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DOSE DEPENDENT EPIDURAL ANALGESIA IN DONKEYS

(With 4 Tables & 6 Figures)

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التأثيرات المتعلقة بالجرعات للتخدير الجزئي
بالحقن حول الأم جافيه في الحمير

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لقد درست التأثيرات المتعلقة بالجرعات للتخدير الجزئي بالحقن حول الأم جافيه في الحمير ومدى قدرة الحيوانات على تحمل الجرعات الكبيره من المخدر. وكانت هناك علاقته طرديه بين الجرعات المستخدمه ومدة التخدير والمنطقه المخدره. ولوحظ تصلب تشنجي للرقبه والرأس عند استخدام الجرعات الكبيره من المخدر. كذلك كانت التغيرات واضحه في معدل النبض والتنفس ودرجة الحرارة بعد حقن الجرعات الكبيره.

SUMMARY

The dose dependent effects of epidural analgesia in donkeys, and to what extent the animals can tolerate the large doses of the analgesic drug were studied. Anterior epidural analgesia of short duration was obtained after injection of 10 ml 2% procaine hydrochloride solution. The duration of analgesia and the desensitized area increased by increasing the dose. Tonic stretching of the head and neck occurred when large doses (100-120 ml) were used. The changes in the heart rate and respiratory rate were obvious after epidural injection of large doses of the analgesic drug.

Key words: Dose-Epidural analgesia-Donkeys.

INTRODUCTION

Epidural analgesia may be considered the method of choice in risk patients whose organic functions are reduced through trauma, infection or organic insufficiency, age and obesity. It is also a suitable method for the animals weakened by previous experimental interventions (*BONATH, et al, 1987*).

Classification of epidural analgesia as anterior and posterior depends chiefly on the volume of solution injected, although, the concentration and diffusibility of the drug and the rate of absorption from the space also play a part (*HALL, 1970*).

While *LUMB and JONES (1984)* stated that anterior epidural analgesia is not recommended for the horse, 50 to 120 ml of 1% procaine Hcl via the first intercoccygeal space were recommended for severe obstetrical manipulation and 30 to 80 ml of 2% procaine for surgical procedures in horses (*HALL, 1971*). There are many controversial opinions about the efficacy of anterior epidural analgesia in caudal epidural analgesia can be used in the horse, because injection of larger volume raises the pressure of the cerebrospinal fluid causing clonic contractions, *TUFVESSON (1963)* indicated that 100 to 150 ml of 2% lidocaine induces anaesthesia to the level of the costal arch.

When inducing full anterior analgesia, *HALL (1971)* stated that no signs of hypotension were seen with dose rates of 100 to 150 ml in cattle. On the contrary hypotension was recorded in bulls after doses of 150 to 200 ml of 2% solution. The symptoms were those of collapse, with a racing heart, and rapid and shallow respiration.

The present study was designed to evaluate the dose dependent effects of epidural analgesia in donkeys, and to what extent the animals can tolerate the large doses of analgesic drug.

MATERIALS and METHODS

A number of 27 adult donkeys of both sexes were used in the present study. The animals were apparently healthy and weighing 120 to 150 kg body weight.

Procaine hydrochloride (El Nassr Company, Egypt) was prepared as 2% solution for epidural administration. The analgesic agent was prepared by dissolving the powder in the distilled water then the solution was sterilized by boiling for few minutes in a water bath, filtered and left to cool before injection.

The animals were divided into nine groups each of three animals. The analgesic solution was administered epidurally in dose rates of 10, 15, 20, 30, 50, 80, 100, 120 and 140 ml. Each dose was injected into a group of three animals. Injection of the analgesic solution was performed through the first inter coccygeal space. The skin at the site of injection was prepared aseptically before injection.

Analgesia was evaluated by the disappearance of the reflex to the deep needle prick on some parts of the body surface; namely tail, anus, peritoneum, scrotum, thigh, leg, abdomen, and thorax.

The temperature, pulse and respiration rate were recorded before injection and at 15, 30, 45, 60, 75, 90 and 120 minutes after epidural analgesia. The return of reflexes was recorded in reverse order starting from the thorax. The other neurological manifestations were also recorded.

