

# Hematoma block for distal radius fractures – prospective, randomized comparison of two different volumes of lidocaine

Journal of International Medical Research  
2018, Vol. 46(11) 4535–4538  
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DOI: 10.1177/0300060518799883  
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## Abstract

**Objective:** This study aimed to compare analgesic efficacy and safety of different volumes of lidocaine injected into a fracture hematoma (hematoma block [HB]) for reducing distal radius fractures.

**Methods:** Patients were randomly divided into two groups. Group A included patients in whom 10 mL of 2% lidocaine was injected into the fracture site and group B included patients in whom 20 mL of 1% lidocaine was injected. The fracture was manipulated after 15 minutes and the Visual Analogue Scale (VAS) score was recorded during manipulation. Patients were followed up for approximately 1 hour and complications were recorded.

**Results:** Twenty patients were enrolled in the study (12 women and eight men), with a mean age of 57 years (range, 32–87 years). Demographic findings were similar between the groups. The mean VAS score of group A was  $5.50 \pm 3.57$  and that in group B was  $3.09 \pm 2.33$ , with no significant difference between the groups.

**Conclusion:** VAS scores between HB with 20 mL of 1% lidocaine and HB with 10 mL of 2% lidocaine are not significantly different. However, our study suggests that HB with 20 mL of 1% lidocaine has a better analgesic effect than HB with 10 mL of 2% lidocaine.

## Keywords

Distal radius fracture, hematoma block, lidocaine, anesthesia, analgesia, Visual Analogue Scale

Date received: 10 April 2018; accepted: 20 August 2018

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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## Background

Manipulation of a displaced distal radius fracture is routinely performed in the Emergency Department (ED). This manipulation is performed using a variety of anesthetic techniques, such as hematoma block (HB), intravenous block (Bier block), general anesthesia, and nerve block.<sup>1,2</sup> Although many studies have demonstrated the relatively inferior analgesic efficacy of HB, its popularity has dramatically increased over the years because of its safety and simplicity.<sup>3</sup> The low efficacy of HB may be attributed to a low volume of lidocaine with only partial distribution of the solution within the fracture site. Therefore, an increasing volume of lidocaine solution injected into the hematoma may improve the analgesic effect. The common dosage for HB is 10 mL of 2% lidocaine.<sup>3,4</sup> To the best of our knowledge, no studies have used higher dosages or volumes of lidocaine solution to improve the analgesic effect of HB. Therefore, this study aimed to compare the analgesic efficacy and safety of different volumes of lidocaine injected into the fracture site.

## Patients and methods

### *Patients and procedure*

This prospective, randomized, controlled trial was conducted in the ED of our medical center from 2015 to 2017. Inclusion criteria were patients aged 15 years or older with displaced distal radial fractures requiring manipulation. Exclusion criteria were patients who required general anesthesia because of other injuries and those with a known allergy to lidocaine or pregnancy. The study was approved by the local Institutional Review Board of Emek Medical Center. Informed consent was obtained from all patients.

Patients were randomly divided into two groups according to their order of arrival

and underwent HB. Group A included patients in whom a volume of 2 mL of 2% lidocaine was injected into the fracture site. Group B included patients in whom 20 mL of 1% lidocaine was injected into the fracture site. The fracture was manipulated after 15 minutes and the Visual Analogue Scale (VAS) score was recorded while manipulation was performed. Patients were followed up in the ED for approximately 1 hour and complications were recorded.

### *Statistical analysis*

The Mann–Whitney U test was used to compare the two groups with a significance level of 5%. Statistical analysis was performed using SAS 9.4 software (SAS Institute Inc., Cary, NC, USA).

## Results

Twenty patients were enrolled in the study (12 women and eight men), with a mean age of 57 years (range, 32–87 years). Demographic findings are shown in Table 1. There were no significant differences in demographic findings between the two groups. The mean (standard deviation) VAS score of group A was  $5.50 \pm 3.57$  and that of group B was  $3.09 \pm 2.33$  (Table 2). There was no significant difference in the mean VAS score between the two groups (Table 3).

## Discussion

HB is a common anesthetic technique for manipulating displaced distal radius fractures.<sup>2</sup> HB involves inserting a needle into the fracture site, aspirating the hematoma to confirm the position, and infiltrating the fracture site with local anesthetic (Figure 1).

Some studies have shown a poorer analgesic effect of HB compared with other methods, such as intravenous regional block (Bier block), general anesthesia, and

regional nerve block.<sup>3</sup> However, whether HB has an inferior analgesic effect is inconclusive. A meta-analysis conducted by Handoll et al.<sup>5</sup> included 18 studies with 1200 patients regarding different anesthetic methods for manipulation of displaced

distal radius fractures. They concluded that there was some indication that HB has a poorer analgesic effect than other methods. However, numerous studies have suggested HB as the treatment of choice because of its simplicity and safety.<sup>4,6,7</sup>

In our institute, the preferred method for manipulating displaced distal radius fractures is HB because of its simplicity and availability. Unfortunately, we have found that this procedure is painful for our patients. A review of the literature showed that 10 mL of 1 or 2% lidocaine was the solution of choice for HB.<sup>1,2</sup> We assumed that increasing the volume of the solution injected to the fracture hematoma would allow better distribution of the analgesic material within the fracture site. Additionally, this increase could improve the analgesic effect without risks of further

**Table 1.** Demographic findings.

Group A			Group B		
Side	Sex	Age (years)	Side	Sex	Age (years)
R	F	43	L	M	55
R	M	63	R	F	79
L	F	87	L	M	66
R	M	62	L	M	91
L	F	54	R	F	37
R	F	64	L	M	32
R	F	32	L	F	71
R	F	51	L	M	72
L	F	56	R	F	39
R	F	39	R	M	57

R: right; L: left; F: female; M: male.

**Table 2.** Visual Analogue Scale scores.

Group A	Group B
10	2
6	8
6	0
7	3
10	1
8	3
4	3
4	4
0	5
0	2

**Table 3.** Analysis of Visual Analogue Scale scores.

Group	n	Mean	Standard deviation	Minimum	25th percentile	Median	75th percentile	Maximum
A	10	5.50	3.57	0.00	4.00	6.00	8.00	10.00
B	10	3.09	2.33	0.00	2.00	3.00	4.00	8.00



**Figure 1.** X-ray of hematoma block for a distal radius fracture.

complications because the dosage of lidocaine remains unchanged. Younge<sup>8</sup> reported eight patients who developed compartment syndrome of the forearm following HB for manipulation of a displaced distal radius fracture. This author suggested that additional fluid added for HB could precipitate compartment syndrome. In our study, all of our patients were followed up for approximately 1 hour in the ED and sequelae were noted. The cardiotoxicity of lidocaine should be considered. However, Meinig et al.<sup>9</sup> showed that plasma lidocaine levels were well below the toxic threshold after HB for manipulation of distal radius fractures with lidocaine doses of 2.2 to 2.4 mg/kg. In our study, no complications were recorded in any of the patients.

Although the mean VAS score of group A (5.5) appeared to be higher than that of group B (3.09), the difference was not significant. This lack of significance is likely due to the small number of participants in the study. This small number of participants is the main limitation of our study.

## Conclusion

The difference between VAS scores in our two groups was not significant. However, this pilot study suggests that HB with 20 L of 1% lidocaine solution may have a better analgesic effect than HB with 10 mL of 2% lidocaine solution for manipulation of displaced distal radius fractures. However, further investigations with a larger number of patients are required.

## Declaration of conflicting interest

The authors declare that there is no conflict of interest.

## Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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