

East African Medical Journal Vol. 97 No. 9 September 2020

PERIOSTEAL NERVE BLOCK VERSUS HAEMATOMA BLOCK FOR CLOSED REDUCTION OF DISTAL RADIUS FRACTURES IN KORLE BU TEACHING HOSPITAL

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PERIOSTEAL NERVE BLOCK VERSUS HAEMATOMA BLOCK FOR CLOSED REDUCTION OF DISTAL RADIUS FRACTURES IN KORLE BU TEACHING HOSPITAL

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ABSTRACT

Background: Distal radius fractures are common injuries seen by orthopaedic surgeons. Majority are managed non-operatively by manipulation and casting.

Objective: We sought to compare two local anaesthetic techniques; periosteal nerve block and haematoma block in terms of anaesthetic effect and adequacy of fracture reduction in the closed reduction and manipulation of distal radius fractures.

Methods: 84 patients with distal radius fractures presenting to the Trauma and Orthopaedic unit of the Korle Bu Teaching Hospital who met the inclusion criteria were recruited for a randomized clinical trial. Group A received periosteal nerve block while group B received haematoma block. The two groups were compared for anaesthetic effect using the numeric pain rating scale as well as adequacy of fracture reduction using Sarmiento's modification of Lidstrom's criteria. Data analysis was done with Statistical Package for Social Sciences (SPSS 20).

Results: 61.9% of the patients were aged below 60 years with a mean age of 54.85±15.816 years. The drop in mean pain scores in each group from before local anaesthetic administration to fifteen minutes after infiltration and through fracture manipulation was statistically significant. However, between the two groups there is no significant difference. Majority of the patients had excellent or good fracture reduction with very few having fair reduction in both groups. None had poor reduction.

Conclusion: Both periosteal nerve block and haematoma block are effective local anaesthetic techniques for closed manipulation and reduction of distal radius fractures.

INTRODUCTION

Distal radius fractures are fairly common fractures accounting for up to 2.5% of all emergency room attendance⁽¹⁻⁴⁾. It constitutes about 18% of all fractures in the elderly⁽⁵⁾. In the developed world, the incidence has been found to be increasing over the years^(6,7). They mostly result from minor trauma such as ground level falls on the outstretched hand in the elderly but from significant trauma such as falls from heights or motor vehicular accidents in young populations. ⁽⁸⁾. Historically, these fractures were managed non-operatively. In recent times however, there has been an increasing trend towards operative management but more than 70% are still being managed non-operatively in the USA⁽⁹⁾. The non-operative management usually involves closed reduction under anaesthesia and casting for a period of 5-6 weeks.

Various anaesthetic techniques are used in an attempt to achieve pain free manipulation. These traditionally has involved general (including moderate sedation), regional and local techniques ⁽¹⁰⁾. Haematoma block, a local anaesthetic technique is widely used because it is relatively easy to administer and does not usually require extra personnel and equipment. It can be administered safely in the Emergency Room (ER) by the attending orthopaedic surgeon and patients can be safely discharged home from the ER thus significantly reducing ER time, hospital congestion and cost of treatment^(11,12). For a long time, it has been the only form of local anaesthetic technique used for manipulation

of distal radius fractures. Recently, periosteal nerve block, a local anaesthetic technique, has been described and has been found to be safe and efficacious and can be administered under similar conditions as the haematoma block⁽¹³⁾. In this method, the local anaesthetic is infiltrated in ring fashion around the periosteum proximal to the fracture haematoma and not directly into it. Thus, it might be more acceptable to patients as the swollen and exquisitely tender fracture site is avoided. This study sought to compare periosteal nerve block to haematoma block in terms of pain control and adequacy of fracture reduction in the closed reduction and manipulation of distal radius fractures.

MATERIALS AND METHODS

This study was a prospective, single-blinded randomized control trial involving patients with distal radius fractures presenting at the Orthopaedic unit of the Department of Surgery, Korle-Bu Teaching Hospital. We included all patients aged 16 years and above presenting with distal radius fractures sustained less than one week to presentation and for which closed reduction was the chosen definitive management. We excluded multiply injured or polytraumatized patients and severely demented patients.