RESULTS

Analgesia of the anus, tail and perineal region began within 12 minutes after epidural injection of 2% procaine hydrochloride solution in a dose rate of 10 ml. Loss of sensation of the hind limbs and flank became evident 15 minutes after injection, where the animal lied down. Sensation began to reappear in the flank and hind limbs 30 minutes after procaine administration. The animal could stand up within 60 minutes.

Desensitization of the anus, tail and perineal region began 5 minutes after epidural analgesia using 2% procaine hydrochloride solution in a dose rate of 15 ml. Weakness and incoordination of the hind limbs began to appear after 7 minutes. The animals lied down after 15 minutes with loss of sensation in the caudal half of the animal body till the umbilicus. Sensation began to reappear in the cranial desensitized parts and gradually extended caudally after 60 minutes. Sensation became evident in all the previously desensitized parts within 120 minutes after epidural analgesia using 15 ml of 2% procaine hydrochloride (solution). The animal could stand up and walk after 150 minutes.

Epidural injection of 2% procaine hydrochloride in a dose rate of 20 ml led to incoordination of the motor activity of the hind limbs and the animals lied down just after injection of the analgesic solution. Analgesia extended to include the animal body from the level of the thirteenth rib and caudally within 5 minutes. The animals made some trials to raise the head and neck and the cranial thorax by the aid of the fore limbs, then they stayed in the sternal recumbency (Fig. 1). The return of the reflexes began to be evident in

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the cranial parts and extended caudally where analgesia reached the level of the sixteenth rib within 60 minutes. The return of sensation appeared in all animal body within 90 minutes. The animal could stand up within 150 minutes.

After epidural injection of 30 ml procaine hydrochloride solution the findings were more or less resembling those after the use of 20 ml dose level except some limited observations. One animal showed tonic extension of the head and neck for about 10 seconds in the Lateral recumbency then returned to take the sternal recumbency.

Analgesia was evident within 2 to 3 minutes after epidural injection of 50 ml procaine hydrochloride solution. The desensitized area extended till the level of the withers area. The animals lied down during injection of the analgesic solution. Tonic stretching of the head and neck appeared just after injection of the analgesic solution in two animals, but disappeared within 30 seconds then the animals took the sternal recumbency with some lateral inclination and resting the chin on the ground (Fig. 2). Sometimes the animal took the milk fever-like-recumbency and rest the head on the scapula (Fig. 3). The animals returned to take the sternal recumbency with some inclination to lateral recumbency within 45 minutes.

Sensation returned to appear in the cranial half of the chest one hour. after injection of the analgesic solution.

All reflexes returned within 80 minutes and the animals could stand up within 100 minutes after epidural injection of the analgesic solution.

After epidural analgesia using 2% procaine hydrochloride (solution) in a dose rate of 80 ml the finding were or less as those after injection of 50 ml.

After epidural injection of procaine hydrochloride in dose rates of 100, 120 and 140 ml, desensitization extends cranially to include the withers area. The fore limbs did not respond to any prick but the animal moves them in nervous movements. The animals showed tonic convulsions of the head and neck intermitantly with some tremors.

There was return of reflexes within 120 minutes and the animals could stand up within 150 minutes after epidural injection of the analgesic solution.

Epidural analgesia using small doses of 2% procaine hydrochloride (solution) caused no obvious changes in heart rate, respiratory rate or rectal temperature (Table 1, 2, 3 & 4 and Fig. 4, 5 & 6). After epidural injection of large doses of procaine hydrochloride solution the heart rate and, respiratory rate increased sharply within 15 minutes and returned to be more or less around the normal values within 45 to 90 minutes after injection (Table 1, 2,

3 & 4 and Fig. 4 & 5). The rectal temperature decreased within 15 minutes after the epidural injection of the large doses of the analgesic solution and began to improve after 90 minutes (Table 1, 2, 3 & 4 and Fig. 6).

