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CONTINUOUS SEGMENTAL THORACO-LUMBAR EPIDURAL ANALGESIA IN COWS

(With One Table & One Fig.)

By

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التخدير المستمر للجزء الصدرى القطنى فى الأبقـــــار

مجدى سليم ، أحمـد صالـــح ، فتحـى مكـــــاوى

تم إجراء طريقة التخدير الجزئى المستمر لمنطقة الخاصرة فى الأبقار بدون التأثير على القوائم الخلفية . وقد أجرى الحقن فوق الأم الجافية عن طريق إدخال قسطرة بين آخر فقـرة قطنية وأول العجز فى عشرة أبقار خالية من الحمل وبدون إستعمال مهدئات وذلك لتقديـــر التأثيرات المخدرة وجرعة المخدر المستعمل (محلول بروكايين هيدوروكلوريد ٢٪) .

SUMMARY

A technique for obtaining continuous analgesia of the paralumbar fossa in cows without loss of the motor control of the pelvic limbs has been described. The technique for catheterization of the epidural space at the lumbo-sacral interspace was performed on ten nonpregnant cows without premedication in order to determine the analgesic effects and the dose of 2% procaine hydrochloride solution.

INTRODUCTION

Analgesia of the paralumbar fossa in cattle is indicated for most abdominal operations such as rumenotomy, cecotomy, caesarean section, ovariectomy, intestinal obstruction, correction of gastrointestinal displacement and others.

SKARDA (1987), recorded five techniques for obtaining analgesia of the paralumbar fossa in ruminants including infilteration analgesia, proximal and distal paravertebral analgesia, segmental dorsolumbar analgesia and thoracolumbar subarachoid analgesia. The author concluded that the thoracolumbar subarachnoid analgesia produced the fastest and best controlled surgical analgesia of flank in cattle. The segmental lumbar epidural analgesia has been described in cattle (ST.CLAIR and HARDENBROOK, 1956; HEESCHEN, 1960; ARTHUR, 1969 and SKARDA & MUIR, 1979). SKARDA and MUIR (1979) and SKARDA (1984) discussed the disadvantages of the dorsal segmental epidural analgesia that, there was difficulty in performing the technique, loss of motor control of the pelvic limbs, physiological disturbance due to overdose of epidural injection, and there is potential for trauma to the spinal cord or venous sinuses.

The surgical procedures of the foreteats and fore udder may be performed, using paravertebral analgesia of L1, L2 and L3 or segmental epidural analgesia of these nerves. SKARDA (1987) described both techniques as difficult and the later often results in cows lying down.

The surgical procedures of the caudal teats and body of the udder may be performed, after desensitizing the perineal nerve in the standing ruminant, because the caudal udder is supplied by the mammary branch of the pudendal nerve and distal cautaneous branch of the perineal nerve, which have their origin from the second, third and fourth sacral spinal cord segments (ST.CLAIR, 1942 and ARNOLD and KITCHELL, 1957). Therefore most surgical procedures of the caudal teats and udder require high caudal epidural analgesia or lumbosacral epidural analgesia. SKARDA (1987) mentioned that the high caudal epidural analgesia is the method of choice for major udder surgery if recumbency is desired. A dose of 50-150 ml of a 2% lidocaine hydrochloride solution is required.

The purpose of this study is to determine the analgesic effects after two injections and the required dose of 2% procaine hydrochloride solution in order to induce prolonged and safe analgesia for the flank region.

MATERIAL and METHODS

Ten adult nonpregnant native breed cow, 3 to 7 years old, of average 300 kg. body weight were used. Each cow was restrained in a stanchion and the tail was fixed to prevent contaminations of the site of injection. The lumbosacral area was clipped, surgically scrubbed and disinfected. Additional chemical restraint was not used.