Data collection started in June 2018 and ended in January 2019. A total of 84 participants who met the inclusion criteria were recruited and randomized into two groups A and B by simple randomization. Group A received periosteal nerve block while Group B received haematoma block. In

each case 10mls of 1% xylocaine was used for either the haematoma block or periosteal nerve block. A structured evaluation form was administered to each patient. Demographic data, numeric pain rating scale at various times (before local anaesthesia, 15 minutes after administration of local anaesthetic and during fracture manipulation)

were documented. Adequacy of fracture reduction was assessed using Sarmiento's modification of Lidstrom criteria (Table 1). Data analysis was done with Statistical Package for Social Sciences (SPSS 20). The Institutional Review Board of Korle Bu Teaching hospital (KBTH-IRB/00044/2018) approved this study.

Table 1

Sarmiento's modification of Lidstrom's criteria

Dorsal angulation/degrees	Loss of radial height/mm	Radial angulation/degrees	Score for each measurement
Neutral	<3	0-4	0
1-10	3-6	5-9	1
11-14	7-11	10-14	2
>15	>12	>15	4

Categorization of the sum of scores for dorsal angulation, loss of radial height and loss of radial inclination: excellent=0, Good= 1-3, Fair= 4-6 and poor = 7-12

RESULTS

Demographic data

The age range of the study participants was 16 years to 91 years with a mean of 54.85 ± 15.816 years. 61.9% were aged below 60 years. 39 (46.4 %) of the study participants were male and 45 (53.6%) were female. 55 participants (67.9%) sustained the injury when they fell on the outstretched hand while 27 (32.1%) sustained the injury via motor vehicular accidents. Injury was sustained more in the left forearm than the right representing respectively 46 (54.8%) and 38 (45.2%) participants. There was no statistically significant difference between the distributions of study participants into the two groups in age, sex, side affected and mechanism of injury ($X^2 = 1.73$, $p = 0.18$)

Anaesthetic effect

The numeric pain rating scale was used to assess pain before local anaesthetic administration, 15 minutes after administration and during fracture

manipulation. 74 (88.1%) participants rated their pain scores before the administration of local anaesthetic as severe while 10 (11.9%) participants rated it as moderate. The mean pain score before local anaesthetic administration was 8.168 ± 1.29

For both groups (A&B) 37 (88.1%) participants rated their pain as severe while 5 (11.9%) rated it as moderate. The mean pain scores for group A and B were 8.22 ± 1.314 and 8.12 ± 1.273 respectively. 32 (76.2% of participants who received periosteal nerve block experienced no pain 15 minutes after infiltration while 9 participants (21.4%) described the pain as mild. Only 1 participant (2.4%) experienced moderate pain and thus was sedated before successful fracture manipulation. Quite similar results were achieved for participants who received haematoma block with 33(78.6%) participants experiencing no pain and 9 (21.4%) describing it as mild. The mean pain scores for both groups(A&B) were 0.51 ± 1.052 and 0.43 ± 0.914 respectively.

Only a few participants experienced a change in the pain scores during fracture manipulation compared with the scores 15 minutes after administration of local anaesthetic. 31(75.6%) participants who received periosteal nerve block described fracture manipulation and reduction as painless whereas 6 (14.6%) and 4 (9.8%)

participants experienced mild and moderate pain respectively. Those who received haematoma block, 31 (73.8%) described the procedure was painless while 11 (26.2%) found it mildly painful. The mean pain score for periosteal nerve block during fracture manipulation was 0.73 ± 1.45 while that for haematoma block was 0.50 ± 0.94 . (Figure 1)

