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A COMPARISON OF THE ANALGESIC EFFECTS OF INTRATHECAL LIDOCAINE, XYLAZINE AND THEIR COMBINATION IN DONKEYS

By

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مقارنة التأثيرات المخدره للحقن تحت الفراغ العنكبوتى لعقار الليدوكين والزيلازين وخليط منهما فى الحمير

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أجرى هذا البحث على ١٥ حماراً سليماً أكلينيكياً حيث قسمت الحيوانات إلى ثلاث مجموعات متساويه أستخدم عقار الليدوكين فى المجموعه الأولى وعقار الزيلازين فى المجموعه الثانيه بينما أستخدم خليط متساوى من العقارين فى المجموعه الثالثه. أستخدمت كمية واحدة فى المجموعات الثلاثه وبمعدل حقن ٥ر مل/ دقيقه. تم تسجيل وقت بداية تأثير المخدر وأستمرارية التخدير وكذلك المنطقه التى خدرت. هذا وقد أوضحت الدراسه أن أستخدام عقار الزيلازين يعطى أطول فتره تخدير لازمه لأجراء العمليات الجراحيه.

SUMMARY

This study was performed on 15 nonmedicated clinically healthy donkeys of both sexes. The animals were classified into three equal groups according to the type of the anaesthetic used for inducing intrathecal analgesia. Animals of the first group were injected lidocaine HCL 2%. Animals of the second group were injected xylazine HCL 2% while a mixture of both drugs was injected in the third group. All animals received the same volume of anaethetic solution and the injection rate was 0.5 ml/minute. The onset, duration and anaesthetized area were determined in each group. It was found that lidocaine gave immediate onset and short duration (about one hour). Analgesic effect started 5 minutes after the end of xylazine injection and lasted more than four hours. When a mixture of both drugs used in the third group, the onset of analgesia was after three minutes and continued for about 3.5 hours. In all animals the anaesthetized area was the same. It was noticed also that the degree of analgesia induced by xylazine was nearly equivalent to that of lidocaine. The present study showed that intrathecal xylazine can be used for anaesthesia of a prolonged surgical interferences.

INTRODUCTION

Recently regional analgesia is induced by epidural and intrathecal (subarachnoid) injection of local anaesthetic drugs via chronically indwelling catheters for a number of surgical procedures. The most widely used drug for this purpose is lidocaine HCL 2%.

Xylazine is an alpha 2 adrenergic agonist commonly used parentrally as a sedative analgesic in domestic and wild animal species (*KNIGHT, 1980*). The result recorded by *WATERMAN* et al. *(1991)* indicate that, about 60% of the analgesia produced by intravenously administered xylazine appears to be spinally mediated. Xylazine proved to be effective when injected epidurally *(LEBLANC* et al., *1988)*. They stated that epidural administration of xylazine results in perineal analgesia in horses with the absence of behavioral effects commonly associated with systemically administered xylazine.

There is no avaliable literatures about the use of xylazine intrathecally in equines. The purpose of the present study is to evaluate the analgesic effects of lidocaine, xylazine and a mixture of them as an analgesic agents for production of subarachnoid anaesthesia in donkeys.

MATERIAL AND METHODS

15 nonmedicated clinically healthy donkeys of both sexes (1-6 years age, 50-80 kg. b.w.) were used in this study. 17 guage 9 cm Huber Touhy, unidirectional spinal needle with stylet was inserted aseptically into the subarachnoid space at the Lumbosacral intervertebral foramen. The stylet is removed from the needle and a 90 cm polyethylene catheter (0.6x1.0 mm diameter) advanced craniad to the level of thoracolumbar junction. The external portion of the catheter was firmly fixed with adhesive strip to the skin.

The animals were divided randomly into three equal group each of 5 animals according to the drugs used. The volume of the first injection was 1 ml in all groups which followed by 0.5 ml upon return of sensation. The rate of injection was 0.5 ml/minute. Lidocaine hydrochloride 2% was injected in the first group. Animals of the second group were injected xylazine hydrochloride. A mixture of lidocaine HCl (0.5 ml) and xylazine HCl (0.5 ml) was used in animals of the third group.

The analgesic effects of the drugs were tested by firm superficial and deep muscular pin pricks. Onset, duration of analgesia and margins of desensitized area were recorded in all animals.

RESULTS

The first dose of 2% lidocaine HCl solution injected into the subarachnoid space at the thoracolumbar junction produced uniform bilateral analgesia of the flank area in all animals (5 donkeys). Loss of sensation in response to superficial and deep pin pricks stimulation began immediatly after end of injection (i.e. after 2 minutes). No apparent locomotor effects of the pelvic limbs were observed. Analgesia started firstly in the flank region and then extended cranially up to the last 2-3 ribs and caudally till the cranial third of gluteal and lateral aspect of the thigh. Analgesic period was lasted for 30-40 minutes after the first injection. Continuation of the analesia for further 20-30 minutes was recorded after the second injection (0.5 ml lidocaine HCl 2%). The analgesic period

became totally in an average of 58 minutes (52-70 minutes).

Subarachnoid injection of 1 ml xylazine HCl 2% in the second group produced bilateral blockade caudal to the last three ribs and all animals remained the standing position. Analgesic effect started 5 minutes after the end of injection and lasted for 110-130 minutes. After injection of 0.5 ml xylazine HCl prolongates the duration of analgesia for another 140-170 minutes. In this group of animals the total analgesic period was 230-290 minutes (256 minuites).