DISCUSSION

The use of 10 ml procaine hydrochloride solution (2%) was sufficient to produce anterior epidural analgesia till the flank region but the duration of the analgesia was short (15 minutes). The duration of analgesia and desensitized area increased by increasing the dose. Analgesia extended cranially to include most of the thoracic wall after epidural injection of the dose rate of 50 ml.

Although the tonic stretching of the head and neck was momentary in some animals after epidural analgesia using 30ml and 50ml procaine hydrochloride solution, the tonic convulsions were more obvious when dose rates of 100ml, 120 and 140 ml were used. These convulsions may be related to the transient increase in the cerebrospinal fluid pressure after injection of the large doses of the analgesic solution (*BERGE and WESTHUES 1966*).

Although no obvious changes in the heart rate, respiratory rate and rectal temperature were seen after epidural analgesia using small doses of 2% procaine hydrochloride, the heart rate and respiratory rate increased sharply after the use of large doses. The rectal temperature decreased after injection of the large doses. These changes may be related to the systemic effect of procaine hydrochloride solution. The increase in the heart rate and respiratory rate may be related partly to the systemic CNS stimulant effect of the drug and partly as a compensatory effect to the hypotensive effect of the local effect of the drug on the sympathetic ganglions in the thoracolumbar region.

Our conclusion suggested that a dose of 50ml of 2% procaine hydrochloride is quite sufficient for enducing the desirable effect concerning the desensitized area as well as the duration of analgesia without any significant changes. Doses above this limit may affect the animal and from our point of view can not be recommended.

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Table 1: Showing the mean values of the rectal temperature, heart rate and respiratory rate after epidural analgesia in donkeys using 10 ml procaine Hcl 2% solution.

Time	Temp.	Heart rate	Resp. rate
0	37	44	11
15	37.3	60	14
30	37.1	65	15
45	37	60	14
60	37.2	62	12
75	37.1	58	12
90	37.1	54	11
120	37	48	12

Table 2: Showing the mean values of the heart rate, respiratory rate and rectal emperature after epidural analgesia in donkeys using 30 ml procaine Hcl 2% solution.

Time	Temp.	Heart rate	Resp. rate
0	36.8	38	9
15	36.5	62	10
30	36.6	54	11
45	36.4	52	9
60	36	48	10
75	35.8	46	10
90	35.8	42	9
120	36	40	9

Table 3: Showing the mean values of the heart rate, respiratory rate and rectal temperature after epidural analgesia in donkeys using 50 ml procaine Hcl 2% solution.

Time	Temp.	Heart rate	Resp. rate
0	37.8	60	16
15	37.6	160	27
30	37.2	120	23
45	36.8	50	15
60	36.9	55	16
75	35.9	58	13
90	35.9	60	13
120	36	60	15

Table 4: Showing the mean values of the heart rate, respiratory rate and rectal temperature after epidural analgesia in donkeys using 100ml procaine Hcl 2% solution.

Time	Temp.	Heart rate	Resp. rate
0	37.3	44	12
15	36.7	150	36
30	36.5	150	30
45	36.7	145	30
60	36.6	138	18
75	36.6	88	20
90	36.8	48	16
120	36.6	46	14

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Fig. 4: Effect of epidural analgesia on heart rate

