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COMPARATIVE EFFICACY OF XYLOCAINE HCL AND BUPIVACAINE HCL FOR OPHTHALMIC ANESTHESIA IN HORSES

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Ophthalmic surgical procedures can be performed by many clinicians in horses using local nerve blocks by using local anaesthetics for short duration of action for completion of these procedures. These surgical procedures may involve exclusion of third eyelid, suturing of laceration around eye orbit and tumor which can be caused due to any reason with in time period of thirty minutes. Inner chamber centesis can be done easily by using the above mentioned technique in standing horse. There are numerous benefits of doing standing surgical methods and avoiding general anaesthesia in horses. As hospitalizing horse may get other infectious diseases from surroundings like colitis and laminitis and also injured it when recovering from general anaesthesia. On the other hand standing surgical procedure reduced such complication by using local anaesthetic for short duration.
Keywords: anaesthesia, horse, centesis, surgical

Equine have been utilized in numerous ways since time centuries old. They are used for show dancing, tent pegging, joy riding, polo, racing and for official duties and for guard by the police, army, rangers, transportation of goods and for breeding purposes. It is the only mean of transport of ration and ammunition of army in the hilly areas of Pakistan. A number of people depend upon them for their livelihood and the population of equine in Pakistan is 4.9 Million (Economic Survey of Pakistan 2005-06).

The eye is a paired important organ of sight. The eye consists of different parts that enable horses to take stimulus of light from the surroundings, and convey these inducements towards the Brain as electrical wave. Visualization comprises all constituents of the eye. The eye is secured by superior and inferior lids; in addition to a third eyelid, nictitating membrane and tear glands are situated below eyelid. The anterior part of the eye itself is protected through a skinny, clear covering called the cornea. The rest of the eye is shielded with thick white tissue, the sclera. The edge of the cornea and the sclera is entitled the limbus. The conjunctiva is the tissue which cast back from the inside of the eyelids against the globe. Glands which yield tears are also found in the conjunctiva (Gregory L. et al. 2009).

It is significant to inspect horse eyes on a repetitive basis. Frequent analysis permits one to become aware with the standard appearance of the eye, so any irregularities will be observed proximately. Symptoms of an eye problem differ greatly and may consist of cloudiness, tearing, peering, liberation, inflammation, blinking, enlargement, as increase in blood vessels, or variations in the size or shape of the pupil. Horses may go and rub the eye on things in an attempt to release irritation and burning. Any conversion in the eye or nearby tissue may sign a problem and would be a reason for concern.

Eyes are much sensitive organs that are vulnerable to numerous problems. Just like homo sapiens, horses experience the same distress and irritation that people feel with eye difficulties. The most common eye problems occurred in horses comprise traumatic injuries, corneal complications, uveitis or, cancer on or around eye, internal eye inflammation and cataracts. Many of these problems and some other serious conditions produce similar signs.

Such eye problems can be corrected by adopting special surgical procedures and

these procedures are frequently inadequately tolerated by the horse and may produce potentially violent escaping behavior, preventing safe conclusion of the practice. In addition, because of high cost and increased risk of morbidity along with mortality due to general anaesthesia, many surgeons prefer to use local anaesthetics for eye problem correction for saving time in standing sedated horse.

Bupivacaine HCL may give an ideal local eye anaesthesia compare to Xylocaine HCL for standing surgical procedures in horses.

MATERIALS AND METHODS

By the use of Peri-ocular nerve block the procedure which can be performed was sub palpebral lavage passage along with corneal and conjuctival surgeries by using deep sedation. For this purpose anaesthetic commonly used are: Mepivacaine HCL 2% (Intraepicaine®) and lidocaine hydrochloride having adrenaline (Locaine 2%®, Lignol2 %®) Injected by using 25 gauge 5/8 needle. As auriculopalpebral nerve technique blocks motor nerve, the desensitization of cornea and conjunctiva cannot be achieved. Perioccular skin can be desensitized by supraorbital, zygomatic and infratrochlear nerve block techniques (Christiane Kafarnik 2011).

