

EVALUATION OF ED₉₉ VOLUMES OF LOCAL ANAESTHETIC FOR SCIATIC NERVE BLOCKADE

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This study is a cooperation project between the Department of Anaesthesia, Intensive Care Medicine and Pain Therapy, Medical University of Vienna and the Department of Clinical Pharmacology, Medical University of Vienna

Introduction

The use of adequate volumes of local anaesthetic is an important prerequisite for safe performance of regional anaesthetic techniques. Recent studies have been shown that ultrasonographic guidance during peripheral nerve blocks offer the potential advantage to reduce the volume of local anaesthetic. Eichenberger et al. evaluated an ED₉₅ volume of local anaesthetic for ulnar nerve blocks of 0.11 mL /mm² cross sectional nerve area,¹ and O'Donnell et al. showed that axillary brachial plexus blocks can be performed successfully with 1 mL local anaesthetic per nerve.² This study was designed to evaluate an ED₉₉ volume for sciatic nerve blockade in volunteers by using a 'step-up / step-down' approach following the statistical method by Dixon.³

Methods

After institutional approval and informed consent 19 volunteers were included in this prospective and double blinded study. The volunteers received an ultrasonographic guided sciatic nerve block with 1.5% mepivacaine and a starting volume of 0.2 mL/mm² cross sectional nerve area. In cases of a complete sensory block the volume was reduced by 0.02 mL/mm² cross sectional nerve area until the first block failed. Thereafter the volume of local anaesthetic was increased by 0.02 mL/mm² cross sectional nerve area. After 3 cycles of successful / failed blocks the ED₉₉ volume of local anaesthetic could be calculated by a probability function. The primary outcome variable was the block success which was evaluated by Pinprick testing (successful if '0' ≤ 45 min after block performance); secondary outcome variables were sensory onset time and duration of sensory block.

Results

The ED₉₉ volume of local anaesthetic for sciatic nerve blockade was evaluated with 0.10 mL/mm² cross sectional nerve area (Figure 1). Figure 2 shows the up and down sequence of volumes of 1.5% mepivacaine to achieve a sensory block of the sciatic nerve. The correlation between the volume of local anaesthetic and the sensory onset time was weak ($r = 0.14$), whereas the correlation between the volume of local anaesthetic and the duration of sensory block was moderate ($r = 0.65$).

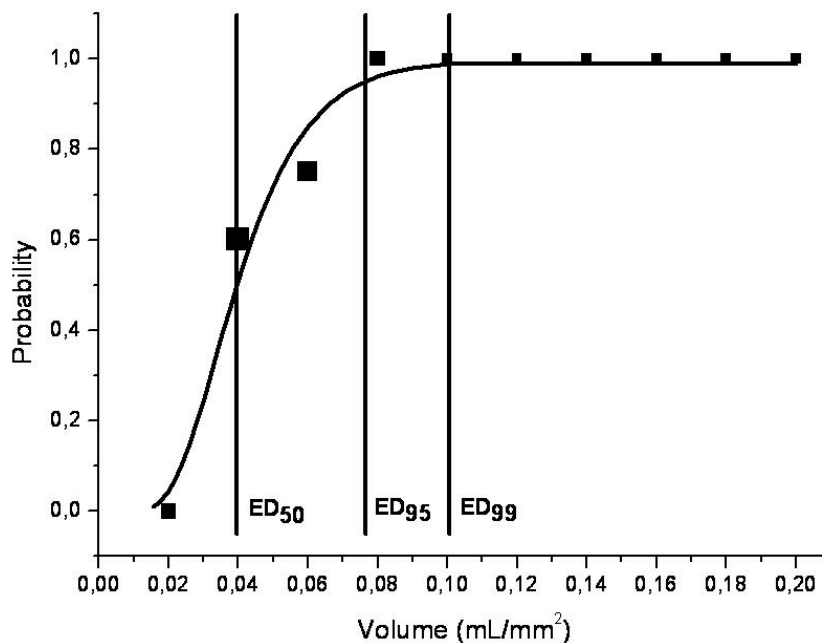


Figure 1. Correlation of the volume of 1.5% mepivacaine per mm² cross sectional nerve area versus probability for complete sensory blocks within 45 min. Squares represent observed cases, size of squares indicates number of cases for the respective volume (between 1 and 5). The line indicates fit by a probit model function.

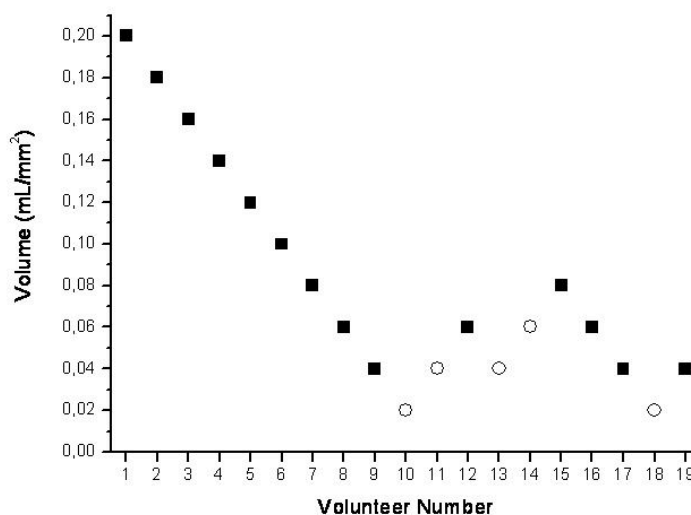


Figure 2. The up and down sequence of volumes of 1.5% mepivacaine to achieve a sensory block of the sciatic nerve. The injected volume of local anaesthetic in mL/mm² cross sectional nerve area is shown in each volunteer. Filled and empty marks represent successful blocks and block failures.

Discussion

This is the first study where an ED₉₉ volume of local anaesthetic for sciatic nerve blockade has been evaluated. The impact of the resulting local anaesthetic volume of 0.10mL/mm² seems to be minimal, whereas the duration of sensory block is shorter.

References

- 1 Eichenberger U, Stoeckli S, Marhofer P, et al. Minimal Local Anesthetic Volume for Peripheral Nerve Block: A New Ultrasound-Guided, Nerve Dimension-Based Method. *Regional Anesthesia and Pain Medicine* 2009; **34**: 242-6
- 2 O'Donnell BD, Iohom G. An estimation of the minimum effective anesthetic volume of 2% lidocaine in ultrasound-guided axillary brachial plexus block. *Anesthesiology* 2009; **111**: 25-9
- 3 Dixon W. The up-and-down method for small samples. *J Amer Stat Assoc* 1965; **60**: 967-78