Is it true that injecting palmar finger skin hurts more than dorsal skin? New level 1 evidence

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Abstract

Background Since the first texts on local anesthesia were written in the early 1900s, it has been widely quoted and believed that dorsal finger skin is less sensitive to needlestick pain than volar finger skin. The result is that the most commonly used finger block for local anesthesia is the dorsal two injection technique.

Methods In this study, the needlestick discomfort associated with dorsal and volar finger skin was compared in a group of 78 volunteers who had the long finger of both hands poked with a 25 G needle; one in the midline of the volar side and the other in the lateral web space of the dorsal side. Volunteers then completed a pain scale for each needlestick and ranked which technique they would prefer for future injections.

Results We found that there was no significant difference in needlestick pain or preference of future needle location between the dorsal and volar aspects of the finger.

Conclusions We provide level 1 evidence that the needlestick of the SIMPLE block which has one needlestick on the volar side of the finger is not more painful than the needlestick of the dorsal finger block.

Keywords Digital nerve block · Local anesthesia · SIMPLE technique

Introduction

There is a popular belief that it hurts more to administer digital nerve blocks on the palmar side of the finger than on its dorsal surface. This belief dates back to the beginning of the twentieth century, when the first textbooks of local anesthesia described the anesthesia of Oberst as the two injection dorsal nerve block with injection of anesthetic “situated on the side of the finger more toward the extensor surface where the finger is less sensitive” [2]. The empiric statement that the dorsal skin was less sensitive than the palmar skin was not based on level 1 evidence as this did not exist in the early 1900s. Nevertheless, the belief is widely quoted [3], and has directly influenced practice; making the two injection dorsal nerve block the most commonly used digital nerve block in most centers today.

In 2006, Williams et al. published level 1 evidence that the single midline volar digital block (SIMPLE block, single subcutaneous injection in the middle of the proximal phalanx, with lidocaine and epinephrine) was preferred to the two dorsal injection technique by volunteers who received both blocks [4]. One possible reason for this finding is the obvious consideration that one needle is bound to hurt less than two needles. However, the following question still remains. Is the palmar finger skin more sensitive to a needlestick than the dorsal skin? The purpose of this study is to answer that question with level 1 evidence.

Materials and Methods

Ethics approval for the study was granted by the Research Ethics Board of the Atlantic Health Sciences Corporation, Saint John, New Brunswick, Canada. Seventy-eight volun-

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Figure 1 (Left) The needle is inserted through the dorsal web space. (Right) The needle is inserted midline in the proximal flexor crease.

teers were enrolled in July and August of 2008. Each participant gave informed consent prior to enrollment. Volunteers received a needlestick with a disposable 25 G needle in each long finger. One long finger was poked on the volar midline aspect of the long finger just distal to the proximal phalanx flexor crease, and the other long finger was poked on the dorsal side in the lateral web space (Figure 1).

Sequence generation was performed by one of the investigators who did not participate in patient testing (B. C.) A randomized block sequence was generated using block sizes of 2–12 to randomize subjects to one of four groups to determine the method by which the first needlestick was to be performed (volar-right, volar-left, dorsal-right, dorsal-left.) Allocation concealment was performed using opaque, sequentially numbered envelopes. The order of needlesticks was randomized according to side of the hand (volar vs. dorsal) and order of long fingers (right vs. left).

All needlesticks were performed with a standard technique by only two investigators (M.W. and M.L.). Participants were instructed to look away during the needlesticks. Following both needlesticks they had to rank the discomfort associated with each needlestick on a scale of 0 (no pain) to 10 (worst pain imaginable). The participant was then asked to rank “which hand they would prefer to receive an injection in if it was required in the future”.

Data was summarized using descriptive statistics. A comparison between the proportion of subjects who preferred the volar poke vs the proportion of subjects who preferred the dorsal poke was performed using a chi-square test.

