Dept. of Surgery,
Faculty of Vet. Med., Assiut University,
Head of Dept. Prof. Dr. M.T. Nassef.

COMPARISON OF LIDOCAINE AND XYLAZINE AS EPIDURAL ANALGESICS IN DONKEYS

(With Two Tables)

By

F.M. MAKADY; SAMIA M. SELEIM; M.A. SELEIM and TH.S. ABDEL ALL*

(Received at 13/12/1990)

مقارنة الليدوكايين والزيلازين في تخدير الأمجافية في الحمير

فتحي مكادى ، سامية سليم ، مجدى سليم ، ثروت عبدالعال

تم حقن كلا من الزيلازين أو الليدوكايين بجرعة مقدارها ٣٥ مجم/ كجم وبتركيز ٢٠ مجم/سم في فوق الأمجافية في ستة حمير (المجموعة الأولى) وذلك لمقارنة تأثيرهما التخديرى لفوق الأمجافية. ولقد تم توزيع المعاملات عشوائيا وأعطيت المعاملتين لكل حمار بفارق اسبوع بينهما وأوضحت النتائج عن زيادة معنوية في طول فترة التخدير بالنسبة للزيلازين (٢٢٦ ± ٣٥ دقيقة) عنها بالليدوكايين (١٢٠± ٢٥ دقيقة) عند حقنهم بنفس الجرعة والتركيز . ولقد أعطيت نفس المعاملات السابقة بالاضافة الى حقن محلول الملح الفسيولوجى (كضابط) لستة حمير أخرى (المجموعة الثانية) ثم تم قياس معدلات التنفس والنبض والتغييرات البيوكيمائية لغازات الدم قبل الحقن وأعتبرت كضابط للتجربة وبعد الحقن بمدة تتراوح بين ١٠، ٢٠، ٣٠، ٦٠، ٩٠ دقيقة. وأوضحت الدراسة أن حقن محلول الملح الفسيولوجي لايترتب عليه أى أثر تخديرى أو تغيير فسيولوجي. وأثبتت الدراسة أن حقن الليدوكايين والزيلازين نتج عنه حدوث تغييرات غير معنوية في غازات الدم ومعدلات النبض والتنفس : مما سبق يتضح أنه يمكن استخدام الزيلازين في تخدير فوق الأمجافية فى الحمير البالغة أو الصغيرة دون أى خطورة وإيضا من الممكن استخدامه فى الحمير التى تعاني من أمراض القلب والرئتين.

SUMMARY

Xylazine (0.35 mg/kg at a concentration of 20 mg/ml) or lidocaine (0.35 mg/kg at a concentration of 20 mg/ml) was injected into the epidural space of 6 donkeys (group I) to compare their effectiveness as epidural analgesics. Each donkey received both treatments at one week intervals with the order of treatments randomized. Xylazine produced analgesia of significantly longer duration (226±35 minutes) than that produced by an equal doses of lidocaine (120±25 minutes).

* Dept. of Animal Medicine, Faculty of Vet. Med., Assiut University.

6 donkeys (group II) were treated with epidural xylazine (0.35 mg/kg), epidural lidocaine (0.35 mg/kg) or epidural saline as a control. The treatment randomized and given to all donkeys. Baseline values (at time 0) for heart rate (HR), respiratory rate (RR), $PaCO_2$ were determined, and at, 10, 20, 30, 60 and 90 minutes post treatment. Epidural injection of saline did not alter sensory perception to needle prick and did not affect any of the physiologic parameters determined. Epidural xylazine (EX) or epidural lidocaine (EL) do not cause significant changes in HR, RR, $PaCO_2$ in adult and young donkeys. This results indicted that EX and EL do not cause significant physiologic stress in donkeys. This study suggests that EX can be considered a safe method of inducing caudal analgesia in adult and young donkeys.