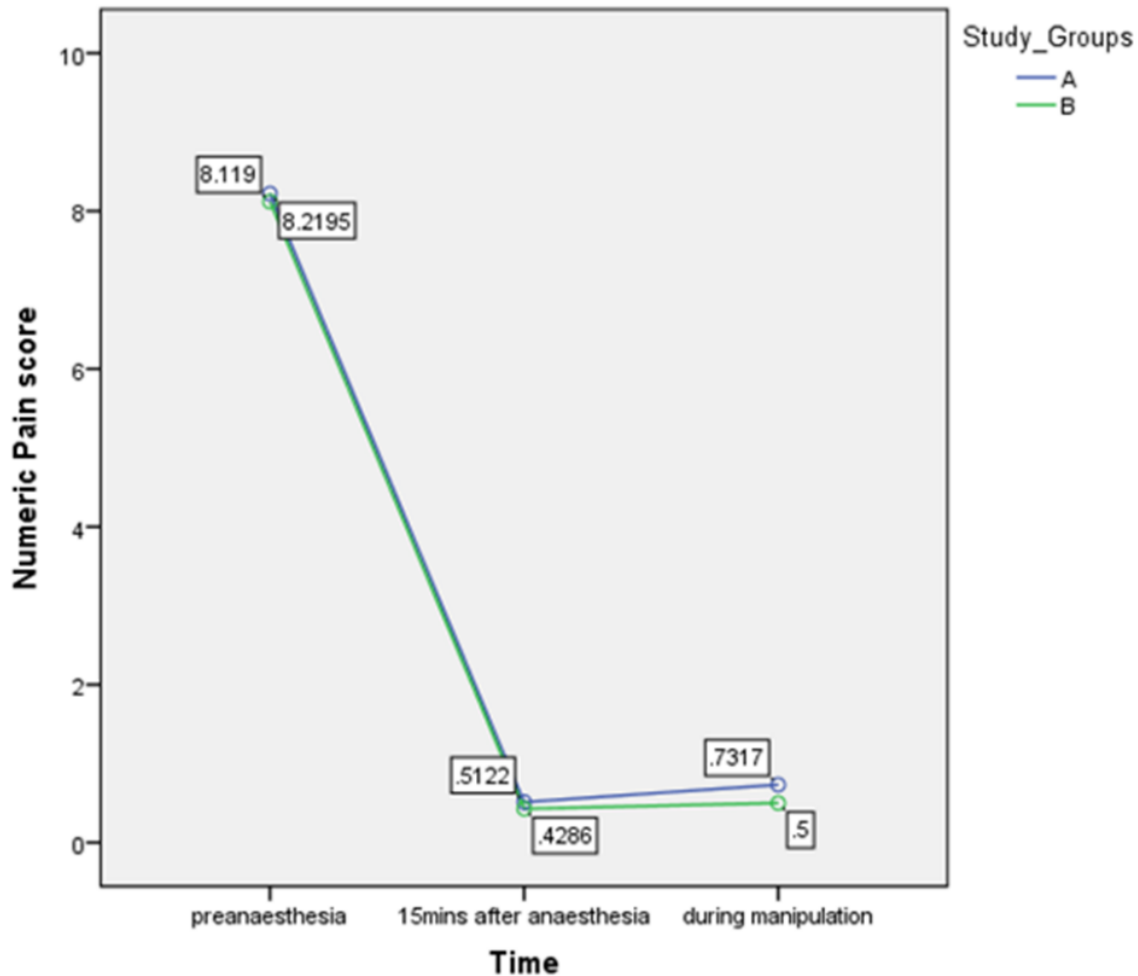


Figure 1. Change in mean pain scores for groups A and B

The overall reduction in pain scores from pre-anaesthetic to fracture manipulation and reduction for participants in group A was statistically significant ($F = 1053.93$ and $P < 0.001$). Participants in group B also experienced a significant reduction in pain scores after anaesthesia ($F = 1203.67$, $P < 0.001$).