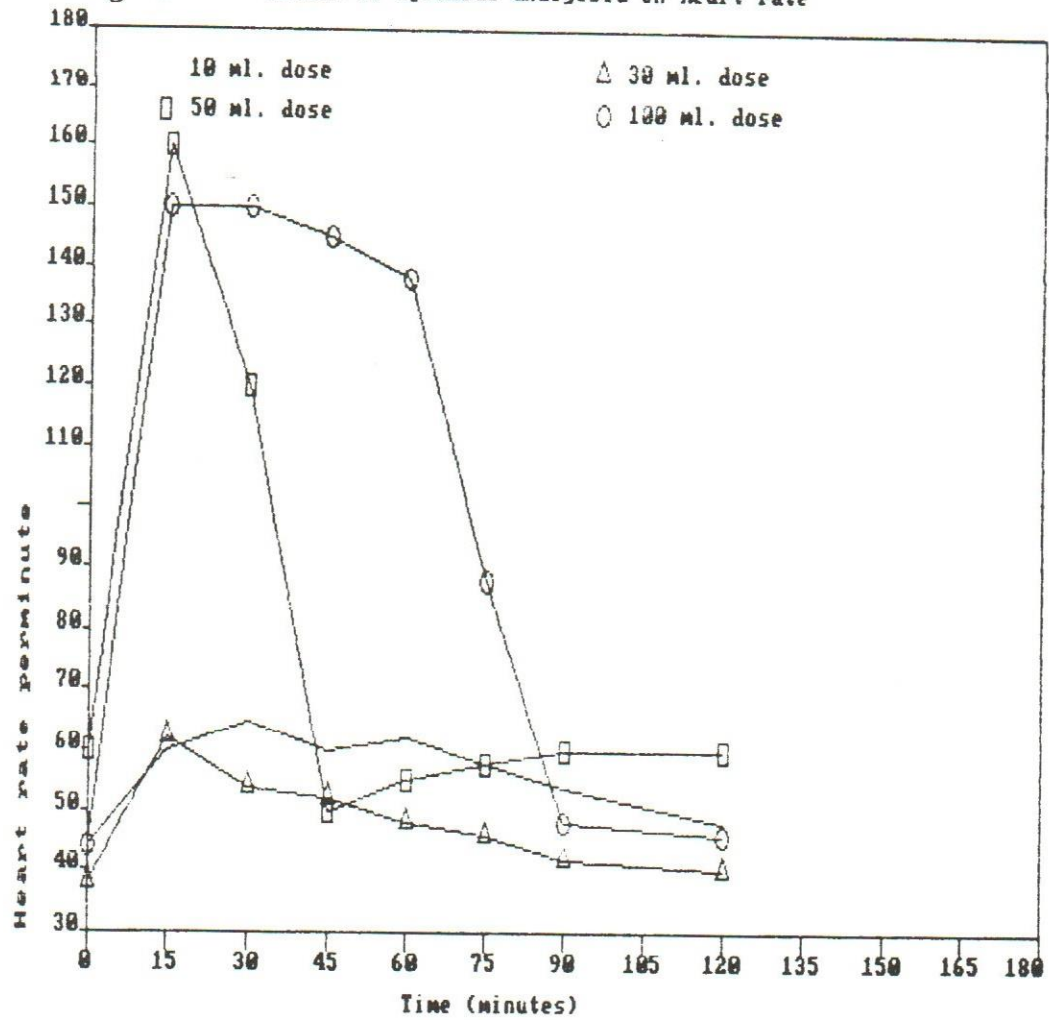
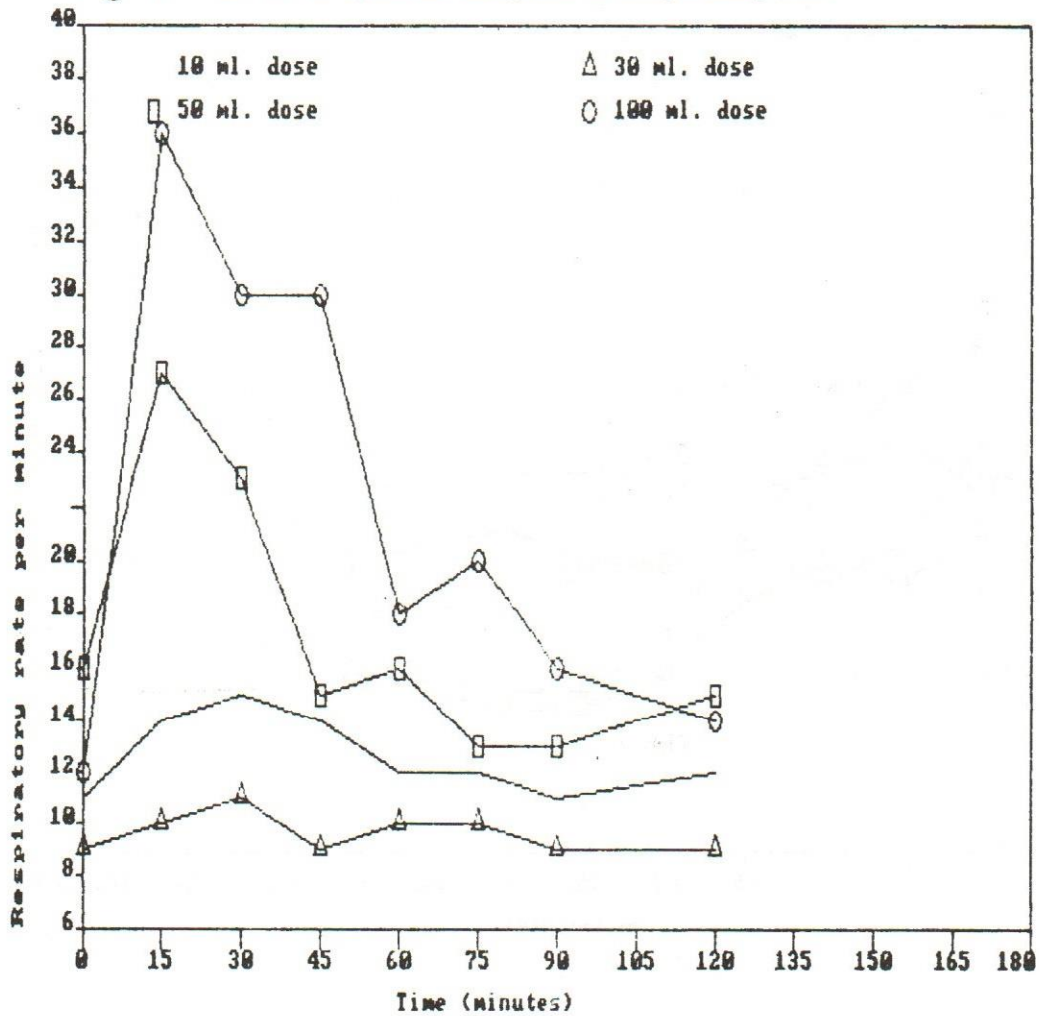
