Is Hematoma block effective in reducing distal radius fractures in elderly patients presenting to the Accidents and Emergency Department?

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ABSTRACT

Objective: To determine the efficacy of hematoma block in reducing distal radius fractures in terms of radiological correction and frequency of re manipulation.

Methods: We conducted this descriptive study in Department of the Orthopaedic Surgery Bolan Medical Complex Hospital (BMC) Quetta from 3rd January 2018 to 3rd June 2020.All patients with distal radius fractures fulfilling the inclusion criteria were manipulated and casted under hematoma block in emergency department. Fracture reduction was confirmed by measuring important radiological parameters on immediate post reduction radiographs and at weekly interval for six weeks. Radiographic reduction was graded as excellent, good, fair and poor as per modified Sarmiento criteria. Patients with unacceptable radiographic correction were re-manipulated. *P* value was calculated by using Chi-square test for determining significance between important proportions. (*P* value< 0.05 was considered significant).

Results: The total number of patients in our study were 120. The mean age was 60.9±8 years (range 51 to 89 years).Female patients were 91(75.8) and male 29(24.1%).Majority (65.8%, n=79) of our patients had right sided fracture while left side fracture was noted in 41(34.1%) patients. Immediate post reduction radiographs revealed excellent outcome in 109(90.8%) patients and good in11 (9.1%) patients and no re-manipulation or revision was needed. The percentage of re-manipulation rate was 1.6 %(n=2) at one week as radiographic reduction was not acceptable (*P* value < 0.05). At final follow up at 6th week excellent and good radiographic reduction was noted in 106(88.3%) and 14(11.6%) patients respectively and no re-manipulation was documented (*P* value < 0.05).No complication was noted.

Conclusion: Distal radius fractures in elderly patients treated with closed reduction and casting under hematoma block in emergency department achieved excellent radiographic reduction in majority of our patients. A very low re-manipulation rate was noted.

Keywords: Closed Reduction, Hematoma block, Lignocaine, Radius.

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INTRODUCTION

Extra-articular distal radius fracture was first described by Abraham Colles in 1814 as dorsally displaced fracture in the metaphyseal region of the distal radius in elderly patients.[1,2] It accounts 14% of upper limb fractures and 17% of all fractures treated in accidents and emergency department.[3] Distal radius fractures are the most common fragility fractures of the upper limb frequently reported in elderly females as a result of fall on outstretched

hands.[4-6] The initial treatment of distal radius fracture consists of fracture reduction to reduce soft tissue pressure and relieve pain and discomfort.[7] The surgical cost, frequent hospital visits, and possible surgical complications in cases of surgical fixation of the distal radius fractures in elderly patients cause huge financial burden on patients and health care services.[8,9] Therefore a consensus is noted on the continuation of non-operative treatment in elderly patients if the fracture is adequately reduced.[10] Although the ideal type of anesthesia for manipulating and reducing distal radius fracture is still controversial,[11] various methods of anesthesia or analgesia are hematoma block, Bier's block, brachial plexus block, conscious sedation and general anaesthesia.[12]The hematoma block is the most popular and routinely performed technique for manipulation and reduction of distal radius fractures in Accident and Emergency Department.[13]Blood is pooled around the fracture site of distal radius forming a hematoma and nervous in this area are anaesthetized by injecting lignocaine thus allowing the Orthopaedic surgeon to manipulate the fracture and achieve reduction without much discomfort to the patient.[14]Optimum fracture reduction is however mandatory.[15]Many studies preferred hematoma block because of simplicity, safety, adequate radiological correction and comparable re manipulation rates of distal radius fractures with Bier's block and general anesthesia. [12,16,17]

The objective of our study was to determine the efficacy of hematoma block in reducing distal radius fractures in terms of radiological correction and frequency of re-manipulation. We hypothesized that distal radius fractures treated with hematoma block and casting resulted in excellent radiological outcome and least chances of subsequent loss of reduction and re-manipulation.