However, between the two groups A and B, there was no statistically significant difference in analgesic effect ($F = 0.44$, $P = 0.51$)

Adequacy of fracture reduction

Three main parameters of fracture displacement were measured: dorsal angulation, loss of radial height and loss of

radial inclination. These were scored according to Sarmiento's modification of Lidstrom's criteria. X-rays for all 42 participants who had haematoma block and 41 participants who had periosteal nerve block (excluding the one who had moderate pain and had sedation for fracture reduction) were analysed. (see tables 2 and 3).

Table 2

Distribution of pre-reduction and post reduction measurements of dorsal angulation, loss of radial height and loss of radial inclination according to Sarmiento's modification of Lidstrom's criteria

Parameter	Group	Sarmiento's S C O R E S							
		Number/percentage							
		BEFORE REDUCTION				AFTER REDUCTION			
		0	1	2	4	0	1	2	4
Dorsal angulation	PNB	0 0%	8 19.5%	11 26.8%	22 53.7%	26 63.6%	12 29.3%	3 7.3%	0 0%
	HB	1 2.4%	9 21.4%	15 35.7%	17 40.2%	24 57.1%	15 35.7%	3 7.1%	0 0%
Loss of radial height	PNB	2 4.9%	28 68.2%	10 24.4%	1 2.4%	28 68.3%	13 31.7%	0 0%	0 0%
	HB	6 14.3%	22 52.4%	13 31.0%	1 2.4%	31 73.8%	11 26.2%	0 0%	0 0%
Loss of radial inclination	PNB	1 2.4%	13 31.7%	11 26.8%	16 39.0%	30 73.2%	7 17.1%	4 9.8%	0 0%
	HB	0 0%	7 16.7%	17 40.5%	18 42.9%	24 57.1%	13 31.0%	5 11.9%	0 0%

Table 3

Mean values of fracture displacement

Parameter	group	Mean value before reduction	Mean value after reduction	t- value	F- value
Dorsal angulation	PNB	14.19±3.56	2.87±3.42	19.97	F=0.30, P=0.60
	HB	13.57±3.67	2.54±3.574	19.77	
Loss of radial height	PNB	5.65±2.51mm	1.87±1.67mm	12.30	F=0.32, P=0.57
	HB	5.52±2.78mm	1.54±1.32mm	11.15	
Loss of radial inclination	PNB	12.78±5.00	3.29±3.26	14.32	F=0.26; P=0.61
	HB	13.07±4.22	3.76±3.13	15.38	

According to Sarmiento's modification of Lidstrom's criteria, 21(51.22%) participants in group A had excellent fracture reduction while 17 (41.46%) and 3 (7.32%) had good, fair reduction respectively. Contrary to group A,

half of participants in group B, had good reduction while 18 (42.86%) had excellent and 3 (7.14%) fair. No participant in either group had poor reduction. (Fig. 2). Analysis however revealed no statistically significant

difference between the two groups ($F=0.73$, $P=0.79$)