The lumbosacral (L6-S1) interspace was located by palpation of the bony land marks. The interspace can be palpated with reference to the tips of the spinous processes of the 6th lumbar and 1st sacral vertebrae. It is approximately defined as a depression on the midline caudal to a line joining the caudal border of the iliac crests.

16 gauge 8 cm Huber Tuohy, unidirectional point needle with stylet (Fig. 1a) was inserted aseptically into the epidural space, through the thoracolumbar fascia, and interspinous ligament, to place the level of the needle under the bony arch of the 6th lumbar vertebra. The point of the needle was directed cranially 5° to 10° from perpendicular to the spinal cord. The needle was slowly advanced with the bevel pointed craniad, until the interarcuate ligament (ligamentum flavum) was felt.

After the needle has entered the epidural space, the stylet is removed from the needle. A 90 cm polyethylene catheter (0.6x1.0 mm diameter), with a stainless steel spring guide, reinforced through the needle and advanced craniad to th level of thoracolumbar junction (Fig. 1b). In most instances the catheter encounters only slight or negligible resistance. First the needle was withdrawn over the catheter, and a stopcock was attached to the catheter. The external portion of the catheter was firmly anchored with adhesive tap to the skin (Fig. 1c).

2% procaine hydrochloride solution was injected using sterile syringe. The volume of the first injection varied between 4 to 5 ml. The rate of injection was approximately 1 ml/minute. The volume of the second injection was about 4 ml of the anaesthetic solution.

The period from the end of injection to the onset of analgesia was assessed using firm superficial and deep muscular pinprick stimulation of the flank, as well as cranial and caudal to it. The second injection was done after sensation of the lumbosacral area reappeared.

The onset of desensetization and the area of analgesia of the two injections have been observed and described. The pinprick tests were repeated at 5 minutes intervals until the analgesia lasted.

RESULTS

The first dose of 2% procaine hydrochloride solution, injected into the epidural space at the lumbosacral interspace of adult cows through a catheter was in average 4.85 ml (4.0-5.5 ml). It produced analgesia involving the paralumbar fossa of one or both sides of the animal. Loss of sensation in response to superficial and deep pinprick stimulation began immediatly at the level of the tip of the catheter, i.e at the thoracolumbar junction, then involved the paralumbar fossa and extended cranial mainlly till T9 and caudad sometimes till L4, where the lenght of the catheter inside the epidural space was about 35 cm (25-40 cm., table 1 a&b).

Onsets of analgesia were in 4 cows with unilateral (3 of them in left side and 1 in right side) and in 6 cows with bilateral blockade. The onset of the analgesic effect begins in the right side after about 14.3 (5-25) minutes and in the left side after about 6.2 (5-10) minutes, after the first injection. The period of analgesia was maintained by fractional bolus of 2% procaine hydrochloride solution in dose of about 4.0 (2-5 ml), just after complete resensitization of the paralumbar fossa. The full desensitization was recorded again after 7.8 (5-15) minutes at the right side and after 6.2 (5-10) minutes at the left side from the second injection. The analgesic period became totaly in avarage of 109 minutes (90-120 minutes) at the right side and of 114.4 minutes (95-125 minutes) at the left side (table 1 b).

The analgesia was evident at the foreteats and fore quarter in the same affected side mainly after 20 minutes, and the effect extended about another 20 minutes from the first injection. The caudal teat and udder were desensitized only in the two cows which fall down and the effect was reached and involved the hind limbs (cow No. 1 & 7).

