

HEMATOMA BLOCK LOCAL ANESTHESIA FOR CLOSED REDUCTION OF COLLES-TYPE FRACTURES

Ismatullah

Department of Orthopedic Surgery
Khalifa Gul Nawaz Teaching Hospital and District Headquarters Teaching Hospital Bannu. - Pakistan.

ABSTRACT

Objective: To describe the outcome of hematoma block local anesthesia for closed reduction of Colles-type fractures in emergency care setting.

Methodology: This descriptive study was conducted at Khalifa Gul Nawaz Teaching Hospital & District Headquarters Teaching Hospital Bannu, from February 2009 to August 2010. A total of 70 patients having Colles-type fractures were recruited for this study. Closed reduction and plaster casting was performed under HB in Accident & Emergency Department. Pre- and post-reduction radiographic assessment was done. A questionnaire about pain perception was administered to patients. It included a visual analogue scale as well. Fractures requiring re-manipulation were noted. Any local or systemic complications of anesthesia were recorded. Patients were sent home 3 hours after reduction. Follow-up of the patients was done up to 12 weeks.

Results: Out of 70 patients, 30 were males & 40 were females. They were in the age range of 20-80 years. On assessing their pain perception with VAS, during closed reduction under HB, 36 patients had no pain, 24 had mild pain, 6 were feeling moderate pain, and 4 were feeling severe pain. 12 patients required re-manipulation for improper reduction. 2 patients developed carpal tunnel syndrome, 3 developed reflex sympathetic dystrophy & one developed localized infection at the site of infiltration. No systemic complications of anesthesia were noted.

Conclusion: HB can be used effectively for closed reduction of Colles-type fractures, especially in a district hospital which lacks advanced anesthesia and intensive care facilities.

Key Words: Colles-type fracture, Local anesthesia, Hematoma block (HB).

INTRODUCTION

Colles fracture is the most common type of distal radius fractures. It occurs within 2 cm. of the distal articular surface of the radius and may extend into the radio-carpal joint or distal radio-ulnar joint. There is dorsal angulation, dorsal displacement, radial angulation and radial shortening¹. The patient usually presents in the Accident and Emergency (A & E) Department with a history of fall on out-stretched hand and has a typical deformity of the wrist known as dinner-fork deformity. A displaced Colles fracture is traditionally treated by manipulative reduction and cast stabilization. Some unstable Colles fractures cannot be held reduced in the cast and are prone to redisplacement. They require percutaneous pin fixation or external fixation for stabilization²⁻⁴.

Fractures which are not reducible by closed method, require open reduction and internal fixation with small T-plate⁵.

Adequate anesthesia is of paramount importance for closed reduction of Colles fracture. Varieties of anesthesia techniques are used for manipulative reduction, like general anesthesia, intravenous regional anesthesia (Bier's block), intravenous sedation, regional block local anesthesia (brachial plexus block and cubital nerve block) and hematoma block(HB)^{6,7}.

Traditionally general anesthesia requires an operation theatre, equipments, skilled anesthesia personnel, fasting of the patient overnight and admission for monitoring and resuscitation. In modern society this has unacceptable cost and time implications.

Now-a-days an increasingly large number of minor procedures are performed under local anesthesia in clinical settings outside operation theatre⁸. In case of Colles fracture, there is a marked trend away from general anesthesia in favor of local anesthesia⁹. Hematoma block is a simple form of local anesthesia which can be performed by A & E doctor. It is a technique of injecting local anesthetic at the site of fracture directly into the hematoma for closed reduction¹⁰. It is given in the most recent cases of these fractures, not more than 24 hours after the injury.

The present study was designed to show the efficacy, safety and practicality of the hematoma block for closed reduction of Colles fractures in emergency care setting in two District Hospitals.

METHODOLOGY

This prospective clinical trial was conducted in Khalifa Gul Nawaz Teaching Hospital and District Headquarters Teaching Hospital Bannu, which are associated with Bannu Medical College, in Khyber Pukhtoonkhwa province of Pakistan. The study was completed in the period from Feb. 2009 up to August 2010. Patients having Colles fractures, coming to the A & E Department were recruited for this study. The following were included;

1. Displaced Colles fracture, requiring manipulation: >15 dorsal angulation and > 2 mm. radial shortening.
2. Only extra-articular fractures.
3. Adult male or female patients in the age range of 20-80 years.
4. Colles fracture of less than 24 hours duration.

