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Reversible Conduction Block in Frog Sciatic Nerve for Three Different Concentrations of Bupivacaine

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Abstract: We examined the effects of various concentrations of the bupivacaine commonly used for spinal anaesthesia on the reversibility of conduction block in isolated frog sciatic nerves measured by the extracellular recording technique. Seventy-two isolated nerves were divided into 3 groups (n = 24), each of which was bathed in a different bupivacaine solution in a range of concentrations (10, 20 or 30 mM for 20 min). In each group, the extracellular action potentials were recorded before exposure to the bupivacaine solution to provide the control data. The extracellular action potentials were recorded after 20 min exposure to the drug by using a BIOPAC MP 100 acquisition system version 3.5.7 (Santa Barbara, USA). The nerves were washed continuously for 3 h with Ringer's solution and action potentials were recorded. The nerves were then soaked overnight at room temperature in Ringer's solution and tested for impulse recovery. The data were analysed with repeated-measures analysis of variance using SPSS 9.05 for Windows. In the presence of 10 mM, 20 mM or 30 mM bupivacaine, the extracellular action potential amplitude decreased by 23.21 $\pm$ 12.42%, 28.42 $\pm$ 17.51% and 39.45 $\pm$ 22.16%, respectively, relative to the control amplitude ($P < 0.05$); it recovered to 89.21 $\pm$ 50.00%, 66.43 $\pm$ 30.10% and 47.12 $\pm$ 37.51% ($P < 0.05$), respectively, after 3-h of wash, and reached 110.31 $\pm$ 50.13%, 90.60 $\pm$ 43.21% and 130.43 $\pm$ 56.32% ($P < 0.05$), respectively, after the overnight soaking process. This study showed that exposing the nerve to high concentrations of bupivacaine causes an reversible impulse blockade and that bupivacaine does not have neurotoxic effects on isolated frog sciatic nerves.

Key Words: Compound action potential, bupivacaine, recovery, cauda equina syndrome

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