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# التخدير القطنى فى الجامـــــوس

نبيـــل مسك ، مصطفى مـــنزلى ، عبد الله حفنى ، هـــــارون علـــــى

تم فى هذا البحث دراسة التخدير القطنى فى الجاموس واوضحت النتائج أن أنسب مكـــان للحقن هو بين الفقرتين الاولى أو الثانية اما كمية المخدر المناسبة فهى ٨سم تركيز ٤٪ أو ١٠٪ سم تركيز ٣٪ من بروكين هيدروكلوريد يسبقه حقن كمية من الرمبون ½ ملجم من وزن الجســـــم وباستعمال هذه الطريقة والكمية السالفة الذكر أمكن الحصول على تخدير كامل فى المنطقـــــة القطنية لمـــدة ٦٥ دقيقـــة ويظل الحـــيوان فى وضع واقـــف.

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# LUMBAR EPIDURAL ANAESTHESIA IN BUFFALOES

(With 3 Tables and 3 Figures)

By

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## SUMMARY

In the present work the technique of lumbar epidural anaesthesia was studied and established in buffaloes. The results show that the most reliable seat was the first interarcual space and the most suitable dose was 8 cm of 4% or 10 cm of 3% procaine Hcl peremedicated by a Rompun in a dose of 0.05 mg/kg bw. The latter gives Satisfactory anaesthesia of the flank for a period of about 65 minutes and the animal remains in the standing position.

## INTRODUCTION

Various forms of important surgical interventions such as rumenotomy, caesarean section, spaying and correction of abomasal displacement are performed through flank laparotomy. For satisfactory completion of these operation, analgesia of the abdominal wall is obtained by lumbar epidural anaesthesia (L.E.A.).

The available literature includes many authors discussing L.E.A. in cattle (BUCHHOLZ, 1948; MAGDA et al, 1952, GREENWOOD, 1953; ARTHUR, 1956; St. CLAIR and HARDENBROOK, 1956; HEESCHEN, 1960; GRIGORESCU et al.1961; and VOSKOBOINIKOV, 1974 and MAGDA and VARONEN 1974), but lacks informations about its clinical application in buffaloes except LYATIFOV (1970).

The aim of the present work is to study and establish L.E.A. in buffaloes. Moreover, Rompun was tested as a preanaesthetic. Attention has been drawn to the topographical anatomy of the seat of injection as well as the lumbar epidural space and roots of last thoracic and first four lumbar spinal nerves in buffaloes.

## MATERIAL and METHODS

A) General Consideration:

General anatomical consideration of the vertebral column, spinal cord segments and spinal nerves in relation to L.E.A. were studied. This study was conducted on 8 formalised specimens of buffaloes, 2-4 years old, with an object to illustrate the topographical anatomy of interarcual spaces and ligaments as well as the spinal cord segments in the region of the last thoracic and first four lumbar vertebrae.

B) Lumbar Epidural Anaesthesia in Buffaloes:

The proper study was carried out on 45 appearently healthy male and female buffaloes of native breed. Their body weight ranged between 220 to 300 kg. and their age between 2 to 4 years. Procaine hydrohloride was used for anaesthesia and applied with and without premedication by Rompun (Bayer).

The experimental animals were divided into two main groups;

Group I: (25 animals). In this group, procaine Hcl solution in doses of 4-16 ml. for ½, 1 & 2% concentrations and 4-14 ml. for 3 & 4% concentrations was used. The injections were conducted time without tranquilizer and another time with Rompun in a dose of 0.05 mg/kg. body weight with one week interval[10].

Group II: (20 animals). In this group, operations were performed under effect of L.E.A. with tranquilization (10 Rumenotomy, 5 laparotomy and 5 cases for some surgical interferences in the anterior half of the udder including experimental teat surgery and superficial wounds).

Injection Technique:

The injection site is located about 1½ cm. to the right or left of the midline and with a distance of about 1 cm. caudal to a line connecting the most prominant lateral edges of the transverse processes of the

second lumbar vertebra. A 12 cm. length, 18- gauge spinal needle was thrusted through the skin and directed ventrally, slightly medially and cranially between the spinous processes of the first two lumbar vertebrae. The angle of inclination of the spinal needle is about 11 degrees with the midplane and about 30 degrees with the transverse plane. Perforation of the interarcual ligament is indicated by abolishment of resistance to the advancement of the needle. This was confirmed by sucking of the drops of the anaesthetic solution that have been applied on the end of the spinal needle after withdrawal of the stillete. Smooth flow of the anaesthetic solution into the epidural space was considered as an evidence for entrance into the epidural space. The anaesthetic solution flows in an almost automatic manner without pressing over the piston of the syringe. The efficiency of anaesthesia was determined by introducing fine needle through all layers of the abdominal wall.