The patients with the following were excluded from the study,

1. Open fractures, intra-articular and comminuted fractures, requiring external fixation or K-wire fixation for which hematoma block is not suitable.
2. Un-displaced Colles fractures which do not require manipulation.
3. Fractures of more than 24 hours duration.
4. Patients with systemic disorders like thyroid disease, hypertension, cardiovascular diseases or diabetes mellitus and those with previous history of allergic reaction to local anesthetic drugs.

On receiving the patient in the A & E department, an informed consent was taken. A thorough general assessment of the patient was

conducted and pulse, blood pressure and body weight recorded. The duration which had lapsed since time of injury was recorded. Radiological assessment was done in every case. A postero-anterior & a lateral view of the wrist were obtained. In a normal wrist, the distal radius has a palmar tilt or palmar angulation of 11 degrees, radial inclination of 23 degrees, and radial length of 12 degrees¹¹. In Colles fracture, there is dorsal angulation of the distal radial fragment, decreased radial inclination and shortening of the length of the radius. On pre-reduction radiographs, the values of these three parameters were recorded.

We used 1.0% plain lignocaine solution, in the dose of 0.2 ml per kg weight for hematoma block in all these cases. We used the method of infiltration of local anesthetic solution as selected by Wardrope J et al¹². Under aseptic condition, about four-fifth of the total dose was given dorsally into the fracture hematoma & the rest of the solution was infiltrated around the styloid process of ulna. Five minutes after the injection of the solution, manipulation was carried out. A plaster of Paris back-slab was applied to stabilize the fracture in reduced position. We preferred a position of slight flexion & unlar deviation of the wrist in the back slab.

Blood pressure and pulse of the patients was closely monitored in order to diagnose any cardiovascular complication of anesthesia.

Post-reduction radiographs of the wrist were taken to assess the accuracy of reduction. The reduction was considered as adequate if there was radial shortening < 5 mm. , dorsal tilt 15 degrees and radial inclination > 15 degrees¹³. The number of patients requiring re-manipulation was recorded.

The patient was administered a questionnaire by the attending nurse. It was written both in English as well as in Urdu form and patient completed this questionnaire in the language he knew better. It was about the severity of pain perception during the procedure & whether the patient was satisfied with the level of analgesia provided by the anesthetic technique. Illiterate patients got help from the nurse or the doctor to tick mark the questionnaire according to his feeling about the procedure. A visual analogue scale (VAS) was also included in the questionnaire for better assessment of pain perception by the patient.

VAS:

0 2 4 6 8

With the help of VAS, categorization of

the patients was done into groups A, B, C and D (Table 1).

Each patient stayed in the hospital for 3 hours after the procedure and then sent home. Follow-up of the patient was done in the out-patient department, with visits scheduled at weekly intervals for the first two weeks and then at fortnight intervals up to a total periods of 12 weeks. After first week, the back slab was changed to a complete cast which was removed after 5-6 weeks. Patients were encouraged to exercise the fingers, elbow joint and shoulder joint. Radiographic assessment was made at each visit to show any re-displacement of the fracture and to document the healing of the fracture.

RESULTS

A total of 70 patients having Colles-type fractures of the distal radius were recruited for this study. Among 70 patients, 30 were male and 40 were female indicating a high tendency of females

to develop Colles fracture, especially in the post-menopausal period (Table 2). The age of these patients was ranging from 20 to 80 years. All of them had closed extra-articular fractures. Open fractures, intra-articular and comminuted fractures resulting from high energy trauma were excluded from this study. There were 29 patients in the age range of 20 to 50 years and 41 patients in the age range of 51 to 80 years. This shows an increased frequency of fracture in old age people.

Closed manipulation of all these fractures was done under HB in emergency setting. Radiographic assessment was done before manipulation as well as after manipulation and the following values (mean values) were noted (Table 3).