Results

A sample size of 76 was calculated using an estimation equation for equivalence studies [1]. The primary outcome

was preference of injection technique for future injections. Comparison of these proportions yielded a p value of 0.26. The post-hoc power of this test was 0.98. A 95% confidence interval was calculated for the number of people who preferred a volar needle stick (95% CI [42, 65]). Forty-six percent of volunteers preferred the volar needle stick and 54% preferred the dorsal needle stick. The secondary outcome of volar and dorsal needlestick pain was analyzed using the median pain score with upper and lower quartile scores (Fig. 2), as the scores were not normally distributed. The volar median pain score for both volar and dorsal needlestick pain was 4. The lower quartile score in both volar and dorsal needlestick was 3 and the upper quartile score was 6 with half of the lower scores equal to 3 and half of the upper scores between 4 and 6. The median volar needlestick pain score was 4 and the median dorsal needlestick pain score was 4. The mean

Figure 2 Box plots showing pain scores associated with volar and dorsal needle stick pain.

difference between volar and dorsal needlestick pain scores was 0.2, with a standard deviation of 2 and a 95% confidence interval of −0.2 to 0.7.

Discussion

This study evaluated the pain associated with dorsal and volar finger needlesticks and the preference for future digital nerve block injection sites. The mean difference between volar and dorsal needlestick pain scores was 0.2 (SD 2), demonstrating no evidence for a difference in the pain between dorsal and volar needle sticks. This study has provided level 1 evidence that the palmar surface of the finger is not more sensitive to needlesticks than the dorsal side of the finger. The evidence in this paper challenges the frequently quoted belief that dorsal finger skin is less sensitive to needlestick pain than volar skin [3]. This belief stems from the first texts on local anesthesia written more than 100 years ago [2]. The clinical importance of the findings in this paper is that the two dorsal injection block technique can no longer be justified on the basis that dorsal skin is less sensitive than palmar finger skin.

There are two parts to the pain of an injection; the pain of the needlestick and the pain of distention of the fluid. The purpose of this study was to separate out these two issues and only examine the pain of the needle penetration, which is why we purposefully did not inject fluid. The popularly held belief is that the palmar skin is more sensitive and that is exactly what we studied. We did not study distention pain, and that may well be worth doing in the future as another study.

Recent evidence supports the assertion that there is no difference in the pain of injection between of dorsal vs. volar nerve blocks. Yin et al. [5] found no difference in injection pain or length of anesthesia between traditional dorsal digital blocks and single subcutaneous palmar blocks at the base of the finger. Williams and Lalonde [4] also found no difference in pain between the traditional two injection dorsal nerve block and a single subcutaneous palmar nerve block. The latter study also found that volunteer injectees would prefer to have a SIMPLE volar nerve block than a two dorsal injection block if they ever

required a finger block in the future. This makes sense, as one injection will always hurt less than two injections. It also makes sense in the light of the findings of this paper that volar finger skin is not more sensitive to needlestick than dorsal finger skin.

Limitations of the current study include the narrow range of patient age, meaning that the findings may not apply to a pediatric population. Patients with co morbid illnesses such as diabetes may have peripheral nerve changes, making the current findings not applicable. Although we did our best to control the angle and depth of needle penetration by standardized technique with only two injecting investigators, it is possible the needle was inserted at different angles or to a different depth between hands or between volunteer injectees. However, there is considerable variability in clinical administration of local anesthesia and our variability likely reflects that in clinical practice.

In conclusion, we have provided level 1 evidence that there is no difference in the sensitivity of volar or dorsal finger skin to needlestick pain. Therefore, the sensitivity of the dorsal vs. palmar side of injection should not influence the choice of one digital nerve block technique over the other, and the two dorsal injection block technique can no longer be justified on the basis that dorsal skin is less sensitive than palmar finger skin.

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References

1. Blackwelder WC. *Control Clin Trials*. 1982;3:345–53.
2. Braun H, Harris ML. *Operation on the extremities. Local anesthesia: its scientific basis and practical use*, Philadelphia and New York, Lea & Febiger. (second 2nd American edition from the 6th revised German edition) Lea & Febiger: Philadelphia and New York, 1914; chapter 16 (operations on the extremities) page 367
3. Ramamurthy S, Anderson D. *Anesthesia*. In *Green's Operative Hand Surgery* 5th ed. Volume 1, Philadelphia, Elsevier Churchill Livingstone, 2005, chapter 2 page 44
4. Williams JG, Lalonde DH. Randomized comparison of the single-injection volar subcutaneous block and the two-injection dorsal block for digital anesthesia. *Plastic and Reconstructive Surg*. 2006;1195–200.
5. Yin ZG, Zhang JB, Kan SL et al. A comparison of traditional digital blocks and single subcutaneous palmar injection blocks at the base of the finger and a meta analysis of the digital block trials. *J Hand Surg* 2006;547–55.