## RESULTS

A- General anatomical consideration: (Fig. 1, 2):

The interarcual space, ligament and epidural space: In buffaloes, the first three lumbar interarcual spaces were found to be nearly crescentic in shape (Fig. 1). The dimensions of the interarcual spaces and thickness of the interarcual ligaments were seen in Table 1. These spaces are occupied by the interarcual ligaments. The thickness of the latter is about 0.25-0.30 cm.

The epidural space (Fig. 2 B) at the level of the first three lumbar vertebrae measures about 0.6-0.7 cm. in width. It is filled with fat except for vessels and strands of connective tissues.

Roots of spinal nerves (Fig. 2, B, B', C & D):

The roots of the second lumbar nerve were nearly opposite to the corresponding intervertebral foramen. The third lumbar nerve roots had very slight caudal inclination while those of the last thoracic and first lumbar nerves had slight cranial inclination.

The spinal cord segment (Fig. 2, $S_{13}$, $S_1$- $S_6$):

The spinal cord segment was considered to be midway between the dorsal roots of adjacent segments[11]. The dimensions of the spinal cord segments are shown in Table 2.

B) Lumbar epidural anaesthesia in buffaloes:

The results of the present study are illustrated in Table 3. It was clearly evident that the technique of L.E.A. in buffaloes was facilitated to a great extent by administration of Rompun as a preanaesthetic medication before indicution of this type of anaesthesia.

Efficient anaesthesia of all layers of the abdominal wall at the flank region was obtained by application of L.E.A. in buffaloes. Administration of Rompun intramuscularly 15 minutes before injection of the anaesthetic facilitate not only the injection process, but also the performance of the operation. Rumenotomy and laparotomy operations were satisfactorily performed under the effect of 8 ml. of 4% or 10 ml. of 3% Procaine Hcl solution (Fig. 3)in the standing position without any weakness in the hind limbs and with complete analgesia of the flank region for about 65 minutes. Surgical intervention of the anterior teats and cranial half of the udder were performed under the effect of L.E.A. using 10 ml. of 4% Procaine Hcl solution.

## DISCUSSION

The technique of L.E.A. in cattle is performed by injection of the local anaesthetic solution into the epidural space, and sometimes through the thoracolumbar or second interarcual space (BUCHHOLZ, 1948; MAGDA, SHALDUEA and VOSKOBOINTKOV, 1952; GREENWOOD, 1953; ARTHUR, 1956; HEESCHEN, 1960 and GRIGORESCU, 1961). LYATIFOV (1970) used the first lumbar interarcual space for L.E.A. in buffaloes. The present study cleared that the interarcual space between the first two lumbar vertebrae is a reliable site for L.E.A. It is larger than the space between the last thoracic and first lumbar vertebrae (Table 1). The interarcual space between the first two lumbar vertebrae is prefered in comparison with the second lumbar interarcual space because when the latter was used, the pelvic lumb were weakened (ST. CAIR and HARDENBROOK, 1956).

SAID et al., (1976) stated that the flank area in buffaloe is supplied by the last thoracic and the first three lumbar nerves. Our study on the spinal cord segments and roots origin of the first lumbar interarcual space could promote deposition of the anaesthetic solution nearly in an appropriate position between the roots of these nerves.

MAGDA et al, (1952), GRENWOOD (1953) and ST. CLAIR and HARDENBROOK (1956) stated that, the determination of the site of injection of L.E.A. in cattle was detected about ½ to 3/4 inch to the right of the midline and the same distance caudal to the transverse plane of the cranial border of the transverse process of the second lumbar vertebra. Our results showed that the site for injection of L.E.A. in buffaloes more or less correspond with that given in cattle.It is of interest to notify here that the cranial edge of the second lumbar transverse process in buffaloes cannot be palpated. Therefore, in the present work, the most prominent lateral edges were taken as a guide point to determine the site of injection in buffales.

An insensitive skin weal at the site of injection is performed in cattle by ARTHUR (1956). In our work, in spite of making the insensitive skin weal the vicious movements of buffaloes bent the spinal needle. Tranqulization of the animal with Rompon greatly facilitates the process without bending the spinal needle and displacement of its position and direction.

To facilitate introduction and movement of the spinal needle many authors (GREENWOOD, 1953 and ST. CLAIR and HARDENBROOK,1956) used wide bore needle through which the spinal needle was passed, while ARTHUR (1956) made a longitudinal 2-3 cm paramedian skin incision. In our work, when a sharp spinal needle was used after tranquilization of the animal with Rompun, there was no need for neither the wide needle nor the skin inision.