Intraoccular surgery can be performed by the depth of anaesthesia to eye. In this study general anaesthesia along with rocuronium is used for estimation of eye ball positioning under relaxation of muscle. For this purpose horses were arranged from different sources having body weight 480±62kg; age 12.6±6.2 years. Xylazine, acepromazine and butorphanol were used as pre-anaesthetic where as maintenance anaesthetic were ketamine and diazepam. Anaesthesia for this purpose was 0.6 mL/kg/h of midazolam, ketamine, and xylazine along with Isoflurane (Gas Anaesthetic) in 100% oxygen, diluted in 500ml 0.9 % NaCl. Ventilation was intravenously injected. Acceleromyograph (TOF-Guard®) and the N. peroneus surface is mixed after 15 seconds with four stimulation model for assessment of neuromuscular function. stirred every 15s with a train-of-four stimulation model. Rocuronium induction was I/V at dose of 0.3mg/kg. Eyeball position was also checked. Complete neuromuscular block in horses were produced by rocuronium at dose rate of 0.3 mg/kg. induction time was 2.38±2.02min (range 0.5-8) duration of anaesthesia was 32±18.6min (range 7.7 76.2) respectively. 31±2.8s was the time period of globe to come to centre, whereas iris was sighted after 42±7.7s in all horses. Additional dose of rocuronium was not required. For ophthalmic surgeries in equine rocuronium bromide can be used for neuromuscular blockage (Auer and Moens 2011).

The study was designed to check out the placing of subpalpebral lavage system medially into inferior eyelid of horse to explain method of placement and degree of complication in this procedure. For this procedure in between the lower eyelid and anterior surface of nicitation a footplate was set in the medial pto explain method of placement, and frequency and degree of complications linked with a sub portion of inferior conjectival fornix. So that inferio-medial subpelbebral lavage (ISPL) tube is placed. By using this method 92 system were placed in 86 horses and tested in 31 month period. 59 % horses were sedated with regional anesthesia for tube placement. On an average tube placement duration was 19 days. 71 horses having ISPL tube were treated for 55 days in hospital. The non-ocular complications which were noted include ISPL system damage (38%), tube dislocation from conjectival fornix (18%), resuturing of horses head (14%) damaged injection port (6%). On the other hand the ocular complication (inferior eyelid) swellings were measured 3%. 88% horses maintain their vision. Placing ISPL system is quite easy and for unlimited time when compared with subpelbebral lavage tube. Such complications are considered rare (Elizabeth et. al.2003).

Ophthalmic complication which can be treated in sedated standing horse include eyelid repair, nictitating membrane surgeries, excision of tumor and corneal foreign bodies. Xylazine is best sedative with or without combination of

acepromazine. Local anesthetic blocks can be used for achieving additional loss of pain. For perfect surgery different local anesthetic blocks can be used for ophthalmic procedures. Lidocaine or detomidine can provide best standing sedation with butorphenol. Although NSAID give analgesia for short duration as well as long duration but the use of local anesthetic is more important. Opiods administered topically provide good analgesia. The development through the study is to use opiod antagonists for corneal ulcer therapy in future (Robertson S.A 2008).

Study design:

The present study was designed and compiled to assess the effectiveness of two local eye anaesthetics; Xylocaine HCL and Bupivacaine HCL by two different techniques (Retrobulbar and auriculopalpebral) in horses. The Twelve (12) clinical cases of horses presented at Inpatient Surgery Clinic-UVAS and SPCA were included in this study. These horses were subjected to two groups i.e. Group A and B. These groups were further subdivided into two subgroups i.e. Group AI, AII and BI, BII respectively. Clinical cases of group A were administered Xylocaine HCL through two different techniques. In subgroup A1, Xylocaine HCL, was injected by auriculopalpebral technique and in subgroup AII, Xylocaine HCL was injected by Retrobulbar technique.

Similarly, clinical cases of group B were administered with Bupivacaine HCL through two different techniques. In subgroup BI, Bupivacaine HCL was injected by auriculopalpebral technique and in subgroup BII, Bupivacaine HCL was administered by retrobulbar technique. The efficacy of above mentioned local eye anesthetics were compared on following parameters a) Induction time

b) Duration time

c) Withdrawal time

d) Blink reflex

e) Papillary light reflex

Preoperative preparation:

The clinical cases presented were thoroughly examined for their health status through complete clinical examination.

- The horses were dewormed.
- The horses were critically examined especially for any other eye problem.
- The horses undergoing the study were adequately scrubbed by using pyodine scrub around the eye preventing flow inside eye.

After visualizing the ophthalmic anatomy, the local anesthetics (Xylocaine HCL and Bupivacaine HCL) were injected at the sites by auriculopalpebral and retrobulbar techniques respectively.