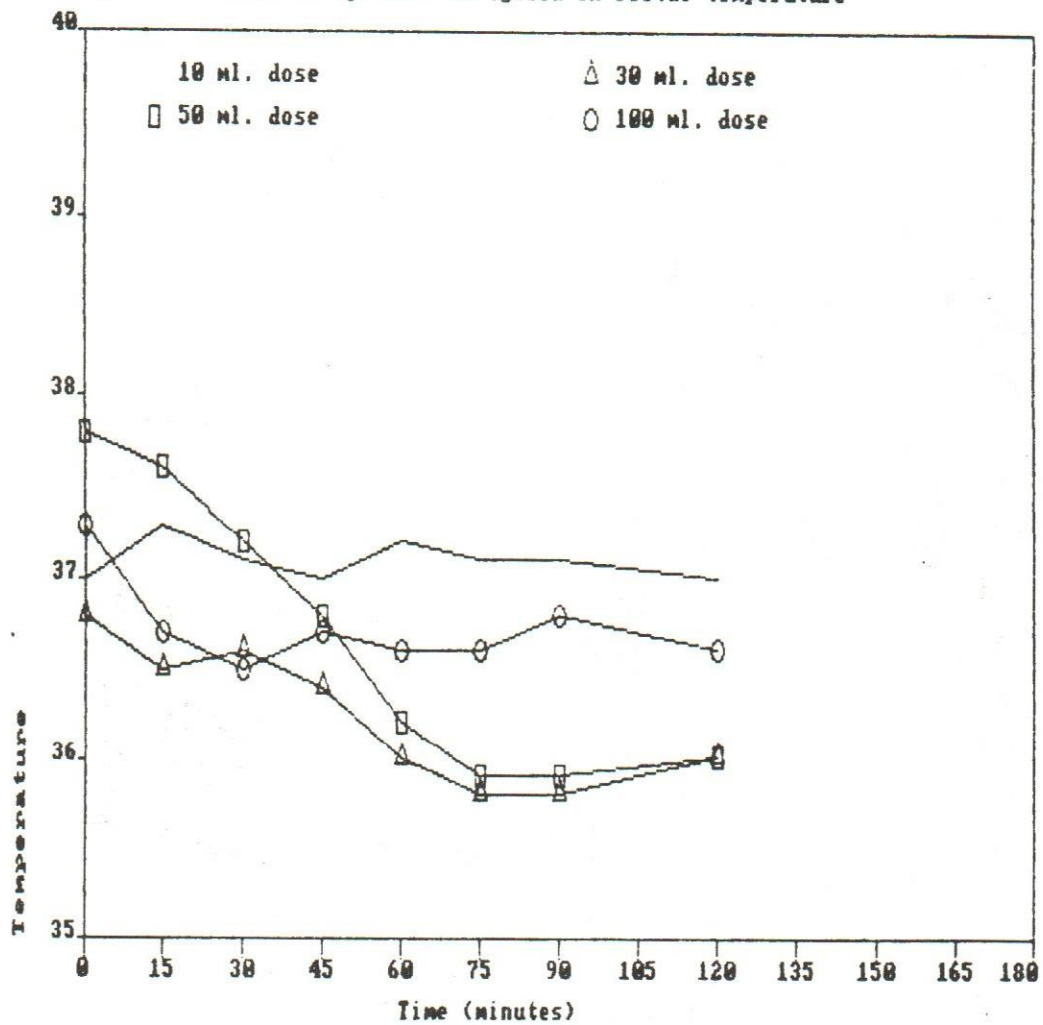


