

Comparison of Local Anesthetics for Digital Nerve Blocks: A Systematic Review

Toby I. Vinycomb, Lukas J. Sahhar

Purpose To evaluate the time to onset of anesthesia, duration of anesthesia, and pain on injection of local anesthetics.

Methods A systematic search of the English literature was performed of the Medline, Cochrane Central Register of Controlled Trials, The Allied and Complementary Medicine Database (AMED), and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases. The study selection process was adapted from the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement, and 6 articles were complied with the study inclusion criteria.

Results Six studies (335 nerve blocks) were included in our final analysis measuring 6 local anesthetic preparations (lidocaine, lidocaine with epinephrine, bupivacaine, bupivacaine with epinephrine, lidocaine with bupivacaine, and ropivacaine). Lidocaine demonstrated the shortest mean onset of anesthesia (3.1 min) and bupivacaine the longest (7.6 min). Lidocaine also demonstrated the shortest mean duration of anesthesia (1.8 h) and ropivacaine the longest mean duration (21.5 h). Lidocaine with epinephrine demonstrated the least mean pain on injection (26 mm on a visual analog scale) and bupivacaine with epinephrine the most mean pain (53 mm).

Conclusions Lidocaine with epinephrine provides a good short-term anesthesia and may reduce the risk of injury or complication while the finger is still anesthetized. Bupivacaine with lidocaine provides good long-term anesthesia and may reduce the need for postprocedural anesthesia. Ropivacaine likely provides the longest duration of anesthesia but the absence of epinephrine means a tourniquet must be used to create a bloodless field and thus is contraindicated in some procedures such as flexor tendon repairs where active testing may be required.

Clinical relevance Lidocaine with epinephrine, bupivacaine with epinephrine, and ropivacaine all provide benefits in digital nerve blocks. The surgeon may choose the most appropriate local anesthetic or combination of local anesthetics based on the procedure to be undertaken and the postoperative requirements. (*J Hand Surg Am.* 2014;39(4):744–751. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Therapeutic II.

Key words Bupivacaine, nerve, epinephrine, lidocaine, ropivacaine.



From the Department of Surgery (MMC), Monash University, Melbourne, Australia.

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Corresponding author: Toby I. Vinycomb, 48 Verdon St., Williamstown, Victoria, Australia, 3016; e-mail: tobyvinycomb@gmail.com.

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DIGITAL NERVE BLOCKS ARE performed regularly in the treatment of lacerations, phalangeal fractures, dislocations, and abscesses. Digital blocks are superior to local infiltration because the former demand smaller doses of anesthetic and avoid physical distortion of the tissue to be treated.¹ The most frequently used anesthetics for digital blocks are lidocaine, bupivacaine, and a newer agent,

ropivacaine, which is emerging into common use.² Lidocaine and bupivacaine are available for use with or without epinephrine. The use of epinephrine in fingers was previously condemned because of the theoretical risk of finger ischemia and gangrene, but a number of studies have demonstrated its safety in digital nerve blocks.^{3–7}

Digital nerve blocks require an agent that provides adequate duration of anesthesia to allow treatment without unnecessary haste. Prolonged duration of anesthesia may also present the advantage of minimizing the patient's requirement for continuing analgesics. In certain settings, it may be beneficial for the medications to have a rapid onset of action and vasoconstrictive properties. These factors enable earlier treatment in acute presentations with reduced hemorrhage and slower systemic uptake of the anesthetic.

Although several local anesthetic options are available, little consensus exists as to which anesthetic agent is most appropriate for digital nerve blocks. A review from 1998 holds limited applicability to current practice because it compares only lidocaine against bupivacaine and does not consider ropivacaine or combination preparations with epinephrine.⁸ We sought to resolve the uncertainty in digital block anesthesia by comparing the evidence for digital nerve blocks using lidocaine, lidocaine with epinephrine, bupivacaine, bupivacaine with epinephrine, and ropivacaine.

The objective of this review was to use 3 important indicators (onset of anesthesia, duration of anesthesia, and injection pain) to evaluate the difference between these commonly used local anesthetics preparations for digital nerve blocks.

The reporting of this systematic review has been undertaken in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement, which was developed to ensure high-quality reporting of systematic reviews and meta-analyses.⁹ It provides a checklist of 27 key points that should be addressed in every reported systematic review and meta-analysis.

METHODS

Protocol registration

The methods of analysis and inclusion criteria were documented in advance and registered in the PROSPERO database of protocols (protocol registration no. CRD42013005169).

Eligibility criteria

The search was formulated based on the following population, intervention, comparison, outcome, and study designs scenario. For adults, does lidocaine (with

or without epinephrine), bupivacaine (with or without epinephrine), or ropivacaine provide the best combination of onset of anesthesia, duration of anesthesia, and pain on injection? This review analyses results from randomized controlled trials and controlled clinical trials that compared outcomes of 2 or more of these 5 local anesthetic preparations.

Search

Studies were identified using electronic databases and hand scanning of reference lists of relevant articles. No limit was set on publication year. The search was applied to OVID Medline (1949 to present), Cochrane Central Register of Controlled Trials (June 2013 edition), and the Allied and Complementary Medicine Database (AMED; 1985–July 2013), as well as being adapted for the Cumulative Index to Nursing and Allied Health Literature database (CINAHL; 1988 to current). The last search was run on July 31, 2013. The search was designed by the first reviewer (T.V.) and included the terms digital nerve(s), ring block(s), finger(s), lidocaine, lignocaine, Xylocaine, bupivacaine, Marcaine, ropivacaine, anesthesia, and pain. The search method in the CINAHL databases was similar to the Medline, Cochrane Central Register of Controlled Trials and the AMED Database search method, but Medical Subject Headings (MeSH) key words were excluded (see [Appendix A](#), available on the *Journal's* Web site at www.jhandsurg.org).

Data collection process

Studies from the search were exported into Endnote X5 (Thomson Reuters, NY) by the first reviewer. Endnote then excluded duplicate studies based on author, year, and title.

Study selection

We both assessed the title and abstract of each article for inclusion based on the following predefined criteria: comparison of 2 or more agents of interest used for digital nerve blocks; a randomized controlled trial or controlled clinical trial; and reporting on at least 1 time of onset, duration of action, or pain on injection. Non-English and nonhuman studies were excluded. If it was unclear whether an article should be included or excluded based on the title and abstract, the full article was examined. A disagreement in determination for inclusion by the authors after the full article was read was resolved by discussion.

Data items

Data collected for this review included study year, block technique, type of participants, finger injected,

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