There was a statistically significant difference, from pre-manipulation to post-manipulation, on the average, in dorsal angulation (P-value=0.000), radial inclination (P-value=0.000) and radial length (P-value=0.000), P-value was

Table 1: Categorization on the Basis of Pain Perception

Group	VAS	Pain Perception
Group A	0 ___ 2 cm	No pain
Group B	2 ___ 4 cm	Mild pain (ignorable)
Group C	4 ___ 6 cm	Moderate pain
Group D	6 ___ 8 cm	Severe pain

Table 2: Age (in years)

	Frequency	Percent
21-35	13	18.6
36-50	17	24.3
51-65	22	31.4
66-80	18	25.7
Total	70	100.0

Table 3: Radiographic Assessment

Radiological Parameters	Mean value (Standard Deviation)	P-value
Pre-manipulation dorsal angulation (degrees)	22.5000 (8.1893)	.000
Post-manipulation dorsal angulation (degrees)	3.5714 (3.1557)	
Pre-manipulation radial inclination (degrees)	14.1000 (3.2444)	.000
Post-manipulation radial inclination (degrees)	19.4714 (2.5804)	
Pre-manipulation radial shortening (millimeters)	6.2143 (2.2143)	.000
Post-manipulation radial shortening (millimeters)	2.1857 (1.1831)	

calculated by using Paired t-test.

The level of pain perception of the patients during the procedure was categorized on the basis of VAS, as follows (Table 4).

Table 4: Level of Pain

1. No pain	36	51.43%
2. Mildly painful(ignorable pain)	24	34.28%
3. Moderately painful	6	8.57%
4. Severely painful	4	5.71%
Total	70	100

Out of 70 patients, 12 required re-manipulation for improper reduction. In 6 patients closed reduction and plaster cast was not successful in stabilizing the fracture. Out of these 6 cases, 4 required percutaneous K-wire fixation and 2 were fixed with external fixation.

Two patients developed carpal tunnel syndrome which gradually resolved in 2 to 3 weeks time. Three patients developed reflex sympathetic dystrophy which was treated with psychological support, active motivation of the patients and intensive physiotherapy program. One patient developed localized infection in the form of cellulites which was controlled with early institution of intravenous antibiotic therapy.

No systemic complications attributable to local anesthetics, like anaphylactic reactions, arrhythmias, collapse, muscle twitching or convulsions were noted during or after the procedure.

Careful blood pressure and pulse monitoring was conducted during and after the procedure and no significant fluctuation in these parameters was noted with HB.

Statistical analysis of the results was done using SPSS program, version 8.0 and the results of pre- and post- manipulation dorsal angulation, radial inclination and radial length were found significant.

DISCUSSION

Adequate anesthesia is fundamental for proper reduction of Colles fracture. Many types of anesthesia are used for manipulative reduction of this fracture. There are pitfalls, advantages and disadvantages associated with each method.

Our study was designed to determine the outcome of HB for closed reduction of Colles

fracture. Although the size of the sample is not a large one, conclusions can be drawn. The safety, simplicity, efficacy and cost-effectiveness of this technique provide a rational basis for its adoption and application in trauma centers. There is a gradual departure from general anesthesia in the reduction of Colles fracture⁹.

Since there are no set standards or absolute parameters against which the results can be weighed, we relied, to a great extent, on the response of the patient regarding pain perception during and after the procedure, including VAS. The results achieved in our study are very much encouraging and comparable to other studies.

Searching the literature, it becomes apparent that many authors have compared the results of HB with Bier's block and intravenous sedation for reduction of Colles fracture^{12, 14}. There have been valid concerns about complication of sudden collapse and death of previously normal patients resulting from failure of tourniquets in Bier's block and the resulting systemic toxicity of local anesthetics. Most of our emergency departments have meager facilities of resuscitation and are poorly staffed as well, having no anesthesia specialist most of the times. Proper pneumatic tourniquets are usually not available in periphery hospitals. HB can be safely performed by an A & E doctor without needing any costly equipments.