Ophthalmic Anaesthetic techniques

1) Auriculopalpebral
2) Retrobulbar

Equipments for Standing Surgical Procedure in Horse (Brian et al., 2002).

- Disposable Syringes (5 & 10 ml)
- Spinal Needle & Regular Needle
- Pre-anesthetic (Xylazine)
- Pyodene Eye scrub
- Lubricants
- Washer
- Shaver
- Surgical gloves
- Scalpel (blades)
- Sterile cotton buds and gauze
- Xylocaine HCL 2%
- Bupivacaine HCL 0.5%

Preparation of the surgeon:

For complete aseptic surgical conditions scrub suit, caps, masks, sweat bands, shoe covers, gowns and gloves were used to prevent micro-organisms and shed particles at surgical site.

Scrub suit usually consists of separate pant and shirt. Which is comfortable and dedicated for aseptic surgery? Head cover was worn to avoid the shedding of hair and bacteria during surgical procedures. Gown provides an aseptic barrier between the skin of the surgeon and patient. The gown is water resistant as well as comfortable. Surgical Gloves were made up of natural rubber latex and provided in a sterile, single use package. Gloves were

fitted tightly because if gloves are loose they could impair dexterity. Face masks are effective bacterial filters. When properly fitted, they redirect airflow away from the surgical wound and reduce the potential for surgical wound infection. Shoe covers help in keeping the surgeon feet dry and thus more comfortable during surgical procedures (Auer and stick 1999).

Preparation of surgical instruments:

All surgical instruments including drapes, scissors, forceps, needle holders, scalpel handles, tray, ophthalmic retractors etc. were sterilized in autoclave before the minor surgical procedures.

Techniques:

1) **Auriculopalpebral Technique (Group AI + BI):**

The auriculopalpebral block is the most helpful block to limit blephrospasm during examination. This procedure blocks some of the motor nerves of the upper eyelid and enables the examiner to control the horse's upper eyelid. The site of injection is situated 3cm below the highest point of the dorsal border of the zygomatic arch. A 5-cm 20-guage needle was inserted obliquely upward and inward to the dorsal border of the zygomatic arch (Pollock et al. 2008).

Group-AI:

Three horses were presented at surgical clinic, UVAS for eye examination and other complication. These cases were treated, using standing surgical ocular anaesthesia through auriculopalpebral technique as mentioned above. Site of anaesthesia was flushed with normal saline and explored to remove any foreign material. Site also scrubbed by using diluted povidone-iodine solution. After preparation, the horse was restrained in standing position with mild sedation using xylazine. After 5-10 minutes of pre anaesthetic injection, 2% Xylocaine HCL was injected at the respective site using the auriculopalpebral technique. The efficacy of the procedure was evaluated as per mentioned parameters (Induction time, Duration time, Withdrawal time, Blink reflex and Papillary light reflex).

Group BI:

Three horses having different complications regarding health were presented at outdoor clinic, UVAS. These cases were treated using standing surgical ocular anaesthesia through auriculopalpebral technique as mentioned above. Site of injection was flushed with normal saline and explored to remove any foreign material. Site also scrubbed by using diluted povidone-iodine solution. After aseptic preparation, the horse was restrained in standing position with mild sedation using xylazine. After 5-10 minutes of pre anaesthetic injection, 0.5% Bupivacaine HCL was injected at the respective site using the auriculopalpebral technique. Procedure was evaluated as per mentioned parameters i.e. Induction time, Duration time, Withdrawal time, Blink reflex and Papillary light reflex.

2) **Retrobulbar technique (Group AII + BII):**

The orbital fossa above the dorsal orbital rim and zygomatic arch was clipped and aseptically prepped with pyodine. A 22-gauge, 2.5-inch spinal needle was placed through skin perpendicular to the skull, in the orbital fossa, just posterior to the posterior aspect of the dorsal orbital rim. Needle was advanced posterior to the globe until it reached retrobulbar orbital cone. The needle was advanced until it just passes into the cone, evidenced by the sudden release of the eye back to normal position or a slight popping sensation. Aspiration was performed before injection (make sure the needle was not positioned with in blood vessel). Globe was pushed externally (indicating accurate placement of anesthetic) (Pollock et al. 2008).

