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Comparative efficiency of lidocaine or lidocaine-ketamine combination for epidural analgesia in camels

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ABSTRACT

The aim of the present study was to evaluate the sedative, analgesic, clinicophysiological and hematobiochemical effects of lidocaine alone or in combination with ketamine when administered epidurally in camels. 8 clinically healthy camels of both sexes were divided equally into two groups, group I was injected with 1.1 mg/kg lidocaine HCl 2 %, while group II was injected with combination of lidocaine HCl (1.1 mg/Kg) and Ketamine –HCl (1 mg/Kg). The drugs were injected in the 1st inter coccygeal space. The onset and duration of sedation and analgesia were recorded. Pulse rate, respiratory rate, rectal temperature and hematobiochemical parameters were recorded before drug administration then at 15, 30, 60, 90 and 120 minutes postinjection. Lidocaine/ketamine combination resulted in significant longer duration of both sedation and analgesia when compared with lidocaine alone; recumbancy was recorded after pronounced ataxia after lidocaine/ketamine combination. Significant changes in hematobiochemical parameters were observed in both groups. It was concluded that epidural administration of lidocaine-ketamine combination resulted in more reliable onset and duration of perineal analgesia in camels as compared with lidocaine alone.

1.INTRODUCTION

Dromedary camels play a significant role in the socio-economic affairs of nomadic people in providing meat, milk and wool. They are also used for transportation (Al-Ani 2004; Tegegne 1991 and Azari et al., (2014). Ruminants are generally not considered good subjects for general anaesthesia, mainly because of hazards of regurgitation and inhalation of ruminal contents or saliva into the lungs if the airway is left unprotected. Thus, regional anaesthesia produced by the perineural or epidural injection of anaesthetic agents is most frequently employed in these species (Hall et al., 2001). Many of the principles of veterinary anesthesia, which are applied to the other species, will also apply to the camelids. (Pereira et al., 2006), but it has been stated that camels may be susceptible to toxicity from some drugs at doses used commonly in other ruminants (Hall et al., 2001). Caudal epidural anaesthesia is simple and inexpensive and requires no sophisticated equipment. It is routinely used in ruminants for obstetric manipulation, caudal surgical procedures and as an adjunct treatment for control of rectal tenesmus (Lee et al. 2003). In recent years, clinicophysiological effects of epidural administration of various sedative agents, such as xylazine and ketamine alone or in combination with local anaesthetics, have been investigated in dromedary camels (Azari et al. 2012 and Molaei et al. 2010). Lidocaine is routinely used for caudal epidural analgesia in ruminants, but large volumes can cause ataxia or even recumbency. To facilitate reproductive manipulations, the onset of analgesia should be faster and shorter and should not interfere with the motor system (DeRossi et al. 2010b). Ketamine is a potent non-competitive antagonist of N-methyl-D-aspartate receptors, which are involved in the transmission and modulation of nociceptive information by the spinal cord (Rainer & Marcel 1998 and Yamamura et al. 1990). Epidural administration of ketamine alone or in combination with lidocaine or other sedative agents has been reported to produce perineal analgesia in a number of ruminant species, for example cattle (DeRossi et al. 2010a), water buffaloes (Singh et al. 2006) and goats (Kinjavdekar et al. 2007). Epidural

administration of lidocaine or lignocaine combined with ketamine resulted in more intense and long duration of analgesia in camels (Azari et al., 2014; calves (Moulvi et al., 2011) and in dogs and cats (De Rossi et al., 2009; DeRossi et al., 2011). The currnt study was conducted to evaluate the efficacy of lidocaine and lidocaine/ ketamine combination for epidural analgesia in camels based on clinicophysiological, sedative and analgesic effects.

2.MATERIALS AND METHODS

2.1. Camels

Eight clinically healthy dromedary camels were used in this study aged from 12 – 18 months and weighing 145 – 200 Kg. food was withheld 24 hours before drug administration with free access for water.