In the present study, the angle of the spinal needle with the midplane at the time of injection ranged from 9 to 13 degrees. When the angle is less than 9 degrees, the flank on the same side of injection or both sides anaesthetized. This may be attributed to the deposition of the anaesthetic solution on the spinal cord at the midline or lateral to it on the same side of injection. Moreover, the point of the spinal needle may be directed towards the lamina of the arches of the vertebrae lateral to the interarcual space. When the angle of the needle point is directed more laterally towards the intervertebral foramen and may penetrate the foramen to outside. The present anatomical study of the lumbar vertebrae cleared that in buffaloes the arch of the vertebra cranial to the interarcual space is higher than that which caudal to it, so the needle should be directed cranioventrally by an angle of about 25-35 degrees with the transverse plane. Introduction of the needle by an angle larger than 35 degrees or smaller than 25 degrees may direct the point of the needle away from the interarcual space.

The length of the needle that was introduced to reach the epidural space ranged from 9.5 to 11.5 cm. This differes from that given by LYATIFOV (1970) who stated that in buffaloes it ranged from 7 to 9.5 cm. In cattle the length of the needle which was introduced ranged from 5.8 to 9.3 cm (MAGDA et al. 1952 and ARTHUR 1956). Our finding could be correlated to the large spinous processes and thick skin of buffaloes.

MAGDA et al. (1952), ARTHUR (1956) and HEESCHEN (1960) stated that when the epidural space was entered by the spinal needle, air could be heared rushing into it. This sucking noise could be heared in few cases in buffaloes.

ST. CLAIR and HARDENBROOK (1956) and HEESCHEN (1960) noticed that absorption of the anaesthetic solution into epidural space occured after pentration of the interarcual ligament.In the present work the more or less automatic flow of the anaesthetic solution was taken as a sure evidence that the epidural space had been entered.

The ideal dose for L.E.A. in buffaloes was 8 ml. of 4% or 10 ml. of 3% procaine Hcl. When the dose was increased,weakness of the hind lumb will occured. From our point of veiw, 65 minutes (period of complete analgesia of the flank) was quite sufficient to perform many operations through the flank and the animal remains in standing position.

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Table (1)

Shows the dimensions of the interurcual spaces and thickness of the interarcual ligaments

| Interarcual space | Diminsions of interarcual spaces (in cm.) | | | Thickness of interarcual ligs (in cm.) |
|---|---|---|---|---|
| | Length | Width | Depth | |
| Between $th_{13}$ & $L_1$ | 1.1 | 0.4 | 1.1 | 0.25 - 0.30 |
| Between $L_1$ & $L_2$ | 1.3 | 0.4 | 1.1 | 0.25 - 0.30 |
| Between $L_2$ & $L_3$ | 1.4 | 0.4 | 1.2 | 0.25 - 0.30 |

Table (2)

Shows the dimentions of the spinal cord segments

| Segment | Length (cm.) | Width (cm.) | Height (cm.) |
|---|---|---|---|
| Last thoracic segment | 4.8 | 1.30 | 1.0 |
| First lumbar segment | 5.0 | 1.30 | 1.0 |
| Second lumbar segment | 5.1 | 1.30 | 1.0 |
| Third lumbar segment | 5.1 | 1.35 | 1.0 |

Table (3)

Showing the effect of L.E.A. in buffaloes using Procaine Hcl. solution

| % | Dose per/ ml. | Onset of action per/min. | Sensation | Duration of action per/min. | One or double side effect | Weakness of hind limbs |
|---|---|---|---|---|---|---|
| | 4 | - | - | - | - | - |
| | 6 | 18 | ± | 20 | one | - |
| | 8 | 18 | ± | 26 | one | - |
| ½ | 10 | 16 | ± | 27 | one | - |
| | 12 | 14 | ± | 28 | double | - |
| | 14 | 14 | ± | 30 | double | - |
| | 16 | 14 | ± | 30 | double | - |
| | 4 | - | - | - | - | - |
| | 6 | 15 | ± | 20 | one | - |
| | 8 | 15 | ± | 24 | one | - |
| 1 | 10 | 14 | + | 35 | double | - |
| | 12 | 12 | + | 36 | double | - |
| | 14 | 10 | + | 38 | double | - |
| | 16 | 10 | + | 38 | double | - |
| | 4 | - | - | - | - | - |
| | 6 | 12 | + | 35 | one | - |
| | 8 | 10 | + | 45 | double | - |
| 2 | 10 | 8 | + | 50 | double | - |
| | 12 | 7 | + | 53 | double | x |
| | 14 | 7 | + | 58 | double | xx |
| | 16 | 6 | + | 60 | double | xxx |
| | 4 | 10 | + | 22 | one | - |
| | 6 | 10 | + | 36 | one | - |
| | 8 | 7 | + | 48 | double | - |
| 3 | 10 | 7 | + | 65 | double | - |
| | 12 | 7 | + | 85 | double | x |
| | 14 | 6 | + | 95 | double | xxx |
| | 4 | 8 | + | 40 | one | - |
| | 6 | 7 | + | 48 | one | - |
| | 8 | 6 | + | 65 | double | - |
| 4 | 10 | 6 | + | 95 | double | - |
| | 12 | 5 | + | 103 | double | xx |
| | 14 | 3 | + | 120 | double | xxx |