Transient, slight hind limb ataxia was observed in three cows and required support to remain standing. Recumbency occured after 20 minutes of the first injection in cow No. 1 and another after 5 minutes of the second injection in cow No. 7. The two cows

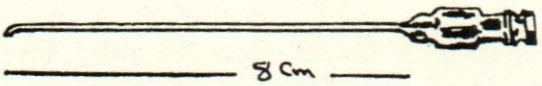

Fig. (1a): Tuohy needle (unidirectionable epidural needle)

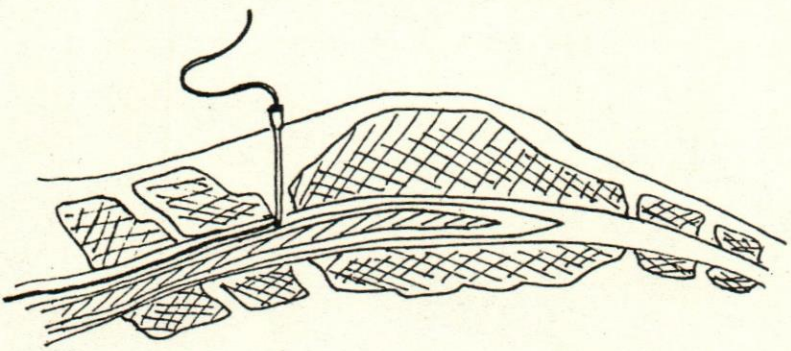

Fig. (1b): Placement of the catheter inthe epidural space in the lumbo-sacral interspace.

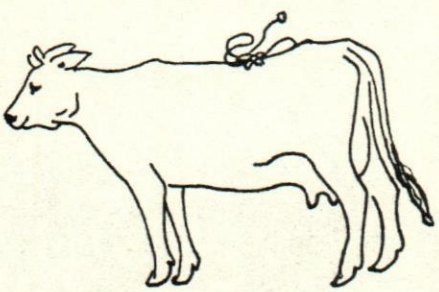

Fig. (1c): The catheter taped to the back of a cow for prolonged and repeated epidural analgesia.

stood again after 20 & 40 minutes respectively. Catheter related problems and other complications were not evident.

DISCUSSION

Catheterization using the unidirectionable pointed spinal needle of the thoracolumbar epidural space of cattle, from the lumbosacral intervertebral site, and production of continuous segmental analgesia of the paralumbar fossa and to some extend the neighbouring areas has been described. This technique can be performed in the standing cow to facilitate a flank laparotomy.

SKARDA and MUIR (1981) stated that, when the analgesic effects of 5% procaine hydrochloride solution on intrathecal nerve roots and epidural nerve roots are compared, it becomes evident that intrathecal administration requires less drug for similar segmental analgesic blockade. In addition it has a more rapid onset, and shorter 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 probably reflects the small dose of anaesthetic agent used and the inhrent dilution effect of the spinal fluid. When the results of subarachnoid injection at the lumbosacral intervertebral junction by SKARDA and MUIR (1981) are compared with the same injection epidurally of the present work

From this study, it was found that the dose for epidural analgesia was 97 mg procaine H Cl in comparison to that recorded by SKARDA and MUIR (1981) who reported the intrathecal dose was 75 mg to 100 mg procaine H Cl for Holstein-Friesian cows weighing from 530 to 707 kg. From the above results, it was concluded that, the epidural injection required higher dose of procaine HCl and has a longer duration of action, than that in case of intrathecal injection while the anaesthetized areas were the same in the two techniques.

When the other techniques, including paravertebral analgesia, dorsal segmental lumbar epidural analgesia and infilteration analgesia of the flank are compared with the segmental epidural of the present investigation, some advantages are of considerable importance.

These advantages can be summarized in the following points. 1-the catheterization to a desired length permits the exact deposition of local anaesthetic drug, 2- minmal dose of the anaesthetic agent is required, and 3- the catheterization of this method provide a route for repeated small fractional maintenance doses of the local anaesthetic solution, making extent of analgesic effect more readly controlled and in continuous manner achieved.

On the other side, the continuous segmental thoracolumbar epidural analgesia of the present trials indicates that, exacting technique is required and precise determination of anatomic landmarkes, needle and catheter position and dose of the agent are necessary. SKARDA (1987) stated some other disadvantages of the catheter technique in cow and

horse namely kinking and curling of the catheter, trauma to the conus medullaris, accidental vascular puncture and also that catheter positioning may require radiography for confirmation.