In the third group, intrathecal injection of 1 ml of the analgesic mixture (0.5 ml xylazine HCl 2% + 0.5 ml lidocaine HCl 2%) produced analgesia after 3 minutes from the end of injection. The duration of an initial dose continued for 80-120 minutes. The second dose produced immediate analgesia for further 95-150 minutes. Total analgesic period in this group was 200-243 minutes (213 minutes). The desensitized area in second and third groups was identical as in the first group.

DISSCUSION

Spinal analgesia is indicated for all procedures caudal to diaphragm and has been used extensively for laparotomies. Although in past two decades, it rarely used in animals particularly equines because of difficulties and dangers associated with this technique (*HALL, 1974*). However, the hazards of spinal block are no greater than that of any other anaesthetic technique (*COVINO and VASSALLO, 1976*).

Some advantages of subarachnoid catheterization in donkey are of considerable importance. In contrast to the epidural placement, subarachnoid catheterization of the thoracolumbar area from the lumbosacral intervertebral space is a more practical procedure (*SKARDA and MUIR, 1982 & 1983*). The use of catheter provides a route for repeated administration of local analgesic drugs, making the duration, degree, and area of analgesia more easily controlled. In addition, asymmetric or incomplete analgesia due to septa within the epidural space or inadequate dispersal of the analgesic as a result of escape of the drug through patent intervertebral foramina are avoided.

It is well known that xylazine is a powerfull alpha 2 adrenoceptors which have been identified in the dorsal born of the spinal cord of rats (*GIRON* et al. *1985*). So, xylazine induced analgesia is thought to be due to stimulation of peripheral and central alpha receptors (*SCHMITT* et al. *1974*). Moreover, *WATERMAN* et al. (*1991*) concluded that even analgesia produced by intravenous xylazine appears to be spinally mediated. In the present study, intrathecal administration of

small dose of xylazine proved to be effective and has a reversible local anaesthetic properties *(AZIZ and MARTIN, 1978)*.

The onset time for subarachnoid blocks is appreciably shorter than that reported following epidural administration of lidocaine 2% where the onset of analgesia is within 15 minutes *(SHORT, 1987)*. In the present study immediate onset of analgesia was observed after end of subarachnoid lidocaine 2% injection. On the other hand, somewhat delay onset of xylazine analgesia (5 minutes) on comparison with lidocaine has been recorded.

Intrathecal lidocaine essentially provides a short duration which considered insufficient for prolonged surgical procedures. Whereas, xylazine in this situation induces a much longer duration. An average total analgesic duration of 58 minutes (about one hour) has been recorded following the use of 1.5 ml of 2% lidocaine while this period was 256 minutes (more than 4 hours) after injection of the same dose of xylazine. The degree of analgesia induced by xylazine was nearly equivalent to that of lidocaine.

Generally, It was clear that subarachnoid analgesia has a more rapid onset and a short duration of action. The roots of the spinal nerves within the subarachnoid space are not covered by protective dural sheets and are more readily anaesthetized. The relatively short duration of action is probably due, in part, to the small dose of anaesthetic agent employed for spinal analgesia in addition to the dilution effect of spinal fluid.

In the present study, absence of motor disturbance of the pelvic limbs could be simply attributed to the catheter position (thoracolumbar deposition of analgesic solution) and also to the use of small amount of the drug. The analgesic solution did not extended caudally through cerebrospinal fluid to block spinal segments (L4-S1), from which the motor innervation (femoral and sciatic nerves) to the pelvic limbs originated.

REFERENCES

Aziz, M.A. and Martin, R.J. (1978): Alpha agonist and local anaesthetic properties of xylazine. Zentralbl. Vet. Med., A, 25: 181-188.

Covion, B.G. and Vassallo, H.G. (1976): Local anaesthetics, mechanisms of action and clinical use. 1st ed., A subsidiary of Harcourt Brace Jovanovich, Publishers, New York, San Francisco, London.

Giron, L.T.; McCann, S.A. and Crist-Orlando, S.G. (1985): Pharmacological characterization and regional distribution of alpha-noradrenergic binding sites of rat spinal cord. Eur. J. Pharmacol., 115: 285-290.

Hall, L.W. (1974): Wright's Veterinary Anaesthesia and Analgesia. 7th ed., London, Bailliere, Tindall.

Knight, A.P. (1980): Xylazine. JAVMA, 176: 454-455.

LeBlanc, P.H.; Caron, J.P.; Patterson, J.S.; Brown, M. and Matta, M.A. (1988): Epidural injection of xylazine for perineal analgesia in horses. *GAVMA.*, 193: 1403-1708.

Schmitt, H.; LeDourec, J.C. and Petillot, N. (1974): Antagonism of the anticociceptive action of xylazine, a sympathomimetic agent, by adrenoceptor and cholinoceptor blocking agents. Neuropharm., 3: 295-303.

Short, C.E. (1987): Principles and Practice of Veterinary Anaesthesia. 1st ed., Williams & Wilkins, Baltimore, U.S.A.

Skarda, R.T. and Muir, W.W. (1982): Segmental thoracolumbar spinal (subarachnoid) analgesia in conscious horses. Am. J. Vet. Res., 43: 2121-2128.

Skarda, R.T. and Muir, W,W. (1983): Segmental epidural and subarachnoid analgesia in horses: A comparative study. Am. J. Vet. Res., 44: 1870-1876.

Waterman, A.E.; Kyles, A.E. and Livingston, A. (1991): Spinal activity of analgesics in sheep. Proceeding of the 4th International Congress of Veterinary Anaesthesia, Utrecht, 25-31 August. pp. 139-141.