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Efficacy of Hematoma Block VS Conscious Sedation in Terms of Pain Relief for Manipulation and Reduction of Distal Radius Fracture

Naseem Munshi, Muhammad Khalid Arain, Athar Muniruddin Siddiqui, Muhammad Naseem, Khadija Abid

ABSTRACT

Objective: To compare the efficacy of hematoma block versus conscious sedation for closed reduction of distal radius fractures.

Study Design and Setting: This was a Randomized Control Trial was conducted at Dr. Ziauddin University Hospital between 1st July 2018 and 31st July 2020.

Methodology: A total of 158 patients underwent closed reduction of distal radius fractures in emergency department; these patients were divided in two groups of 79 each. Hematoma block was used as an analgesic in group A whereas conscious sedation was used on the patients in group B. Both groups were then compared for effectiveness in terms of pain reduction and SPSS software version 25 was used for data analysis.

Results: Median age in group A was 44 years (IQR=37-48.5 years) and 40 years (IQR=30-47.50 years) in group B. The median pain score in group A [3 (IQR=2-5)] was significantly lesser than group B [5 (IQR=3-6)] with p=0.001. In group A effectiveness was achieved in patients was 69.6% and in group B effectiveness was achieved in patients was 35.44%. Statistically there was significant difference observed in proportion of efficacy between groups with p=0.001.

Conclusion: This study show that hematoma block is more effective than conscious sedation in closed manual reduction of distal radius fractures in terms of pain relief.

Keywords: Conscious sedation, distal forearm fractures, Hematoma block, Visual Analogue Scale

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INTRODUCTION:

Distal radius fractures (DRF) are one of the most commonly encountered upper limb fracture with peak incidence in pediatric and geriatric group and is common in both genders.[1,2] With recent advancements, research and understanding of biomechanics, reduction DRF has been acknowledged as the first line management, regardless of requirement of surgical intervention in future or not.[3] However, pain during manual reduction not only leads to uneasiness and strain on the patients leading to restriction of effective fracture reduction.[4]

Treatment protocols for DRF are undergoing changes, which are ranging from conservative (closed manual reduction and cast splint) to surgical methods (open reduction and internal fixation).[5] Conservative method, that is closed reduction, necessitates the patient to be sedated or given strong analgesics.[6] Opioids are used as analgesics which is given in combination with a sedative and muscle relaxant, most commonly used is a short acting benzodiazepine. They have decent response but they carry with them, risk of respiratory depression and seizures.[7,8]

One of the effective method during upper limb surgery is regional anesthesia (Bier block).[1] However, it brings along with it complications like, tourniquet site pain, local anesthetic toxicity, and immediate surgical site pain ensuing tourniquet deflation and risk of anesthetic leakage due to accidental tourniquet deflation.[9] For DRF reduction, PSA an alternative effective method of analgesia.[10] PSA is widely used in the ED as a part of daily practice in tertiary care hospitals, but

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these patients are under the risk of respiratory depression and need close monitoring. On the other hand, HB provides a safe alternate for pain relief during DRF reduction procedure.[2,11]

Use of conscious sedation has its own risks of cardiorespiratory distress and may need continuous monitoring. Hematoma block (HB) is a method in which a local anesthetic preferably 1.5% xylocaine is injected into the hematoma between the fractured bone fragments. It is an effective method for pain relief during manual reduction for DRF minus the additional risks from IV anesthetic injection.[2,10,12,13] Teng et al. found that the effect of HB on post-reduction pain severity was better than that of PSA with significant heterogeneity (Hedges' *g* - 0.600, 95% CI - 1.170 to - 0.029, $p = 0.039$).[10]

The rationale for comparing the effectiveness of HB and PSA in close reduction of DRF in terms of pain relief, is the need to identify the most effective and patient-friendly approach to alleviate pain during this procedure. By evaluating the pain-relieving efficacy of these two approaches, healthcare professionals can make informed decisions to optimize patient comfort, minimize complications, and enhance the overall experience of fracture reduction procedures.