INTRODUCTION

Injection of a local analgesic drug into the caudal epidural space to induce analgesia of the tail, vulva, vagina, rectum and anus is a well developed and frequently used procedure in equadae (SKARDA, 1987). The most widely used drug for this purpose is 2.0% lidocaine hydrochloride. Xylazine is often administered intravenously or intramuscularily for sedation in conjunction with epidural analgesia (GREENE and THURMON, 1985). The molecular structure of xylazine is similar to that of lidocaine (KLIDE, et al. 1975). The sedative analgesic effect of xylazine is produced primarily by its agonistic effect on central alpha-2 adrenoceptors. In addition, xylazine induces profound visceral analgesia which appears to be directly related to its central nervous activity (MUIR and ROBERTSON, 1985).

The purpose of this study is to compare the analgesic effects of lidocaine and xylazine when adminstere in the caudal epidural space of healthy donkeys at aqual doses, as well as to determine if epidural xylazine (EX) or epidural lidocaine (EL) influence blood gases and cardiopulmonary functions in donkeys.

MATERIAL and METHODS

12 clinically healthy donkeys (2 months - 8 years age, 40-120 kg.b.w) were used in this study. The animals were divided into two groups. In group I, the lumbosacral space was located by palpation. The skin over the region was clipped and scrubbed. 16 gauge 8 cm Huber Touhy, unidirectional point needle with stylet was inserted aseptically into the epidural space. The stylet was removed from the needle and a 90 cm polyethylene catheter (0.6x1.0 mm diameter) with a stainless steel spring guide,

reinforced through the needle and advanced caudad to the level of the first coccygeal interspace (Cy1-Cy2). Correct placement of the needle and catheter was ensured radiographically and it was further ensured by lack of resistance to injection of 3 to 4 ml of air into the epidural space. Xylazine (0.35 mg/kg) or lidocaine (0.35 mg/kg) was injected into the epidural space. The concentration of each drug was 20 mg/ml. All donkeys received both treatments. Each treatment was separated by 1 week and the order of treatment was at random. Each donkey was evaluated at 10 minute intervals for evidence of decreasing tail muscle tone, anal sphincter relaxation and perianal analgesia. The degree and duration of analgesia was assessed by response to pin prick adjacent to the anus. Analgesia was defined as no reaction to pin prick. Positive response to pin prick was defined as a reaction to pin prick characterized by movement, attempts to kick, or turn of the head toward the site of pin prick.

To determine if epidural xylazine or epidural lidocaine influence blood gases, 6 donkeys (group II) were treated with EX (0.35 mg/kg), EL (0.35 mg/kg) or epidural saline as a control. The treatments were randomized and given to all donkeys. Heart rate (HR) and respiratory rate (RR) were recorded before treatment (base line) and at 10, 20, 30, 60 and 90 minutes intervals post-treatment. For blood gases analysis, blood samples were drained from jugular vein at the same intervals using plastic syring whose dead space had previously filled with 1:1000 I.U. sodium heparine, then analyzed directly using blood gas analyzer model 186.

RESULTS

Signs of epidural analgesia characterized by loss of tail muscle tone, relaxation of the anal sphincter and absence of response to pin prick developed in all treated donkeys. In group (I), 5 out of 6 donkeys treated with xylazine, signs of epidural analgesia developed within 20 minutes. Thirty minutes were required before donkey No. 6 attained this same level of analgesia. Signs of epidural analgesia developed within 10 minutes in all donkeys receiving lidocaine, except donkey No. 2. in which analgesia developed after 20 minutes.

In donkeys receiving xylazine, response to pin prick returned by 226±35 minutes. In donkeys receiving lidocaine, response to pin prick had returned by 120±25 minutes. Xylazine administered epidurally produced analgesia of significantly longer duration than that produced by an equal dose of lidocaine administered epidurally.

In group II epidural injection of Nacl 0.9% solution did not alter sensory perception to needle prick and did not affect any of the physiologic parameters determined. Mean values of blood gases, HR and RR before and after treatments were illusterated in table (1 & 2).