Group A-II:

Three horses having compromised vision were presented at S.P.C.A, U.V.A.S Lahore. These cases were treated, using standing surgical ocular anaesthesia through Retrobulbar technique as mentioned above. Site was flushed with normal saline. Site also scrubbed by using diluted povidone-

iodine solution. After aseptic preparation, the horse was restrained in standing position with mild sedation using xylazine. After 5-10 minutes of pre anaesthetic injection, 4ml of 2% Xylocaine HCL was injected at the respective site using the Retrobulbar technique. The efficacy of the procedure was evaluated as per mentioned parameters (Induction time, Duration time, Withdrawal time, Blink reflex and Papillary light reflex).

Group B-II:

Three horses from S.P.C.A, U.V.A.S Lahore were presented. These cases were treated, using standing surgical ocular anaesthesia through Retrobulbar technique as mentioned above. Site was flushed with normal saline. Site also scrubbed by using diluted povidone-iodine solution. After aseptic preparation, the horse was restrained in standing position with mild sedation using xylazine. After 5-10 minutes of pre anaesthetic injection, 3ml of 0.5% Bupivacaine HCL was injected at the respective site using the Retrobulbar technique. The efficacy of the procedure was evaluated as per mentioned parameters (Induction time, Duration time, Withdrawal time, Blink reflex and Papillary light reflex).

Grading of papillary reflex

No Anaesthesia	(0)
Mild Anaesthesia	(1)
Moderate Anaesthesia	(2)
Ideal Anaesthesia	(3)

Evaluation of blink reflex

Presence of Reflex	(P)
Absence of Reflex	(A)

POST OPERATIVE MANAGMENT:

- The withdrawal time of both local anaesthetics was recorded and compared.
- Animals were kept in hygienic condition to observe any untoward effect.

Statistical Analysis:

The data were analyzed through Factorial Design (one factor factorial) using statistical package for social science (SPSS) version16.

Outcome:

Standing surgical procedure will lessen the time required for hospitalization compared with horses accepting general anaesthesia, less toxic, rapid recovery and cost effective. It will be novel approach for veterinary ophthalmologist worldwide.

RESULTS AND DISCUSSION

Three (3) Horses of group AI, anaesthetized with Local anaesthetics xylocaine HCL through auriculopalpebral route, following parameters were noted. The average Induction time was 6 minutes (Table-1) and the mean duration of anesthesia in all three (3) horses was 16.4 minutes (Table-2).

Horses of group AII, Anaesthetized with Local Anaesthetic Xylocaine HCL through retrobulbar route and following observations were noted. The average induction time for all three horses was 3.5 minutes (Table-1). The anesthesia was maintained for 20 minutes (Table-2)

In group BI, anaesthetized with Local anaesthetic Bupivacaine HCL through auriculopalpebral route, parameters were noted. Mean induction time was 5.2 minutes (Table 1). The duration of anesthesia on average was 35.7 minutes for all three (3) horses (Table 2).

Group BII, Anaesthetized with Local Anaesthetic Bupivacaine HCL through retrobulbar route, following observations were noted. For all three horses, the average induction time was 4.5 minutes (Table-1). The mean duration of anesthesia was 39.3 minutes (Table-2).

Group AI showed maximum mean induction time i.e. 6 minutes, while group AII showed minimum induction time i.e. 3.5 minutes. Statistical analysis showed the significant difference between group AI and AII. Data showed significant statistical difference between group BI and BII. Statistical results also showed significant between group A and B in terms of induction time. Our results showed rapid induction time with Xylocaine HCL injected through retrobulbar route.

Group BII showed maximum mean duration time i.e. 39.3 minutes, while group AI showed minimum duration time i.e. 16.4 minutes. Statistical analysis showed the significant difference between the groups A and B, also within the groups between AI, AII and BI, BII. Our results showed long

Table 1. Time of induction of eye anesthesia of horses in different treatment groups

Group	Local Anaesthetic used	Injection technique	Time of induction (Min)
AI	Xylocaine HCL (2%)	Auriculopalpebral	6
AII	Xylocaine HCL (2%)	Retrobulbar	3.5
BI	Bupivacaine HCL (2%)	Auriculopalpebral	5.2
BII	Bupivacaine HCL (2%)	Retrobulbar	4.5

Table 2. Duration of eye anesthesia of horses in different treatment groups

Group	Local Anaesthetic used	Injection technique	Duration (Min)
AI	Xylocaine HCL (2%)	Auriculopalpebral	16.4
AII	Xylocaine HCL (2%)	Retrobulbar	20
BI	Bupivacaine HCL (2%)	Auriculopalpebral	35.7
BII	Bupivacaine HCL (2%)	Retrobulbar	39.3

Table 3. Papillary light reflex during eye anesthesia of horses in different treatment groups.