METHODOLOGY:

This Randomized Control Trial was conducted at Dr. Ziauddin University Hospital, Karachi from 1 July 2019 and 30 July 2020. Ethical approval was obtained before starting the study (ERC Ref#: 301-2019). Sample size of 46 in each group was estimated in group, by using Open Epi sample size calculator and taking efficacy of heamatoma block as 68% and conscious cases as 28%, power of test as 90% and 99% confidence level. However, for increasing the generalizability of results we included 79 patients in both groups. All patients with DRF who underwent manual reduction in ED of age 30 to 70 years of either gender were inducted our study after taking informed consent. Patients having multiple or pathological fractures necessitating general anesthesia, neurovascular injury, skin infection at wrist, blood disorders, comorbid conditions like hypertension and diabetes, and allergies to medicines were excluded from this study. Non-probability consecutive sampling technique was employed.

Patients were divided in two groups by a lottery method, group A and group B. A total of 158 patients were placed in two groups of 79. All patients underwent a thorough general physical examination, vitals, weight, duration which had lapsed since the time of injury along with radiological assessment.

Hematoma block was used as a method of analgesia in one group (A) and conscious sedation in the other group (B). In Group A, patient's skin was first scrubbed with pyodine (Povidone-iodine) and monorapid (ethanol), the fracture was identified dorsally, and a 22-gauge needle was inserted in the fracture hematoma. Aspiration of minimal blood into the syringe, led to confirmation of hematoma, after which (5-10) ml of 1.5% xylocaine was injected into the hematoma. After 5 minutes, effectiveness of the block was confirmed by observing an obvious decrease in pain on movement of the patient's wrist. If at any time before or during the procedure, the patient's pain was not well tolerated, HB was abandoned, and converted to PSA. In group B, patients were given a combination of intravenous short acting benzodiazepines and analgesia. A combination of injection Diazepam 10 mg and injection tramadol 50mg was used diluted in 10 ml distilled water. After giving 5 minutes for pain to settle, manual reduction of fracture was done, after reducing the fracture, application of plaster of Paris slab was done to stabilize and immobilize the fracture in reduced position. Pain was recorded on VAS before and after the procedure. Effectiveness of both groups was considered successful if pain on VAS scale was equal to or less than 4 (i.e. reduction in pain score on VAS after procedure). Radiograph images was taken after reducing the fracture to assess the accuracy, which was considered to be successful if it met the criteria given in the table below. Before getting discharged, the patients or their attendants were asked to fill a survey, in absence of attending doctor, regarding severity of pain perception during the procedure, satisfaction with mode of anesthesia and post-operative pain (VAS was also incorporated in the survey to get better evaluation of pain perception). It was in both languages, English, and Urdu.

The SPSS software (version 25) was used for data analysis. Quantitative variables, such as age, duration of fracture and pain score were presented in the form of median and interquartile (distribution of age, duration of fracture and pain score was non-parametric). Qualitative variables such as gender, mode of injuries, type of DRF, and efficacy were presented in the form of frequency and percentage. Mann-Whitney U test was used to compare pain score between both groups. Chi-square test was used to compare efficacy between both groups. A p-value=0.05 was considered as statistically significant.

RESULTS:

Total number of patients included in this study were 158, all of whom came with displaced DRF. Patients having multiple or pathological fracture necessitating general anesthesia were excluded from the study.

Median age in group A was 44 years (IQR=37-48.5 years) and 40 years (IQR=30-47.50 years) in group B. In group A, 64 (81.08%) patients were males while 15 (19%) were females. In group B, 61 (77.2%) were males while 18 (22.8%) were females. There were different modes of injuries causing DRF in our study population, some of the most common were fall (n=103, 65.2%), followed by road traffic

accidents (RTA) (n=47, 29.7%) and sports (n=8, 5.1%), respectively. Colles' fracture was the most common (85%) type of DRF seen in this study.