DISCUSSION

Alpha-1 and alpha-2 adrenoceptors have been identified in the dorsal horn of the spinal cords of rats, and humans (UNNERSTALL, et al. 1984 and GIRON, et al. 1985). Clonidine, an alpha-2 agonist with actions similar to xylazine, has been shown to produce analgesia when injected into the lumbo-sacral spidural space of sheep (EISENACH, et al. 1987). This action has been postulated to be the result of alpha-2 adrenoceptor mediated mechanisms at the cord level. Lack of ataxia after epidural xylazin administration in adult horses has been attributed to selective sensory blockade (LeBLANC and CARON, 1987). However, the spinal cord ends at the mid-sacral region in the equine species, so it is possible that xylazine produced its action by direct local anasethetic activity on the spinal nerves. Also, it is not known to what extent xylazine diffuses within the epidural space. Xylazine has been shown to have a local anaesthetic effect on frog sciatic nerve trunk preparations similar to that of 0.5% procaine hydrochloride (AZIZ and MARTIN, 1978).

Epidural injection of xylazine induced centrally mediated sedation in cattle (SKARDA, et al. 1989). However, sedation after epidural xylazine was not apparent in our donkeys. Xylazine (0.17 mg/kg) was reported to induce caudal epidural analgesia in the horse with less motor inhibition than lidocaine (LeBLANC and CARON, 1987). However, the dose of lidocaine was not reported. The accepted dose of lidocaine to induce analgesia in mature 450 kg horse is 6 to 8 ml of 2% lidocaine i.e. 0.26-0.35 mg/kg (SKARDA, 1987). An equal dose of xylazine (0.35 mg/kg) produced no more ataxia in our donkeys than was seen with an equal dose of lidocaine.

The effects of analgesic agents in the epidural space are influenced by many factors including: (1) size of the epidural space, (2) volume and concentration of the injected agent, (3) speed of injection, (4) gravity and (5) technique (BENSON and THURMON, 1981). One or more of these foctors may explain the delayed responce of donkeys number 2 and number 6.

The obtained data revealed that EX or EL induced non-significant changes in PaC02 and Pa 02 (table 1). Meanwhile a non-significant depression in heart rate after treatments was recorded. Furthermore there are also a non-significant increase in respiratory rate following EX or EL (table 2). The obtained results either to cardio-pulmonary function or blood gases were coincided with those previously obtained by CARTER, et al. (1989) in foals and LeBLANCE and EBERHART (1989). This suggested, that EX and EL do not cause significant physiologic stress in both adult and young donkeys.

This study suggested that xylazine induced caudal epidural analgesia for significantly longer duration that an equivalent dose of lidocaine in donkeys. EX can be concidered as a safe method of inducing caudal analgesia in young and adult donkeys as well as in donkeys with heart and lung diseases.

REFERENCES

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

Benson, G.L. and Thurmon, J.C. (1981): Regional analgesia of food animals. In: Howard J.L.ed. Current Veterinary Therapy, Food Animal practice. 1st ed. Philadelphia: W.B. Saunders Co. p. 7.

Carter, S.W.; Robertson, S.A. and Jourdenais, D.A. (1989): The cardiopulmonary effect of intravenous xylazine in neonatal foals. Vet. Surg., p. 248.

Eisenach, J.G.; Dewan, D.M.; Rose, J.G. and Angelo, J.M. (1987): Epidural clonidine produces antinociception but not hypotension in sheep. Anesthesiology. 66: 496-501.

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

Greene, S.A. and Thurmon, J.C. (1985): Epidural analgesia and sedation for selected equine surgeries. Equine Pract. 7 (2): 14-19.

Klide, A.M.; Calderwood, H.W. and Soma, L.R. (1975): Cardiopulmonary effects of xylazine in dogs. Am. J. Vet. Res., 36 (7): 931-935.

LeBlanc, P.H. and Caron, J.P. (1987): Epidural xylazine administration in the horse. 68th Annual Meetin of the Conference of Research Workers in Animal Diusease. Abstract 127, Chicago, Illinois, Nov., 16-17.

LeBlanc, P.H. and Eberhart, S.W. (1989): The influence of epidural xylazine or lidocaine on arterial blood pressure and blood gases in the horse. The ACVA Annual meeting. Vet. Surg., 15: 250.

Muir, W.W. and Robertson, J.T. (1985): Visceral analgesia: effect of xylazine, butorphanol, meperidine and pentazocine in horses Am. J. Vet. Res, 46 (10): 2081-2084.