x : Slightly weakened.

xx : Strongly weakened.

xxx : Animal lies down.

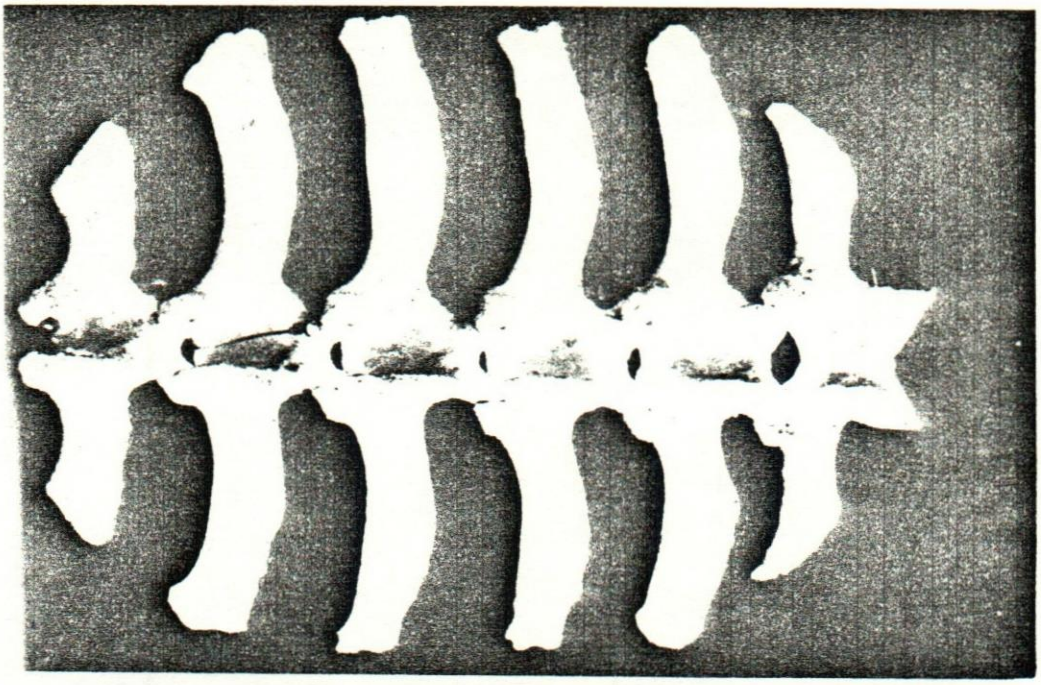

Fig. (1)