Although it has been argued that injection of local anesthetic into the hematoma has a theoretical risk of converting a close fracture into an open fracture, possibly introducing bacteria in a clean and sterile hematoma but practically the rate of infection is quite negligible⁹. Johnson PQ and Noffsinger MA conducted study on closed reduction 132 distal forearm fractures with HB and compared them with a control group of 100 patients who had either general anesthesia or intravenous regional anesthesia. Results were similar in both groups and no infection or other major complication occurred in Hb¹⁵.

In our study, because of using strict aseptic technique, only one case developed infection at the site of infiltration of local anesthetic. It was controlled with intra-venous antibiotic therapy.

Bajracharya et al compared the results of 50 patients receiving brachial plexus block (BPB) with those of 50 patients receiving (HB) for closed reduction of distal forearm fractures¹⁶. They used VAS scoring for outcome measurement. Their study showed that HB was as effective in terms of providing analgesia as BPB. There was only an insignificant difference between the VAS scoring for BPB and HB, with 2.08 mean value \pm 0.85

S.D. for HB group and 1.70 mean value \pm 0.64 S.D. for BPB group. One out of 50 patients had bronchospasm in BPB group and one out of 50 patients in HB group developed infection which needed incision drainage and external fixation. The quality of reduction was higher in HB group as compared BPB group. Apart from this, HB was administered by the surgeon himself whereas BPB was given by the anesthetist. In peripheral hospitals, anesthetist may not be available. Based on these facts, these authors have concluded that HB is superior to BPB in our circumstances, in selected fractures of distal radius, especially Colles-type of fractures.

Man KH et al performed a prospective clinical trial to compare the effectiveness of HB with that of nitrous oxide (Entonox) in pain relief during closed reduction of distal radius fractures¹⁷. A total of 67 patient were studied. 34 patients received HB and 33 patients received Entonox. Pain perception (VAS score), procedure time, patient acceptance and complications were recorded. Patients in the HB group had less pain perception, less procedure time and more patients acceptance. Major complications were not found in any of the groups.

The rate of complications like carpal tunnel syndrome and reflex sympathetic dystrophy was quite low in our study and consistent with other international studies¹⁸. We encountered no systemic complications of local anesthetic drug which is also consistent with previously reported studies. Some authors have reported lidocaine induced acute changes in the mental status and generalized seizures with HB¹⁹. These complications are most likely due to inadvertent intravascular injection of local anesthetic. We have not encountered any such complication in our study.

For decreasing pain during infiltration, alkalization of local anesthetic by mixing with sodium bicarbonate solution has been recommended by various authors^{20, 21}. We have not tried this method in our study.

Some Colles fractures are inherently unstable. Loss of reduction occurs when these cases are treated with conventional method of manipulation and casting. For stabilizing these fractures other methods like closed reduction and percutaneous pin fixation, external fixation, or open reduction and internal fixation with plate and screws are used²². These procedures cannot be done under HB and require other forms of anesthesia, like regional or general anesthesia.

In our study, 4 cases required percutaneous pin fixation and 2 required external fixation. All

these cases were extra-articular because intra-articular fractures were not included in our study. Out of 4 cases which were fixed with K-wires, 2 were in the age group 20-35 years and 2 were in the age group 35-50 years. Out of 2 cases which were stabilized with external fixation, one was in the age group 35-50 years and one in the age group 65-80 years. All these operations were performed under general anesthesia in the hospital main operation theater (O.T.) on regular O.T. day of the Orthopedic Unit.

In children local anesthesia is not a favorite type of anesthesia for closed reduction of forearm fractures. It is very occasionally used in pediatric emergencies²³. We excluded this section of population from our study.

Most importantly, we found that the transit time of patient through the A & E Department was decreased to 2-3 hours. This has significant relevance in our society as it decreases the cost of management of these commonly sustained fractures. The bulk of expenditure usually results from in-door patients' management. Treating patients in Day-Surgery Units and in emergency settings decreases burden on the health care departments.

CONCLUSION

Hematoma block is a simple technique of local anesthesia which can be used effectively for closed reduction of Colles fractures in the A & E Department. It is especially useful in a periphery hospital where skilled anesthetist, anesthesia equipments or intensive care facilities are not available.

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Address for Correspondence:**Dr. Ismatullah**Assistant Professor Orthopedic Surgery
Bannu Medical College, Bannu - Pakistan