

Title A DOSE RESPONSE STUDY OF BUPIVACAINE IN SPINAL ANESTHESIA

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Bupivacaine hydrochloride is a long acting local anesthetic, which has been used for peripheral nerve blocks and epidural anesthesia. Its limited use in spinal anesthesia suggests bupivacaine provides clinical results comparable to tetracaine. Controlled studies are needed to determine optimum dosage for spinal anesthesia.

Methods. Sixty male patients between the ages of 40 and 80 who required urological procedures in the lithotomy position were selected for the study. This study was approved by the Human Trials Research Committee and informed written consent was obtained from all patients. Dural puncture was performed at the L-3,4 interspace in the sitting position using a 25 gauge spinal needle. The patients remained in the sitting position for two minutes and then were immediately placed into the lithotomy position. All injections were made in approximately 20 seconds by a senior anesthetist. Sensory anesthesia and motor block was determined by another anesthetist. Neither the patient nor the testing anesthetist was aware of the volume or concentration of anesthetic solution employed. The following solutions of glucose-free bupivacaine were utilized in this study: 2, 3, and 4 ml of 0.5% bupivacaine and 1.3, 2 and 3 mls of 0.75% bupivacaine. Thus, dosages of bupivacaine varying from 10 to 20 mg were utilized. Heart rate and blood pressure were measured prior to and at 5 minute intervals following dural puncture by means of an automatic blood pressure monitor. Sensory anesthesia was determined by pinprick bilaterally at 2 minute intervals following dural puncture until the maximum upper sensory level was attained. Thereafter, sensory anesthesia was assessed at 10 minute intervals for the first hour and at 30 minute intervals until complete regression of anesthesia had occurred. Motor block was assessed at the same time intervals according to a modified Bromage scale.

Results. No significant difference in onset of sensory anesthesia to the T-10 level was observed between any of the patient groups (table 1). Duration of surgical anesthesia, i.e., regression to T-10 and T-12 levels was significantly longer in those patients receiving 15 and 20 mg of bupivacaine, compared to 10 mg. of bupivacaine (table 1). However, no difference in total duration of sensory anesthesia was observed between groups. A significantly higher maximum level of sensory anesthesia was observed in those patients receiving 15-20 mg of bupivacaine compared to the 10 mg group. Two patients receiving 15-20 mg of the 0.75% solution showed spread of anesthesia into the cervical area. This was not observed in any of the patients in whom 0.5% bupivacaine was employed. The degree and

duration of motor block was also significantly greater in those patients receiving 15 and 20 mg of bupivacaine compared to those patients receiving 10 mg of bupivacaine. An average decrease in mean blood pressure of $1 \pm 2\%$ to $14 \pm 2.4\%$ was observed at 10 minutes following subarachnoid administration of bupivacaine in the six groups of patients. No significant difference in blood pressure was observed between any of the groups.

Table 1
Dose-Response Study of Bupivacaine in Spinal Anesthesia

Group	Dose (ml)	Sensory Onset (min)*			Sensory Regression (min)*			Motor Block†		
		T10	T12	Mid-thigh Level	T10	T12	Mid-thigh Level	Onset	Regression	
I	0.5% 2 ml	10	8±0	14±3.4	78(71-77)	74±25.7	107(21-13)	25±23.5	2	160±46.3
II	0.5% 3 ml	15	7±1.7	21±1.3	73(70-72)	95±42.9	153±54.9	260±40	3	236±64
III	0.5% 4 ml	20	7±1.5	19±3.4	73(72-72)	159±16.4	204±15.8	300±15.6	3	356±17.8
IV	0.75% 1.3 ml	10	7±1.5	18±5.4	73(70-72)	94±16.5	136±27	190±37.5	2	169±58.5
V	0.75% 2 ml	15	4±0.85	19±2.4	72(70-74)	170±21.5	225±13.7	270±17.3	3	244±25.5
VI	0.75% 3ml	20	5±1.0	20±7.4	72(70-72)	143±13.3	190±25	290±42.2	3	290±54

*mean ± S.E.

Conclusion. Glucose-free bupivacaine solutions can provide adequate anesthesia for urological procedures. Doses of 15-20 mg of bupivacaine produce relatively long durations of surgical anesthesia and profound motor blockade. Little difference in any of the anesthetic parameters appeared to exist between the 0.5% and the 0.75% solution when the same number of mg was employed. Thus, the quality of spinal anesthesia obtained with bupivacaine appears related to the total dose in mg rather than the concentration or volume of the solution employed. The only possible exception was the high spread of sensory anesthesia observed in several patients receiving 15 to 20 mg of the 0.75% solution. Similar spreads of anesthesia were not observed with the 0.5% solution despite the same total mg dose. The degree of hypotension following spinal anesthesia with bupivacaine was relatively mild which may suggest some sparing of sympathetic fibers by this agent.

References.

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