METHODS

This descriptive study was conducted in Department of the Orthopaedic Surgery Bolan Medical Complex Hospital (BMC) Quetta from 3rd January 2018 to 3rd June 2020.Patients of either gender and age above 50 years with isolated closed, dorsally displaced extra-articular distal radius fractures and arrived within 48 hours of sustaining the fracture to the Accident and Emergency Department of our hospital were included in our study. Patients with pathological fractures, previously manipulated fractures and fractures with neurovascular impairment were excluded. Prior approval of the study protocol was granted by the Ethical Committee of our hospital. Informed written consent for treatment and publication of the results was taken from all participants of our study. In the enrolled subjects complete history and physical examination was performed. AP and lateral wrist radiographs were taken. Pre-operative radiographic measurements of radial height, radial inclination and volar tilt was done and recorded in millimetre or degrees as per Mann's technique.[18]

Hematoma block and fracture manipulation and reduction technique

The administration of hematoma block followed by manipulation of the fracture and application of splint was performed by the same team of Orthopaedic surgeon and assistant in the operation theatre of Accident and Emergency Department. The patient was placed in supine position on operation table with exposure of the affected upper limb up to the shoulder. The fractured wrist was sterilized and fracture hematoma was confirmed by aspiration of blood from dorsal side followed by injection of 10ml of 2% Lignocaine into the fracture hematoma dorsomdially and dorsolaterally by angulating the syringe. We waited for 7 to 10 minutes for pain to subside and began manipulating the fracture.[14,19]

We adopted Charnely[20] and Robert-Jones[21] technique of closed reduction of distal radius fracture. In this technique an assistant held the affected forearm supinated and surgeon applied longitudinal traction continuously by holding patient's thumb and fingers until the fracture was disimpacted and dorsal angulation exaggerated. This was followed by flexion of the elbow and surgeon pushing the distal fracture fragment from dorsal to volar side to achieve fracture reduction. Lastly the forearm was pronated and a well-padded below elbow Plaster of Paris splint was applied.

Immediate post-operative AP and lateral radiographs were ordered and radiographic parameters were measured and fracture reduction was graded as excellent, good, fair and poor as per Modified Sarmiento Criteria (Table I).[22,23] All such patients were followed up weekly for six weeks and in each visit radiographic fracture reduction was reassessed and re-manipulation was done if reduction was lost and unacceptable. These follow up assessments were done by an experienced Orthopaedic surgeon who was not part of this study team.

We used SPSS version 22 for analysis of our results. Frequency and percentage was calculated for gender and side of fracture while mean and standard

deviation for age of the patient. *P* value was calculated by using Chi-square test for determining significance between important proportions. (*P* value< 0.05 was considered significant).Data was presented in table where necessary.

RESULTS

A total of 120 patients were included in our study. The mean age was 60.9±8 years (range 51 to 89 years).Majority (75.8, n=91) of our patients were female while male were 29(24.1%).Right sided fracture was present in 79(65.8%) and left in 41(34.1%).The cause of fracture was fall in 89(74.1%), road traffic accidents in 25(20.8%) and physical assault in 6(5%) patients. The results of radiographic interpretation of distal radius fracture after manipulation with hematoma block is shown in table II. The radiographic reduction was excellent in 109(90.8%) and good in11 (9.1%) on immediate post reduction x-rays and no re-manipulation or revision was needed. The percentage of re-manipulation rate was 1.6 %(n=2) at one week as radiographic reduction was not acceptable (*P* value < 0.05). At final follow up at 6th week excellent and good radiographic reduction was noted in 106(88.3%) and 14(11.6%) patients respectively and no re-manipulation was documented (*P* value < 0.05). No statistically significant difference in radiographic outcome was noted when data was stratified for gender, age and side (P value >0.05). No complication related to hematoma block or plaster was noted.

Table I: Modified Sarmiento Criteria for interpretation of post reduction radiographic results.

Result	Description	Radiographic Parameters	Interpretation
Excellent	No Deformity	Dorsal Angulation ≤ 0^0	
		Radial Shortening < 3mm	
		Loss of Radial Inclination <4^0	
Good	Slight Deformity	Dorsal Angulation 1-10^0	Perfect Reduction
		Radial Shortening 3-6 mm	
		Loss of Radial Inclination 5-9^0	
Fair	Moderate Deformity	Dorsal Angulation 11-14^0	
		Radial Shortening 7-11 mm	Acceptable Reduction
		Loss of Radial Inclination 10-14^0	
Poor	Sever Deformity	Dorsal Angulation > 15^0	
		Radial Shortening ≥ 12 mm	Unacceptable Reduction
		Loss of Radial Inclination > 15^0	

Table II: Results of radiographic interpretation of distal radius fracture after manipulation with hematoma block.