2.2. Study design

The camels were divided into two groups each of four animals. The animals in-group 1 were injected with 1.1 mg/kg, lidocaine –HCl, while, in group II were injected with combination of 2 % lidocaine-HCl (1.1 mg/Kg) and 5 % ketamine HCl (1 mg/Kg). The drugs were injected epidurally at first inter coccygeal space after its aseptic preparation for injection. The volume of drugs injected kept constent in two groups by adding sterile saline.

2.3. Clinical assessement

Onset and duration of analgesia and area of desensitization were recorded by pinpricking of skin and S/C tissue.

Sedation onset and duration were also recorded. It was graded on 1 to 4 scores for each dose according to Azari et al. (2014). (Table, 1).

Table (1): Showing scores and signs of sedation.

Score		Signs
1	Alert	No sedative effect
2	Mild	Reduced alertness without any other signs
3	Moderate	Drowsiness and slight drooping of head
4	Deep	Marked drowsiness and drooping of head.

Inco-ordination or ataxia was assessed by observing hind limb position, swaying or even leaning against the chute. Pulse rate, respiratory rate and rectal temperature were recorded before drug injection then at 15, 30, 60, 90 and 120 min post-injection. Blood samples were collected at the same previous intervals for the following hematological and biochemical analysis. Hemoglobin (Hb), erythrocytic count (RBCs), while blood cells count (WBCs) and PCV % were measured in blood, urea, creatinine, AST, ALT, cholesterol, total protein and glucose were measured in serum.

2.4. Data analysis

Data analyses were performed using SPSS software (SPSS 16.0, Chicago). For studying the differences among different treated groups in different studied variables.

3.RESULTS

Signs of sedation and analgesia were observed in camels of both groups. Onset of sedation was not significantly differ between groups, while, duration was significantly higher in-group II (134.75±1.70 min), than group I (81.00 ±1.08 min). It was mild (Score 2), in-group I, while, in group II was varied from mild to moderate (score, 3), Table (2). Complete analgesia occurred in tail, pernium and inner aspect of thigh of both groups with no significant difference in onset. Duration of analgesia was significantly longer in lidoocaine/ketamine group (136.25±1.49 min) versus (128.25±1.38 min) in lidocaine group (Table, 3). Ataxia was observed also in both groups but it was more pronounced after lidocaine/ketamine injection, which, characterized by swaying and flexion of all joints of hind limbs followed by recumbancy, which continued for (117.25±7.95 min). On other hand, recumbancy did not occurre after lidocaine injection alone. Significant reduction in both rectal temperature and respiratory rate was observed in both groups post-injection but returned to pre-injection value at the end of experiment.

Pulse rate was significantly increased in-group I and never returned to the pre-injection value by the end of experiment, on the other hand pulse rate increased significantly only at 15 min post-injection then decreased again till the end of observatuion period (Table, 4). The results for hemato-biochemical analysis were summarized in Tables (5 – 7).

Table (2): Onset and duration of sedation following injection of lidocaine and lidocaine/ketamine combination for epidural analgesia in camels.

Drugs	N	Sedation	
		Induction	Duration
		Mean±S.E	Mean±S.E
lidocaine-HCl	4	A	B
		6.75±0.25	81.00±1.08
lidocaine-HCl +	4	A	A
Ketamine HCl		5.25±0.25	134.75±1.70

Means within the same column of different litters are significantly different at ($P < 0.01$).

Table (3): Onset and duration of Analgesia following injection of lidocaine and lidocaine/ketamine combination for epidural analgesia in camels.

Drugs	N	Analgesia	
		Induction	Duration
		Mean±S.E	Mean±S.E
lidocaine-HCl	4	B	B
		8.50±0.29	128.25±1.38
lidocaine-HCl +	4	A	A
Ketamine HCl		7.50±0.29	136.25±1.49

Means within the same column of different litters are significantly different at ($P < 0.01$).