Skarda, R.T. (1987): Local and regional anesthesia. In: Shor C.E. ed. principles and practice of Veterinary Anesthesia, 1st Ed., Vol. 93: p. 103.

Skarda, R.T.; St. Jean, G. and Muir, W.W. (1989): Influence of caudal epidural xylazine on central nervous, respiratory, cardiovascular and reticuloruminal motor function in cows. Vet. Surg., 249.

Unnerstall, J.R.; Kopajtic, T.A. and Kuhar, M.J. (1984): Distribution of alpha-2 agonist binding sites in the rat and human central nervous system: analysis of some functional, anatomic correlat of the pharmacologic effects of clonidine and related adrenergiago- nists. Brain Res. Rev., 7: 69-101.

Table (1) Mean values of blood gases and acid base balance pre and post epidural injection of xylazine and lidocaine in donkeys .

Substance employed	Time /min	Ph	Pa Co_2 mm/Hg	Pa O_2 mm/Hg	Hco_3^- mmol/L	TCo_2 mmal/L	B.E mmol/L
Xylazine	0	7.38 ± 0.1	42.4 ± 1.4	34.07 ± 1.5	25.84 ± 1.6	25.71 ± 1.3	- 0.2
	10	7.34 ±0.015	43.4 ± 1.6	34.06 ± 1.6	25.85 ± 1.85	25.74 ± 1.85	- 0.2
	20	7.355±0.01	42.31 ± 1.3	34.05 ± 1.5	25.84 ± 1.9	25.73 ± 1.5	- 0.1
	30	7.356± 0.1	42.31 ± 1.2	34.08 ± 1.5	25.83 ± 3.1	24.97 ± 1.75	- 0.1
	60	7.365± 0.2	41.95 ± 1.5	34.09 ±0.95	25.76 ± 2.5	25.69 ± 1.35	- 0.1
	90	7.375± 0.6	42.36 ± 1.3	34.1 ±0.85	25.79 ± 2.1	25.68 ± 1.54	- 0.1
Lidocaine	0	7.45 ± 0.1	40.4 ± 1.5	34.80 ± 1.9	26.4 ± 1.2	25.4 ± 1.3	- 0.1
	10	7.39 ±0.03	40.32 ± 1.2	34.5 ± 2.1	26.3 ± 1.4	25.17 ± 1.9	- 0.1
	20	7.38 ±0.15	40.51 ± 1.4	34.61 ± 1.6	26.35 ± 1.6	25.32 ± 1.8	- 0.1
	30	7.36 ± 0.1	40.46 ± 1.6	34.5 ± 1.5	26.26 ± 1.9	25.4 ± 1.2	- 0.1
	60	7.39 ± 0.1	40.49 ± 1.8	34.61 ± 1.3	26.81 ± 1.4	25.2 ± 1.10	- 0.1
	90	7.42 ±0.15	40.39 ± 1.6	34.65 ± 1.5	26.39 ± 1.6	25.3 ± 1.09	- 0.1

Mean ± Standard deviation

Table (2) Mean values of respiratory rate and heart rate pre and post epidural injection of xylazine and lidocaine in donkeys.

Substance employed	Parameter	Time / minute					
		0	10	20	30	60	90
Xylazine	Respiratory rate / min	14.0 ± 1.1	11.1 ± 1.08	14.4 ± 1.8	15.5 ± 1.7	16.9±1.8	18.3 ± 1.5
	Heart rate / min	48.8 ± 0.2	44.4 ± 1.1	44.8 ± 1.2	44.6 ± 1.2	44.8±0.3	44.7 ± 0.2
Lidocaine	Respiratory rate / min	13.9 ± 0.3	13.6 ± 0.9	14.1 ± 0.5	15.6 ± 1.6	17.1±1.2	18.4 ± 2.5
	Heart rate / min	45.5 ± 1.4	44.6 ± 2.1	44.5 ± 1.3	42.9 ± 1.3	41.3±1.4	42.9 ± 1.4

Mean ± Standard deviation .