The cause for the unilateral analgesia was not investigated but could be attributed to the following possibilities. Placement of the catheter at the ventrolateral surface of the cord, where the tip of the catheter could be trapped between the trabecula and dorsal longitudinal ligament, thereby restrichting the dissipation of the local anaesthetic to the same side (SKARDA and MUIR, 1983).

Minimal circumferential overflow of local anaesthetic around the dura mater spinalis because of the small volume of local anesthetic solution (USUBIAGA, et al. 1970). Lateral escape of the local anaesthetic through patent intervertebral foramina (HEHRE, et al. 1960 and SANCHEZ, et al. 1967). Inadequate diffusion of the anaesthetic solution as a result of anatomical pecularities such as congenital or acquired midline adhesions, between dura mater and lamina (SKARDA, 1982). The placement of catheter could have been directed to one side because of the existence of an inconsistent septum dividing the spinal subarachnoid space along the midline of the dorsal surface of the cord, in case of subarachnoid injection (HALL, 1974).

It is observed that, there is a wide range of different segment analgesic zones occured in cows after epidural injections of the same drug and the same concentration and dose, using a similar injection rate and injection site. SKARDA and MUIR (1981) observed the same results and discussed the factors which influenced the area affected by subarachnoid blockade but were not standardized. These factors were, 1- the exact position of the catheter tip at the T13-L1 vertebral level, 2-the capacity of the subarachnoid space, 3-the physiologic curvature of the spine, and 4-variations in density of spinal fluid and spinal fluid dynamics.

The results fo the present technique confirmed that, the surgical procedures of the fore teats and fore quarter only can be performed using the thoracolumbar epidural injection, but the caudal parts required desensitization of the perineal nerve and the mammary branch of the pudendal nerve which have their origin from S2, S3 & S4 and from L3 & L4 spinal nerves (ST.CLAIR, 1942 and ARNOLD and KITCHELL, 1957).

The analgesia of the caudal parts was obtained in the two recumbant cows, when the last two lumbar and sacral nerves were desensitized. It can be concluded that, the other simple infilteration analgesic methods are recomended and the lumbosacral i.e. high epidural analgesia is the technique of choice for major udder surgery if recumbency is desired.