Table (4): Temperature following injection of lidocaine and lidocaine/ketamine combination for epidural analgesia in camels.

Drug	Time	N	Temperature	Respiratory rate	Pulse rate
			Mean Std. Error	Mean Std. Error	Mean Std. Error
lidocaine-HCl	0-Min	4	38.10±0.22A	17.00±2.68D	56.50±3.28D
	15-Min	4	38.08±0.18A	17.25±0.48D	54.50±2.63D
	30-Min	4	38.08±0.25A	18.00±1.47B	58.75±4.17DD
	60 Min	4	37.88±0.11B	16.50±1.19E	65.75±2.39C
	90-Min	4	37.85±0.17B	15.00±0.71F	64.75±5.48C
	120-Min	4	37.90±0.16B	16.50±0.50E	67.00±5.24B
lidocaine-HCl + Ketamine HCl	0-Min	4	38.45±0.46B	20.50±2.84A	66.00±2.86BC
	15-Min	4	37.73±0.21C	18.50±3.38C	72.75±2.36A
	30-Min	4	37.78±0.22C	17.75±2.17D	62.00±1.58C
	60 Min	4	37.60±0.22C	17.50±2.33D	66.50±3.07BC
	90-Min	4	37.40±0.21C	18.00±2.74B	68.00±2.00B
	120-Min	4	37.68±0.22C	20.25±2.56A	69.75±2.59B

Means within the same column of different litters are significantly different at ($P < 0.01$).

Table (5): Blood pictures following injection of lidocaine and lidocaine/ketamine combination for epidural analgesia in camels.

Drug	Time	N	Hb	WBCs	RBCs	PCV
			Mean Std. Error	Mean Std. Error	Mean Std. Error	Mean Std. Error
lidocaine-HCl	0-Min	4	10.49±0.79B	8.98±2.34I	3.29±0.14C	35.62±0.49A
	15-Min	4	10.36±0.75B	9.95±2.22H	3.36±0.12C	35.51±0.39A
	30-Min	4	10.29±0.86B	10.24±3.39G	3.39±0.11C	35.14±0.54A
	60 Min	4	10.16±0.77B	9.54±2.56H	3.30±0.12C	35.56±0.35A
	90-Min	4	10.04±0.77B	10.96±2.30G	3.35±0.12C	35.46±0.29A
	120-Min	4	10.15±0.73B	10.85±3.10G	3.43±0.11C	35.68±0.52A
lidocaine-HCl + Ketamine HCl	0-Min	4	10.37±0.38B	14.88±2.00F	4.74±0.59B	25.86±3.95B
	15-Min	4	10.25±0.66B	19.78±4.74C	4.90±0.81B	26.26±4.66B
	30-Min	4	10.73±0.74B	18.33±1.47D	4.90±0.80B	25.71±3.77B
	60 Min	4	10.92±0.79B	24.80±1.89A	5.23±0.87A	26.62±3.66B
	90-Min	4	10.92±0.72B	23.00±3.73B	5.27±0.84A	27.83±4.35B
	120-Min	4	11.26±0.82A	18.68±1.74D	5.10±0.82A	27.68±4.13B

Means within the same column of different litters are significantly different at ($P < 0.01$).

Table (6): Protein, cholesterol and glucose levels following injection of lidocaine and lidocaine/ketamine combination for epidural analgesia in camels.

