The Temperature of Bupivacaine 0.5% Affects the Sensory Level of Spinal Anesthesia

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Three milliliters of plain bupivacaine 0.5% was injected intrathecally in two groups of 20 patients. Group 1 received a solution that had been equilibrated to 37°C, group 2 received a solution that had been equilibrated to 4°C. Patients were kept sitting for 3 minutes after injection. All observations were observer-blind. The differences between segmental levels of sensory loss between groups 1 and 2 (T4 and T9, respectively) and of temperature loss (T3 and T8, respectively) 10 and 20 minutes after injection of bupivacaine were statistically significant. It is concluded that the time needed for thermal equilibration in the cerebrospinal fluid and hence temperature of the injected solution plays an important role in the sensory spread of plain bupivacaine 0.5%.

Key Words: ANESTHETIC TECHNIQUES—spinal. ANESTHETICS, LOCAL—bupivacaine.

It has been shown that anesthetic solutions in vitro equilibrate with body temperature within 1 to 2 minutes (1,2). Accordingly, it is assumed that the clinically important densities of anesthetic solutions are those measured at 37°C (3). The baricity of a solution is the density of that solution divided by the density of cerebrospinal fluid. By definition, a solution is isobaric if baricity is 1.0000; if baricity is >1.0000, the solution is hyperbaric; if less, it is hypobaric.

The plain solution of bupivacaine 0.5% at a temperature of 4°C has a density of 1.0040 (courtesy of Astra, The Netherlands); because the mean density of cerebrospinal fluid at 37°C is 1.0003 (1,3), the plain solution of 0.5% bupivacaine is slightly hyperbaric. At 37°C, the density of plain bupivacaine 0.5% is 0.9970 (courtesy of Astra, The Netherlands), i.e., the solution is slightly hypobaric. The present study was undertaken to determine if this difference in baricity has any clinical significance.

Patients and Methods

Forty male patients (ASA I–II) scheduled for urologic surgery under spinal anesthesia were randomly allocated to one of two groups. Each group comprised 20 patients. All patients received 3 ml plain bupivacaine 0.5% while sitting; they were kept in the sitting position for 3 minutes after completion of the intrathecal injection of the solution and were then turned into the supine horizontal position. Patients in group 1 received a solution that had been previously equilibrated in a stove (MELAG Apparate GmbH W-Germany, type 85) to 37°C for at least 1 day. Patients in group 2 received a solution that had been equilibrated in a refrigerator to 4°C for at least 1 day. Syringes used to administer the bupivacaine solution were also equilibrated to 37°C and 4°C, respectively. The study was approved by the Ethical Committee of our institution and oral consent was obtained from all patients.

Premedication consisted of lorazepam 1 mg orally the night before surgery. Before induction of spinal anesthesia 500 ml Ringer's solution were administered by rapid intravenous infusion, followed, after completion of the intrathecal injection, by 500 ml of a plasma expander (Haemaccel) at a slower rate. Dural puncture was performed with the patient in the sitting position at the L3–L4 interspace using a standard midline or paramedian approach and a 25-gauge spinal needle.

Blood pressure and pulse rate were measured before injection (T = 0) and at 5-minute intervals after injection for 20 minutes (T = 5–20) using an automatic

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but also reduces the variability of sensory spread considerably, as is shown by a relatively small SEM of

ability of the ensuing level of analgesia is good. In case a high level of sensory blockade using bupiva-

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