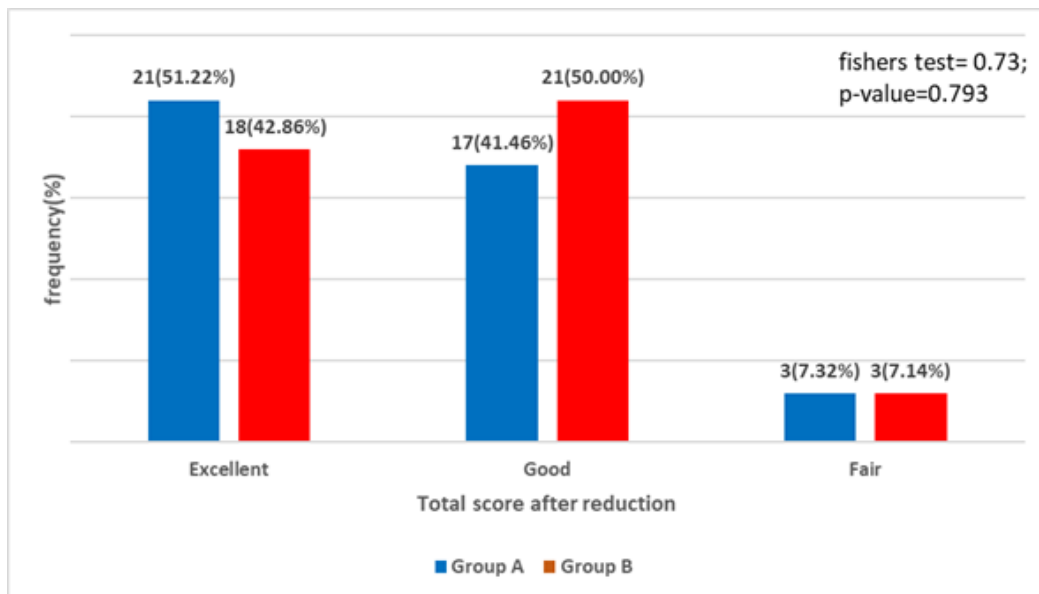


Fig 2. Results of fracture reduction according to Sarmiento's modification of Lidstrom's criteria

DISCUSSION

We found that majority of the participants were aged below 60 years and this is similar to previous work done by Ogunlade et al in Nigeria⁽¹⁴⁾. Our findings is contrary to most literature from the developed world where, distal radial fractures mainly occur in persons 65 years and above⁽¹⁰⁾. This disparity could be attributed to the higher life expectancy in the developed world.

The female preponderance of this injury in our study is confirmed by other studies^(4,6,15-17). The mean pain scores in this study were 8.22 ± 1.31 and 8.12 ± 1.27 for group A and B respectively. This contradicts previous studies by Ogunlade et al⁽¹⁴⁾, where it was reported that the mean pain scores before anaesthesia was 6.64 ± 1.59 . This difference in mean pain scores could be due to the timing of presentation as well as the ingestion of analgesia prior to evaluation of the pain scores. There was a marked reduction in

mean pain scores 15 minutes after infiltration with local anaesthetic in both groups for a majority of the participants and this only marginally increased during fracture manipulation and reduction. Majority of the participants in both groups reported experiencing no pain at all. Thus, both techniques demonstrated efficacy in pain control with statistically significant reduction in pain scores in each group. Though haematoma block appeared to offer better clinical pain control, the difference was not found to be statistically significant.

Ogunlade et al reported a drop in mean pain scores from 6.64 ± 1.59 at presentation to 0.72 ± 1.1 , 10 minutes after infiltration with local anaesthetic and a marginal increase to 1.79 ± 0.66 during fracture manipulation⁽¹⁴⁾. This compares favourably with the findings in our study. The marginally higher mean pain scores recorded by Ogunlade et al at 10 minutes after local anaesthetic infiltration and during fracture manipulation compared to

this study could be attributed to the shorter waiting time of 10 minutes compared to the 15 minutes allowed after infiltration before fracture manipulation. The importance of allowing adequate waiting time of at least 15 minutes after infiltration with local anaesthetic before fracture manipulation was stressed by Myderrizi and Mema⁽¹⁸⁾. In their study comparing haematoma block to sedation with intravenous propofol for closed manipulation and reduction of distal radius fractures, mean pain scores for the haematoma group dropped from 6.01±1.4 to 0.00 during fracture manipulation when at least 15 minutes waiting period was allowed.

In this study, all the participants had adequate fracture reduction with a vast majority scoring excellent or good in both study groups according to Sarmiento's modification of Lidstrom criteria.

The above finding could be attributed to the fact that local infiltration by both techniques offered effective pain control during fracture manipulation in majority of the participants. Similar findings were reported by Ogunlade et al. in Nigeria and Tageldin et al in the United Kingdom using haematoma block or periosteal nerve block respectively for closed reduction of distal radius fractures.^(13,14)

CONCLUSION

Both periosteal nerve block and haematoma block are effective local anaesthetic techniques for the close manipulation and reduction of distal radius fractures. We recommend both techniques for patients with distal radius fractures for which closed reduction is required as definitive management.

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