Drug		N	Protein	Cholesterol	Glucose
			Mean Std. Error	Mean Std. Error	Mean Std. Error
lidocaine-HCl	0-Min	4	4.36±0.29A	30.63±6.49A	92.84±6.82E
	15-Min	4	4.19±0.29A	31.04±6.60A	107.59±9.30D
	30-Min	4	4.29±0.36A	31.64±7.54A	114.42±9.61C
	60 Min	4	4.20±0.35A	30.20±7.74A	122.47±7.06B
	90-Min	4	4.25±0.36A	31.13±6.99A	125.90±6.19AB
	120-Min	4	4.21±0.32A	30.09±6.80A	126.25±4.61A
lidocaine-HCl + Ketamine HCl	0-Min	4	4.33±0.28A	24.42±5.17B	103.00±6.77F
	15-Min	4	4.32±0.38A	20.84±2.71C	118.75±5.54C
	30-Min	4	4.52±0.31A	25.54±5.60B	105.50±6.69D
	60 Min	4	4.55±0.32A	21.17±2.98C	118.75±6.57C
	90-Min	4	4.42±0.29A	21.24±2.88C	128.00±5.20AB
	120-Min	4	4.62±0.30A	21.84±3.21C	120.25±3.47C

Means within the same column of different litters are significantly different at ($P < 0.01$).

Table (7): Urea, creatinine, ALT and AST activities following injection of lidocaine and lidocaine/ketamine combination for epidural analgesia in camels.

Drug		N	Urea	Creatinine	ALT	AST
			Mean Std. Error	Mean Std. Error	Mean Std. Error	Mean Std. Erro
lidocaine -HCl	0-Min	4	45.12±8.83A	1.37±0.11A	20.60±2.62EF	106.35±8.44D
	15-Min	4	44.23±8.21A	1.42±0.10A	20.73±4.01EF	106.60±16.54D
	30-Min	4	45.28±8.32A	1.43±0.10A	19.80±4.82F	111.00±9.26D
	60 Min	4	44.82±7.95A	1.43±0.11A	13.85±2.85F	96.78±12.67E
	90-Min	4	44.55±7.57A	1.45±0.11A	13.54±3.74F	95.08±13.43E
	120-Min	4	44.47±7.71A	1.47±0.11A	13.59±2.44F	99.00±13.93E
	0-Min	4	46.50±9.21A	1.44±0.12A	44.73±26.45D	155.25±21.04C
lidocaine -HCl	15-Min	4	30.75±6.54C	1.48±0.09A	46.80±28.77D	172.50±17.10A
+ Ketamine	30-Min	4	27.75±6.47D	1.43±0.07A	74.80±30.50B	161.75±16.74B
HCl	60 Min	4	30.50±6.66B	1.49±0.07A	82.50±33.62A	160.00±15.67B
	90-Min	4	33.00±7.41B	1.46±0.08A	83.78±32.90A	166.75±20.18B
	120-Min	4	33.50±7.44B	1.43±0.08A	59.00±30.57C	156.25±16.84C

Means within the same column of different litters are significantly different at ($P < 0.01$).

4.DISCUSSION

Epidural analgesia in ruminants not only induced by analgesics like local analgesics and opoids but also by injection of several drugs that induced analgesia and/or sedation like ketamine in sheep and goats (Abu-Ahmed, 2003), buffaloes (Singh et al., 2006), camels (Azari, 2012) and in cow calves (Moulvi et al., 2011), also α2 agonists were also injected by Kenawy (1998); Abu-Ahmed (2003). In this study complete perineal analgesia was produced in camels by injection of lidocaine alone or in combination with ketamine. However, the duration of analgesia was significantly longer after lidocaine / ketamine combination. Administration of lidocaine with ketamine produced longer duration of analgesia in dogs and cats than lidocine alone (De Rossi et al., 2009 and De Rossi et al., 2011).

Azari et al. (2014) reported that, no significant differences in onset and intensity of analgesia in camels between lidocaine and lidocaine /ketamine combination. However Moulvi et al. (2011) reported that, combination of ketamine with lignocaine resulted in more rapid and intense analgesia than lignocaine alone in calves. Smith et al. (1980) suggested that the analgesic effect of epidurally injected ketamine may be due to interaction with opiate receptors or due to blockade of α2-adrenoceptors pathway as mentioned by Gordh (1987).