Median duration of fracture after injury was significantly lower in group A as compared to group B (7 vs 11 hours) with p=0.0001. Before reduction, patients who received analgesia at least 8 hours' prior, were excluded from the study.

The median pain score in group A [3 (IQR=2-5)] was significantly lesser than group B [5 (IQR=3-6)] with p=0.001. (Fig 1)

In group A effectiveness was achieved in patients was 69.6% while in 30.3% patients it was ineffective. In group B effectiveness was achieved in patients was 35.44% while in 64.55% patients it was ineffective. Statistically there was significant difference observed in proportion of efficacy between groups with p=0.001. (Fig 2)

DISCUSSION:

DRF are one of the most commonly encountered fractures of the upper limb that are seen and managed in ED all over the world.[10] Regarding background diseases, general anesthesia has its own side effects. Evaluation and association between numerous methods has been done earlier in studies on patients with DRF, but elderly population are of special importance as they require methods which are effective with fewer side effects and requires short hospitalization holds importance in the elderly group.[14]

In recent years, certain randomized controlled trials have established the efficacy of HB as a satisfactory method for manual reduction of DRF in all age groups.[2,10,15] Kendall studied the increasing acceptance of the HB in reduction of Colles' fracture, and revealed increasing popularity of the HB (7% in 1989 vs. 33% in 1994), when compared with general anesthesia (44% in 1989 vs. 24% in 1994).[16] Ogunlade studied sample size of 35 patients and result showed a significant reduction in pain following HB with attainment of satisfactory reduction in all cases.[12]

Handoll in 2002 reviewed Cochrane Database in which he involved 18 studies that included a total of 1200 patients, comparing HB to anesthesia for DRF reduction in adult patients. Although general anesthesia provides superior analgesia during manipulation but leads to longer hospital stay and greater expenses compared with HB.[17] These studies also pointed out the complaints of increased post procedure pain in patients receiving general anesthesia.[2,6,10,13,18]

Singh conducted a double blind RCT between HB and conventional sedation. As a method of analgesia for reduction of Colles' fracture. It showed that pain scores during fracture reduction in the HB Group were low, which were < 3 (median = 1.8) when compared with sedation group, it was >3 pain