Fig. 5: Effect of epidural analgesia on respiratory rate



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Fig. 6: Effect of epidural analgesia on rectal temperature



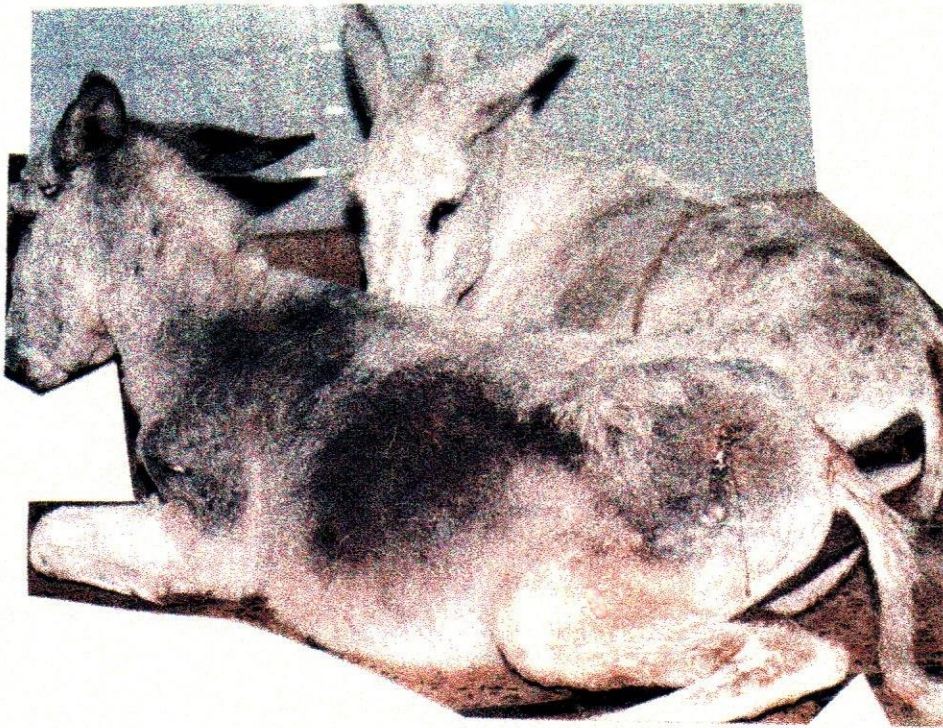


Fig. 1: Sternal recumbency position after injection of 20 ml analgesic solution.



Figure 1. A map of the study area showing the location of the study sites in the region of the study.



Fig. 2: Sternal recumbency with some lateral inclination and resting the chin on the ground after injection of 50 ml of the analgesic solution.



Fig. 3 Milk-fever recumbency position.