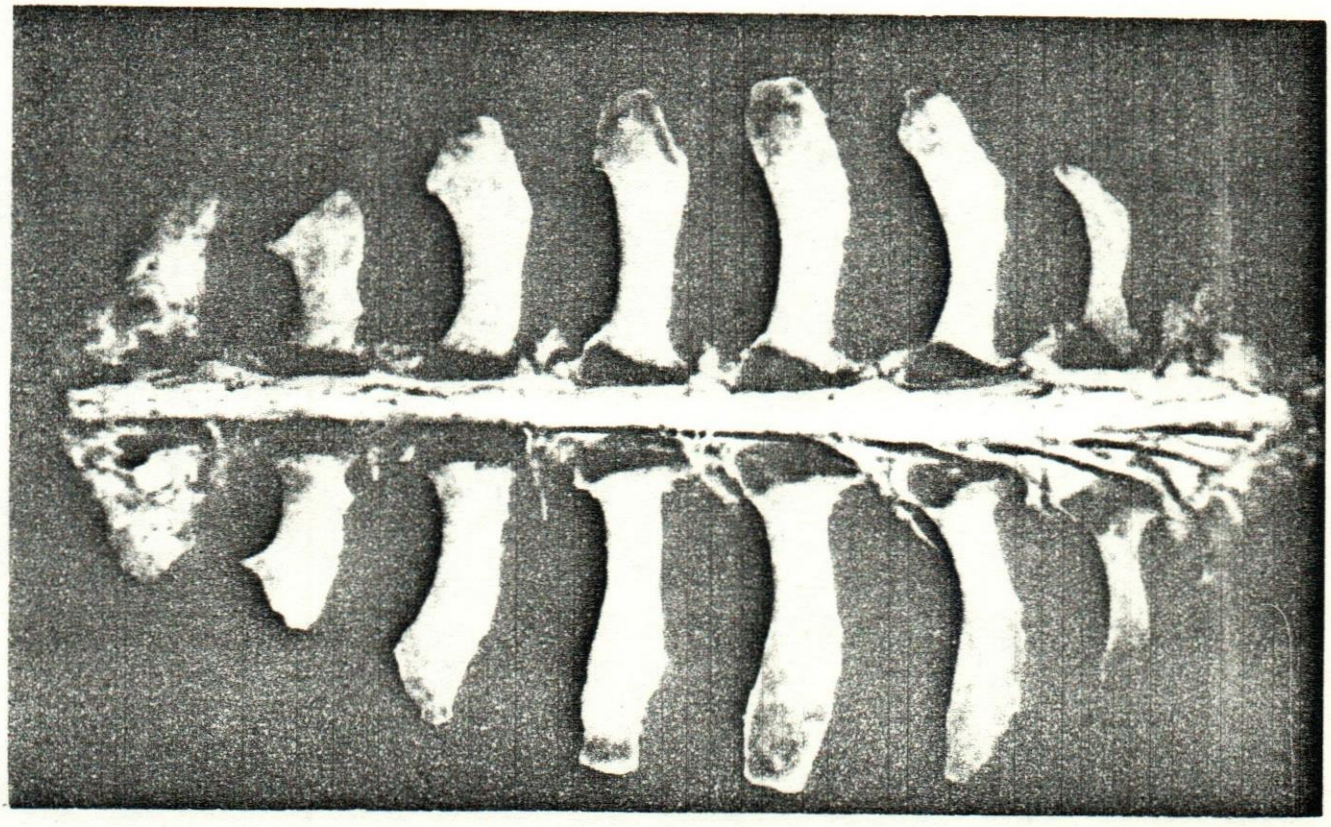

Fig. (2)

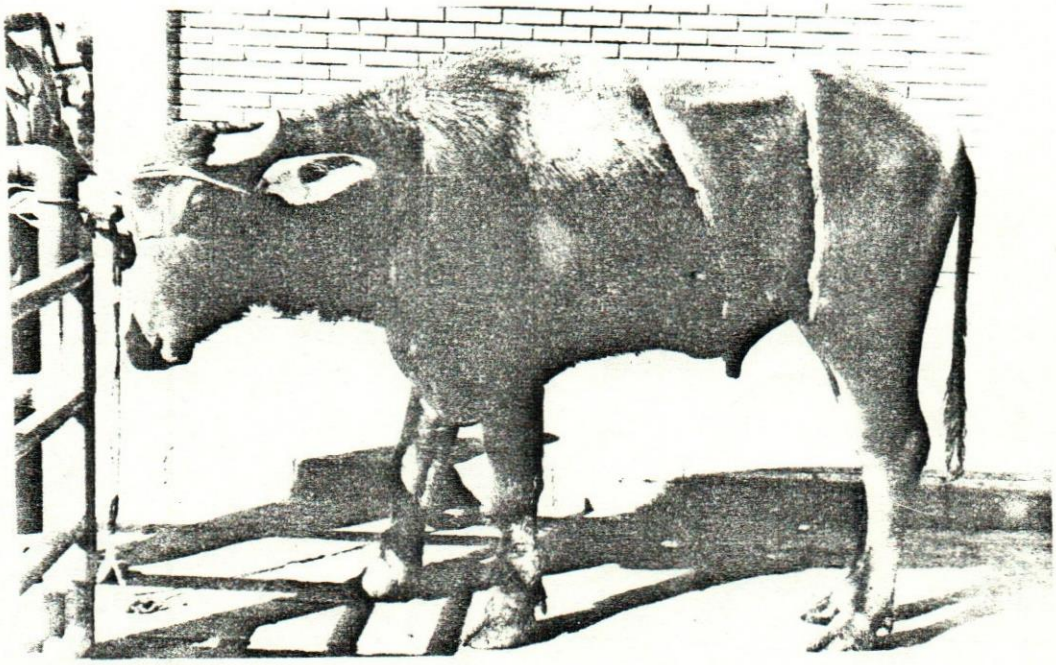

Fig. (3)