Title : NERVE BLOCK DURATION WITH BUPIVACAINE-DEXTRAN

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Introduction. Since 1960 when Loder[1] claimed that low molecular weight (LMW) dextran increased the duration of action of lidocaine as an anesthetic agent, other investigators have demonstrated increased clinical duration for lidocaine[2], mepivacaine[3], and bupivacaine[4,5] when injected with LMD dextran (Dextran 40, Pharmacia). But a recent internally controlled clinical study revealed no potentiation of bupivacaine's action by dextran[6]. As dextran is now often used in conjunction with local anesthetics to increase their duration, it was thought that an in vivo study of dextran and bupivacaine, using an animal system not compounded by subjective patient evaluation, could yield a more definitive statement as to the effects of low molecular weight dextran on the action of local anesthetics.

Material and Methods. Male Sprague-Dawley rats weighing 300-400g were injected with 10 mgm of sodium pentobarbital, I.P., after a light ether induction. Additional pentobarbital was given, if necessary, until the righting reflex was lost. Marcaine-HCL 0.75% (bupivacaine, Winthrop) was mixed 1:1 (V/V) with 10% (W/V) Rheomacrodex (Dextran 40, Pharmacia, Piscataway, N.J.) or deionized water. 1 mg bupivacaine (.26 ml) with or without dextran was infused into the maxillary nerve through a 30g needle guided to the nerve by a metal jig positioned on the roof of the mouth by the incisor and molar. The contralateral maxillary nerve was used as a control throughout the experiment. Block was tested by stimulating the lip/whisker area innervated by the maxillary nerve on experimental and control sides and observing whether the stimulus produced a contraction of abdominal muscles or not. Stimulation consisted of 1-10V 6 msec square wave pulse trains (2 pulses/sec for 5 sec) produced by a Grass S48 stimulator triggering a stimulus isolation unit (DS-2, Digitimer Ltd.), and were delivered through bipolar electrodes (two 30g needles 2 mm apart). The response was quantitated by recording the EMG from muscles of the abdominal wall, and displaying it on a Tektronic 5111 oscilloscope after amplification (Tektronic AM502 differential amplifier). Comparison of the EMG response produced by stimulating the control and treated side allowed an accurate determination of the duration of maxillary nerve block.

Results. Table 1 summarizes the results of this study. The onset time refers to the period from injection of the anesthetic to the loss of EMG response on the treated side and the duration of the block represents the time from the onset of the block to the point where the EMG response from the control and treated sides are again similar. As can be seen from the results, there is no discernible effect of low molecular weight dextran on the onset or duration of nerve block by bupivacaine. The P value for the two groups of 0.999 accounts for any variation as chance. Additional experiments with 1 ug of epinephrine added to each group produced similar results.

Discussion. The evidence that LMW dextran prolongs the action of local anesthetics is tenuous. In the one study where the patient served as his own control, only a 5% increase in the mean duration of block was found with bupivacaine plus dextran as opposed to bupivacaine alone.[6] This, plus the fact that we found no binding between LMD dextran and lidocaine (as proposed by Chinn[4]), made us question whether dextran had any effect on the action of local anesthetics. Our preparation was designed to bypass the cognitive areas of the central nervous system and simply look at the presence or absence of a reflex response to a noxious stimuli. The results of this and Dr. Bridenbaugh's study[6] make us seriously doubt that LMW dextran has any effect on the duration of local anesthetic action.

References.

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TABLE 1: EFFECT OF DEXTRAN ON BUPIVACAINE ANESTHESIA OF RAT MAXILLARY NERVE

Treatment	Onset of Block	Duration of Block
1 mg bupivacaine	1 min ± 2'	134 min ± 24 min (5)*
1 mg bupivacaine + low molecular weight dextran	1 min ± 2'	131 min ± 26 min (6)**

*Number in parentheses indicates number of animals.
**P value for the two groups is 0.999 as calculated by the students' t test.