Group	Local Anaesthetic used	Injection technique	Pupillary light reflex
AI	Xylocaine HCL (2%)	Auriculopalpebral	2
AII	Xylocaine HCL (2%)	Retrobulbar	1
BI	Bupivacaine HCL (2%)	Auriculopalpebral	1
BII	Bupivacaine HCL (2%)	Retrobulbar	N

0= No Anaesthesia, 1= sluggish (mild anesthesia), 2=moderately sluggish (moderate anesthesia), 3=complete absence of pupillary reflexes (ideal anaesthesia)

Table 4. Blink reflex during eye anesthesia of horses in different treatment groups.

Group	Local Anaesthetic used	Injection technique	Blink Reflex
AI	Xylocaine HCL (2%)	Auriculopalpebral	Absent
AII	Xylocaine HCL (2%)	Retrobulbar	Absent
BI	Bupivacaine HCL (2%)	Auriculopalpebral	Present
BII	Bupivacaine HCL (2%)	Retrobulbar	Present

Table 5. Withdrawal Time of eye anesthesia of horses in different treatment groups

Group	Local Anaesthetic used	Injection technique	Duration (Min)
AI	Xylocaine HCL (2%)	Auriculopalpebral	23
AII	Xylocaine HCL (2%)	Retrobulbar	32.5
BI	Bupivacaine HCL (2%)	Auriculopalpebral	55
BII	Bupivacaine HCL (2%)	Retrobulbar	54

duration time with Bupivacaine HCL injected through retrobulbar route.

The depth of anaesthesia was assessed by the intensity of various reflexes i.e. papillary light reflex and blink reflex. Papillary light reflex and blink reflex was recorded.

The effect of anaesthesia on papillary light reflexes were recorded as 1, 2, 3 and N. N represents complete absence of papillary reflexes (No anaesthesia), 3 represents ideal reflex, 2 represents moderately sluggish (moderate anesthesia) and 1 represents sluggish (mild anesthesia).

Horses of AI and AII anesthetized with Xylocaine HCL through both techniques(Auriculopalpebral & Retrobulbar) show 2 and 1 respectively, where as the horses of group BI and BII were given Bupivacaine HCL by auriculopalpebral and retrobulbar technique give result 1 and N respectively.

Horses of AI and AII anesthetized with Xylocaine HCL through both techniques showed absence of blink reflex in both groups which indicate the accuracy of anaesthetic technique as Xylocaine HCL execute sensory nerves, where as the horses of group BI and BII were given Bupivacaine HCL by auriculopalpebral and retrobulbar technique give result as presence of eye blink reflex during the study because Bupivacaine HCL achieve anaesthetic effect by altering the function of motor nerves.

The horses belonging to group AI shows the average withdrawal time of anesthesia i.e. 23 minutes. The animal of Group AII shows the average withdrawal time of anesthesia i.e. 32.5 minutes. This result show that using same anesthesia but with different technique results in different withdrawal time. In this study use of Xylocaine with retrobulbar technique show higher withdrawal time as compared to auriculopalpebral technique and the total difference of withdrawal time between these two techniques is 9.5minutes.

When using bupivacaine with two different techniques the results in this study show the average withdrawal time using auriculopalpebral technique is 54 minutes while the average withdrawal time using the retrobulbar technique is 55 minutes. This study shows no significant difference in total average withdrawal time when using bupivacaine irrespective of the above mentioned techniques. Group BI showed Statistical analysis showed the significant difference between group AI and AII. Data showed no significant statistical difference between group BI and BII. Statistical result also shows the significant difference between group A and B in terms of withdrawal time. Our results showed rapid withdrawal time with Xylocaine HCL injected through Auriculopalpebral route.

Group BI showed maximum mean withdrawal time i.e. 55 minutes, while group AI showed minimum withdrawal time i.e. 23 minutes. Statistical analysis showed the significant difference between the groups A and B, also within the groups between AI, AII and BI, BII. Our results showed long withdrawal time with Bupivacaine HCL injected through Auriculopalpebral route.

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