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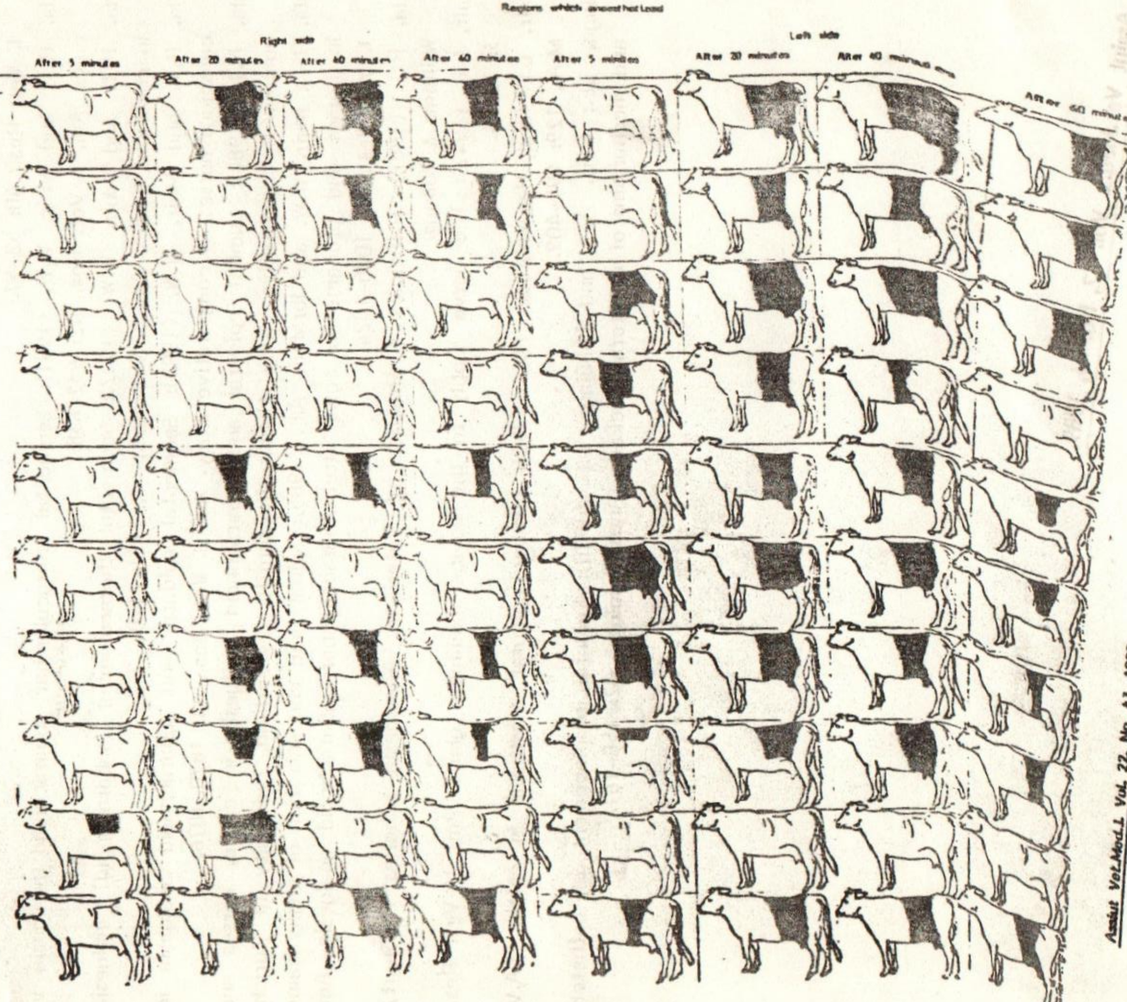
Table (1): Onset, duration, extend and results of continuous thoraco-lumbar epidural analgesia in cow, using proc. HCl, 2%.

A- First anaesthetic injection.

No	Length of catheter in cm	Dose in ml	Onset in mints R	Onset in mints L	Duration in minutes R	Duration in minutes L	Complications
1	35	5.5	15	10	75	70	After 20 minutes recumbent position for 20 minutes.
2	30	4.0	25	10	40	50	
3	40	4.0	-	5	-	75	
4	35	4.5	-	5	-	45	
5	37	5.0	10	5	50	65	
6	38	5.0	-	5	-	60	
7	35	5.0	20	5	45	55	
8	25	5.0	15	5	65	65	
9	35	5.0	5	-	30	-	
10	32	5.0	10	5	70	75	
AV	35	4.85	14.3	6.2	53.6	62.2	



B- Second anaesthetic injection

Dose in ml		Onset in minutes R	Onset in minutes L	Duration in minutes R	Duration in minutes L	Total Duration R	Total Duration L	Complication
1	2.0	10	5	40	45	115	115	
2	2.0	15	5	50	45	90	95	
3	2.5	-	5	-	40	-	115	
4	3.0	-	5	-	50	-	95	
5	2.5	5	5	55	50	105	115	
6	3.0	-	10	-	60	-	120	
7	3.0	5	5	65	65	110	120	After 5 minutes recumbent position for 40 minutes
8	3.0	10	5	50	60	115	125	
9	3.0	5	-	70	-	100	-	
10	2.0	15	10	50	55	120	130	
AV	6.8	7.8	6.2	54.5	40.0	109	114.6	

Regions which anaesthetized

Right side: After 5 minutes | After 20 minutes | After 40 minutes | After 60 minutes

Left side: After 5 minutes | After 20 minutes | After 40 minutes | After 60 minutes