Figure 1: Comparison of pain score b/w group A and group B

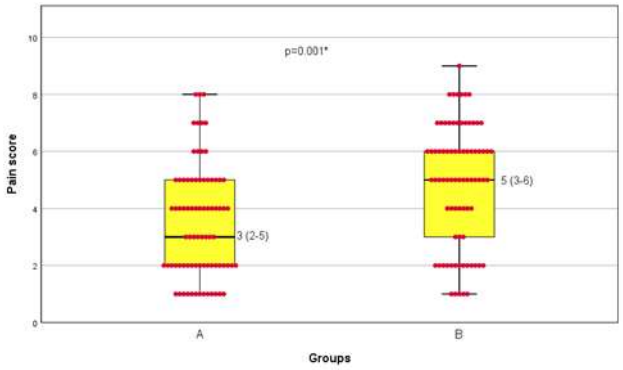

Figure 2: Comparison of efficacy between both groups

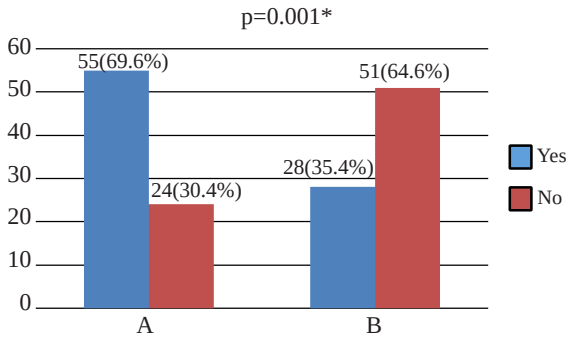

Table 1: Criteria for accurate reduction of the fracture

Results	Criteria		Modified criteria
Excellent	No deformity	Dorsal angulation <0 degree Shortening <3mm Loss of radial deviation <4 degree	Perfect reduction
Good	Slight deformity	Dorsal angulation 1-10 degree Shortening 3-6mm Loss of radial deviation 5-9 degree	
Fair	Moderate deformity	Dorsal angulation 11-14 degree Shortening 7-11 mm Loss of radial deviation 10-14 degree	Acceptable reduction
Poor	Severe deformity	Dorsal angulation >15 degree Shortening >12 mm Loss of radial deviation >15 degree	Unacceptable reduction

scores (median = 8.7).[19] In the study of Fathi et al. regarding pain control during DRF reduction, ultrasound guided HB was established as a safe and effective method when compared with PSA.[20] In the study conducted by Myderrizi and Mema in 2011 on patients with DRF, HB was safer and more effective than general anesthesia and PSA for closed reduction of the DRF, although treatment failure was equal in patients in both methods.[13]

In the latest study by Tseng et al in 2018 result revealed, that in adult population, post-reduction pain relief achieved by HB is more adequate than PSA. However, no significant variance in severity of pain was observed during DRF reduction in both groups. This implies that anesthesia with HB, instead of PSA, is beneficial in sustaining analgesic effect post-reduction. In pediatric population, HB led to reduced pain when compared to PSA. Additionally, more adverse effects were observed in adult patients given PSA, including nausea, vomiting, and respiratory distress. However, the rate of adverse effects was similar in both pediatric groups receiving HB and PSA, reduction failure amongst both groups of adult and pediatric population were also indifferent.[10]

Total number of patients included in this study were 158, all of whom came with displaced DRF. Patients having multiple or pathological fracture necessitating general anesthesia were excluded from the study. These patients were divided and randomly placed in two groups of 79 patients each. Colles' fracture was the most common (85%) type of DRF seen in this study. The comparison of pain was determined by VAS during and post fracture reduction. Pain reduction was considered effective if score on VAS scale was equal or less than 4. If it was greater than 4 then it was considered ineffective. In group A, effectiveness was achieved in patients was 69.6% while in 30.3% patients it was ineffective. In group B effectiveness was achieved in patients was 35.44% while in 64.55% patients it was ineffective. This study show that HB has more efficacy than PSA in closed manual DRF reduction in terms of pain relief.

Our study has few limitations. The study was conducted at a single center, which may limit the generalizability of the findings to other healthcare settings and patient populations. Multi-center studies involving larger sample sizes are needed to confirm the results. The study focused on pain relief and efficacy of hematoma block versus conscious sedation, without considering other factors such as cost-effectiveness, patient satisfaction, and complications. Future studies should explore these additional outcome measures. The study included patients within a specific age range (30 to 70 years) and excluded those with certain comorbidities and conditions. The findings may not be applicable to younger or older age groups or patients with specific medical conditions. The study did not evaluate long-term outcomes, such as functional recovery, range of motion, or radiological parameters of fracture healing. Future research could investigate these aspects to provide a more comprehensive understanding of the benefits and limitations of hematoma block versus conscious sedation in distal radius fracture management.

CONCLUSION:

In group A, effectiveness was achieved in patients was 69.6% while in 30.3% patients it was ineffective. In group B effectiveness was achieved in patients was 35.44% while in 64.55% patients it was ineffective. This study show that hematoma block is more effective than conscious sedation in closed manual reduction of distal radius fracture in terms of pain reduction

Authors Contribution:
Naseem Munshi: Conception and design of study, Literature review, Final approval of manuscript
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Athar Muniruddin Siddiqui: Data cleaning, Methodology, editing and drafting, final review
Muhammad Naseem: Accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved
Khadija Abid: Analysis and interpretation of data, wrote the manuscript, final approval

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