Absorpition of ketamine into systemic circulation produced significant ataxia and sedation (Gomez de Segura et al., 1998). In this study lidocaine /ketamine combination resulted in more pronounced ataxia ended with recumbancy, this may be attributed to the local anesthetic action of ketamine and enhancement of motor action of lidoocaine at the spinal cord level (Kinjavdekar et al., 2007). Gebhardt (1994) mentioned that intrathecal ketamine resulted in a complete motor blockade in human and animals. Sedation degree varied from mild to moderate in both groups, it was significantly longer in-group II. Ketamine in cows and horses resulted in moderate level of sedation and ataxia (Gomez de segura et al., 1998 and Marisco et al., 1999). On other hand, Abu Ahmed (2003) reported no signs of sedation post-epidurally injected ketamine in sheep and goats. Lidocaine produced significant degree of sedation after absorption from epidural space (Soma, 1971 and Abu-Ahmed, 2003). However, (Molaei et al., 2010 and Azari et al., 2012) found that, the camels injected with lidocaine are nervous and alert allover, the experiment. Significant reduction in rectal temperature and respiratory rate was observed in both groups. On other hand Molaei et al. (2010) reported that lidocaine have no significant effect on both rectal temperature and respiratory rate. Respiratory rate was significantly decreased post-epidural ketamine injection in sheep and goats (Abu-Ahmed, 2003).

Pulse rate was significantly increased post-epidural ketamine injection at 15 min and at 60 min post-epidural lidocaine injection. This increase in pulse rate may be due to increased sympathetic tone resulted from systemic absorption of ketamine (Singh et al., 2006). No significant effect on both Hb and PCV % was observed in this study. The same results were recorded by Kenawy (1998) in goats.

Injection of either lidocaine alone or lidocaine / Ketamine combination resulted in significant increase of WBCs. The same results were observed post-ketamine injection in goat, while epidural injection of lidocaine in sheep and goats resulted in significant reduction of WBCs (Abu-Ahmed, 2003).

It could be concluded that, combination of lidocaine and ketamine for epidural analgesia in camel proved to be advantageous than lidocaine alone. This combination is suitable for long lasting surgical procedures in perineal region of camels.

5. REFERENCES

Abu-Ahmed, H. 2003. Spinal analgesia in small ruminants. Thesis M. V. Sc. (Surgery), Vet. Med. Alex. Univ.

Al-Ani, F.K. 2004. Camel Management and diseases. First edition, Al-Sharq Printing Press, Jordan: 7-19 & 91.

Azari, O., Molaei, M.M., Emadi, L., Sakhaee, E., Esmaeili, M. 2012. Epidural ketamine in the Dromedary camel. Vet. Anaesth and Analg, 39: 291-295.

Azari, O., Molaei, M.M., Ehsani, A.H. 2014. Caudal epidural analgesia using lidocaine alone or in combination with ketamine in dromedary camels Camelus dromedarius. J. S. Afr. Vet. Assoc.,

Feb 27; 85(1):1002.

DeRossi, R., Frazílio, F.O., Jardim, P.H., Martins, A.R., Schmidt, R., Negrini-Neto, J.M. 2011. Evaluation of thoracic epidural analgesia induced by lidocaine, ketamine, or both administered via a lumbosacral approach in dogs. Am. J. Vet. Res., Dec;72(12):1580-5.

DeRossi, R., Benites, A.P., Ferreira, J.Z., Neto, J.M.N., Hermeto, L.C. 2009. Effects of lumbosacral epidural ketamine and lidocaine in xylazine-sedated cats, J. S. Afr. Vet. Assoc.,80:79-83.

DeRossi, R., Bertoni, R.A., Ruzzon, R.H.S., Verde-Selva, A.B., Frazilio, F.O. 2010a. Segmental dorsolumbar epidural analgesia via the caudal approach using multiple ports catheters with ketamine or lidocaine or in combination in cattle, Vet. Anaesth and Analg., 37, 451–459.

