حسی بین این دو گروه دیده نشد($P>۰/۰۵$). اما مدت زمان بی حسی و بی حرکتی کره چشم و بی حسی پلک ها در گروه LX به طور معنی داری طولانی تر از گروه L بوده است ($P<۰/۰۵$). علاوه بر این حیوانات در گروه Xدر طول مطالعه کاملاً حالت آرامش و خواب آلودگی داشتند. در صورتی که در گروه L حیوانات بسیار آشفته بودند.

بر طبق نتایج این مطالعه اضافه نمودن ۰/۰۵ mg/kg داروی زایلازین به داروی بی حسی لیدوکائین، در تزریق ناحیه خلفی کره چشم می تواند مدت زمان و شدت بی حسی چشم را افزایش دهد.

کلید واژگان بی حسی خلفی کره چشم، لیدوکائین، زایلازین، بز.