LOCAL ANESTHESIA AND PAIN III

Title: EFFECT OF INJECTION RATE ON LEVEL AND DURATION OF HYPOBARIc SPINAL ANESTHESIA

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Introduction. Many factors influence the spread of intrathecally injected local anesthetics including type of needle, patient position, size, direction of needle orifice, site of dural puncture, rate of injection, and injectate volume, temperature and specific gravity. In this study we investigated the effect of rate of intrathecal injection on the spread of spinal anesthetic achieved with a hypobaric mixture of tetracaine and epinephrine.

Methods. Approval was granted by our Institutional Review Board for Human Investigation. Twenty male patients ranging in height from 173 to 183 cm undergoing total hip arthroplasty were randomized into two groups: the "Fast" and "Slow." Patients in the "Slow" group received a hypobaric mixture of tetracaine and epinephrine by intrathecal injection rate of 0.02 ml/sec. Patients in the "Fast" group received the same mixture at a rate of 0.5 ml/sec. Injectate consisted of 10 mg of tetracaine, 0.2 mg of epinephrine, and water; yielding a total volume of 5 ml.

Routine monitoring was established, and 500 to 700 ml of lactated Ringer's solution were administered. Patients were positioned in a lateral decubitus position on the operating table. The table was then adjusted in such a manner that the L₄ and T₄ spinous processes were in a line parallel with a fluid-filled leveling instrument. Lumbar puncture was performed with a 22-gauge Whitacre needle at L₄-L₅. Five ml of CSF were then aspirated for refractometric determinations. Care was taken to align the orifice of the Whitacre needle upward and perpendicular to the spine. Injection of the local anesthetic mixture was then performed by a specially-designed syringe pump capable of delivering 5 ml at precise rates. Sensory dermatomal levels of anesthesia were assessed at five minute intervals on both nondependent and dependent sides by an investigator who was unaware of the injection rate. Regression of the block was assessed in a similar manner. Time of regression was determined to be that point at which the "level" was found to have receded four dermatomes.

Within and between group differences were assessed using two-sample T-test comparisons.

Results. Patients were no different with respect to age, height and weight. Maximum nondependent block was T₈,7 ± 3,4 dermatomes (mean ± S.D.) and T₁₂,4 ± 5,6 on the dependent side in the "slow" group. Nondependent block was T₉,5 ± 2,3 and dependent block was T₇,7 ± 3,2 in the "fast" group. This demonstrates a significantly greater cephalad level of anesthesia in the nondependent and dependent sides in the "fast" group as compared to the "slow" group (P < 0.01). Nondependent levels were more cephalad than dependent levels within the "slow" group (P < 0.05). No differences were found between nondependent and dependent levels within the "fast" group.

Discussion. Time to four segment regression was considerably longer 266 ± 29.1 minutes in the "slow" group than in the "fast" group 196 ± 22.3 minutes (P < 0.01). Injectate had a significantly lower baricity, 1.001 ± 0.0003 than did patient CSF, 1.005 ± 0.0005 (P < 0.01).

In conclusion, we believe that this study gives support to rate of injection as being a major factor in the final level of spinal anesthesia achieved employing hypobaric technique.

References


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