Time of X-ray	Excellent		Good		Fair		Poor	
Immediately post reduction	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
	109	90.8	11	9.1	--	--	--	--
At One week	106	88.3	12	10	01	0.8	01	0.8
At 6th week	106	88.3	14	11.6	--	--	--	--

DISCUSSION

In our study perfect radiographic reduction was achieved in all of our study at 6th week follow up. Only 2(1.6%) patients need re-manipulation at one week follow up as the reduction was not acceptable.Bajracharya[24] conducted a comparative study of 50 distal radius fracture reduced under hematoma block with 50 patients under brachial plexus block. He noted that 32/50(64%) patients had perfect radiographic reduction in hematoma block group while17/50(34%) patients in the brachial plexus block had perfect reduction (P value 0.005). Ogunlade and Omololu[25] treated 35 patients of distal radius fractures with hematoma block and achieved satisfactory reduction in all patients. A retrospective case control study was conducted by Koren and colleagues [15] in which 210 distal radius fractures were closely reduced under hematoma block and 30 under sedation in emergency department. Post reduction radiographs revealed better restoration of volar tilt and ulnar variance in sedation group than in hematoma group(*P* value 0.001).However sedation group spent relatively more time in emergency

department than hematoma block group(*P* value 0.001). Koren[15] was of the opinion that although hematoma block is easy to administer, does not provide sufficient muscle relaxation which is essential for achieving accurate fracture reduction. Sedation has the advantage of providing muscle relaxation but need more knowledge, experience, time and resources to execute.Funk[12] compared 19 patients of distal radius fracture treated with hematoma block alone, 19 patients with hematoma block and sedation combined and 21 with general anaesthesia. He documented better volar tilt restoration under general anaesthesia than hematoma block.

Contrary to our results Kendall and colleagues[26] noted that although no significant difference in radial shortening and radial tilt was noted in distal radius fractures treated with either Bier's block or hematoma block but a relatively better radiographic outcome(dorsal angulation) was noted in Bier's block group than hematoma block group.(*P* value 0.003).Furthermore many patients required re-manipulations in the hematoma block group than Bier's block group(17/70 versus 4/72 respectively with *P* value 0.003).These authors therefore advocated to use Bier's block for perfectly reducing distal radius fractures. Myderrizi and colleague[17] compared 21 distal radius fractures reduced under intravenous propofol with 22 patients under hematoma block and documented no significant difference in all radiographic parameters of reduction between the two groups and number of patients who lost radiographic reduction at one week follow up in either group. These authors concluded that hematoma block was a safe and effective alternative to intravenous sedation for Colle's fracture reduction. Malik and Appelboma[8] were of the opinion that re-manipulation or revision rates of distal radius fractures varied with the type of anaesthesia used for initial reduction. These authors compared distal radius fracture reduction in emergency department using hematoma block in 32 patients, Bier's block in 24 and intravenous sedation in 14 patients .The re-manipulation or revisions were needed in 15(46.9%) patients with hematoma block,7(29.2%) with Bier's block and 7(50%) patients with intravenous sedation within 6 weeks. These differences were however not statistically significant. Younger patients were more prone to had revisions than elderly patients (*P* value 0.01) while gender was not associated with any increase in re-manipulation rate (*P* value 0.05).

These variable results of distal radius manipulation under hematoma block reported in literature is most probably due to lack of universal criteria for deciding re-manipulation or surgery in distal radius fracture and inability to use image intensifier or ultrasound for confirming fracture reduction in emergency department.[27] Use of ultrasound for accurately injecting the local anaesthetic into the hematoma particularly in obese patients and confirmation of fracture reduction has been strongly recommended by some studies.[8,28]

We had not noted any complication of hematoma block in our series. Bajracharya[24] however documented swelling of the hand and reapplication of cast in 2(4%) patients and infection at the injection site in 1(2%) patient. Johnson[16] was of the view that if strict aseptic technique is not followed closed distal radius fracture will be converted to an open fracture by introducing microorganisms and subsequent infection. Young[29] reported compartment syndrome of the forearm in eight patients due to hematoma block. He advised not to use excessive fluid while injecting local anaesthetic.

Our study had few limitations. The design of our study was descriptive and we were not able to calculate the appropriate sample size for our study nor assessed the functional outcome of distal radius fractures. We therefore recommend further studies to verify our results.

CONCLUSION

Distal radius fractures in elderly patients treated with closed reduction and casting under hematoma block in emergency department achieved excellent radiographic reduction in majority of our patients. A very low re-manipulation rate was noted. We therefore recommend hematoma block as the technique of choice to reduce distal radius fractures in elderly patients presented to the Accidents and Emergency Department.

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