

Unmasking Local Anesthetic Injection Injury in the Peripheral Nerve

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Abstract

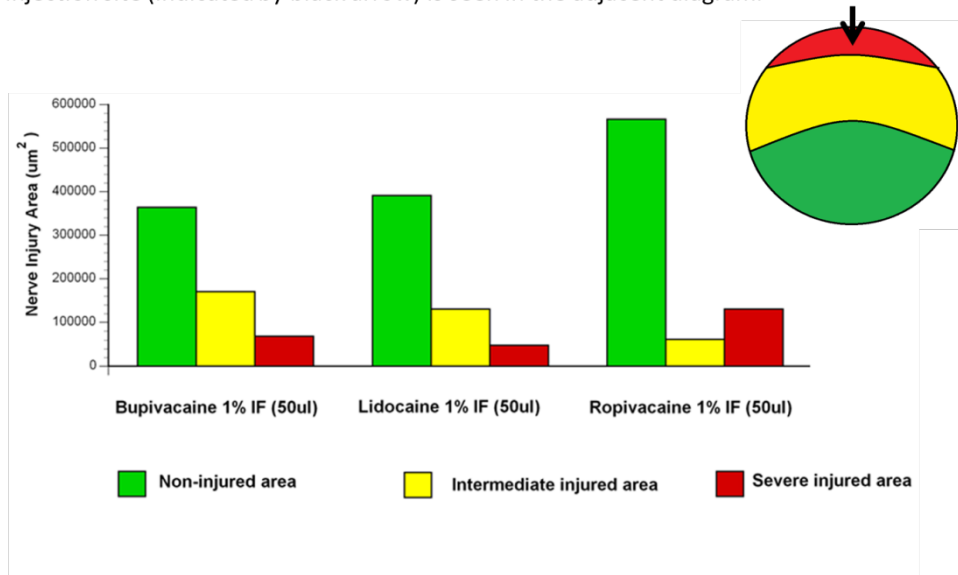
Purpose: Local anesthetics (LA) are frequently used for many operative procedures. A well-known complication of LA blocks is peripheral nerve injury, whether from the needle or toxicity of the medication used. The purpose of this study was to illustrate the extent of damage that results from inadvertent intrafascicular injection of various commonly used local anesthetics.

Methods and Materials: 16 Lewis rats received an intrafascicular injection of saline (control) or one of three LAs (bupivacaine, lidocaine, or ropivacaine) into the sciatic nerve (n=4). At a 2 week endpoint, the sciatic nerves were harvested for histomorphometric and electron microscopic analysis.

Results: Animals injected with a LA showed increased severity of injury as compared to control. In particular, there was a significant loss of large diameter fibers as indicated by decreased counts ($p < 0.001$ for all LAs) and area ($p < 0.001$ for all LAs) of remaining fibers in severely-injured versus non-injured areas of the nerve. There was a layering of severity of injury with most severely injured areas closest to, and non-injured areas furthest from the injection site (Figure 1). No difference in the extent of injury was found between the three different LAs. In all groups, fascicular transection injury from the needle was observed. Electron microscopy confirmed nerve injury.

Conclusions: Frequently used LAs at traditional concentrations are toxic to and can injure the peripheral nerve as evidenced by our data. The nature of injury can vary between 1st and 6th degree as was seen in the study. Any combination of long-term motor and/or sensory sequelae may result due to the varying fascicular topography of a nerve. Surgical repair may be necessary, depending on the severity of the injury and resulting deficit.

Figure 1: Nerve injury area: The relative injury areas (μm^2) were measured using a binary imaging technique. Layering of injury with severe injury occurring closest to injection site (indicated by black arrow) is seen in the adjacent diagram.



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