DeRossi, R., Zanenga, N.F., Alves, O.D., Carneiro, R.P.B., Ossuna, M.R. 2010b. Effects of caudal epidural ketamine and/or lidocaine on heifers during reproductive procedures: A preliminary study, Vet. J., 185: 344–346.

Gebhardt, B. 1994. Pharmacology and clinical results with peridural and intrathecal administration of ketamine, Anaesthesist, 43 (suppl.2): S34–S40.

Gomez de Segura, L.A., DeRossi, R., Santos, M., San Roman, L.J., Tendillo, F.J. 1998. Epidural injection of ketamine for perineal analgesia in the horse, Vet. Surg., 27:384–391.

Gordh, T. J. 1987. Alpha adrenergic and cholinergic mechanisms of analgesia. Acta Anaesth. Scan. 86: 31.

Hall, L.W., Clarke, K.W., Trim, C.M. Veterinary Anesthesia. 10th ed., Philadelphia, Saunders Co., 2001; pp: 225-247.

Kenawy, A. A. 1998. Comparative study of xylazine, lidocine, ketamine and xylocaine for epidural analgesia in goats. Alex. J. Vet. Sci., 14 (1): 53 – 63.

Kinjavdekar, P., Singh, G.R., Aithal, A.H.P., Pawde, A.M. 2007. Clinicophysiological effects of spinally administered ketamine and its combination with xylazine and medetomidine in healthy goats. Vet. Res. Commun., 31: 847-861.

Lee, I., Yoshiuchi, T., Yamagishi, N., Oboshi, K., Ayukawa, Y., Sasaki, N., Yamada, H. 2003. Analgesic effect of caudal epidural ketamine in cattle. J. Vet. Sci., 4: 261–264.

Marsico, F., Nascimento, P.R.L., De Paula, A.C., Nascimento Jnr, A. Tendillo, F.J., Criado, A. Gómezde Segura, I.A. 1999. Epidural injection of ketamine for caudal analgesia in the cow. J. Vet. Anaesth., 26: 27–31.

Molaei, M.M., Azari, O., Sakhaee, E., Naderi, Z. D., Mehdizadeh, S. 2010. Comparison of Lidocaine, Xylazine, and a combination of Lidocaine and Xylazine for Caudal Epidural Analgesia in Dromedary Camels. I.J.V.S., 5(1): 51-61.

Moulvi, B.A., Parrah, J.D., Kalim, M.O., Athar, H., Singh, M., Baba, A. 2011.Comparative efficacy of lignocaine alone and in combination with ketamine as epidural anaesthesia in cow calves, Vet. World. 4: 364–367.

Pereira, F.L.G., Greene, S.A., McEwen, M.M., Keegan, R. 2006. Analgesia and anesthesia in camelids. Small Rumin. Res, 61: 227–233.

Rainer, K., Marcel, E.D. 1998. Ketamine: Teaching an old drug new trick, Anesth.and Analg., 87: 1186–1193.

Singh, P., Pratap, A.K., Kinjavdekar, P., Aithal, H.P., Singh, G.R., Pathak, R. 2006. Xylazine, ketamine and their combination for lumbar epidural analgesia in water buffalo calves

(Bubalus bubalis). J. Vet. Med., 53: 423-431.

Smith, D. J., Pekoe, G. M., Martine, T. L., Colgate, B. 1980. The interaction of ketamine with opiate recptors. Life Sci. 26: 789.

Soma, L. R. 1971. Textbook of veterinary anaesthesia. The William and Wilkins Co. Baltimore.

Tegegne, C. T. 1991. The dromedary in the east Africa countries: its virtues, present conditions and potential for food production, nomadic peoples, Uppsala, 29: 3-9.

Yamamura, T., Harada, K., Okamura, A., Kemmotsu, O. 1990. Is the site of action of ketamine anesthesia the N-methyl-D-aspartate receptor? Anesthesiology, Apr; 72(4):704-10.