Turkish Journal of Emergency Medicine 16 (2016) 60–64

Contents lists available at ScienceDirect

Turkish Journal of Emergency Medicine

journal homepage: http://www.elsevier.com/locate/TJEM

Original article

Intra-articular lidocaine versus intravenous sedative and analgesic for reduction of anterior shoulder dislocation

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ARTICLE INFO

Article history:
Received 10 November 2015
Received in revised form
3 February 2016
Accepted 10 April 2016
Available online 9 May 2016

Keywords:
Shoulder dislocation
Lidocaine
Intra-articular
Pain management
Emergency department

ABSTRACT

Objective: This prospective clinical trial was performed to compare the safety and efficiency of intra-articular lidocaine (IAL) versus intravenous sedative and analgesic (IVSA) in reduction of anterior shoulder dislocation.

Materials and methods: Patients with anterior shoulder dislocation were randomly divided into 2 groups to receive IAL and IVSA. One group patients received an intravenous dose of 0.05 mg/kg midazolam and 1 μg/kg fentanyl, while the other group received 20 mL intra-articular lidocaine (1%). Patient satisfaction (via a standard 5-choice questionnaire), pain score (based on visual analog scale ranging from 0 to 10 points), comfort reduction, recovery time, and side effects were recorded and compared between the two groups before, during and after the reduction procedure.

Results: Totally 104 patients with acute anterior shoulder dislocation and the mean age of 28.75 ± 7.24 years were included (86.5% male). There was no statistically significant difference between IAL and IVSA groups regarding age ($p = 0.45$) and gender ($p = 0.25$). A total of forty-seven (45.2%) patients, distributed in both groups, had a history of anterior shoulder dislocation. A significant difference was seen with regard to diminished pain intensity during reduction in IAL group ($p < 0.001$); Complications including nausea, apnea, hypoxia and headache were only observed in IVSA group, and there was no adverse effect in IAL group; increased patient satisfaction in IVSA group ($p = 0.007$); similar success rate at first attempt of reduction in both groups, and a shorter time to discharge in IAL group ($p < 0.001$).

Conclusion: It seems that the use of intra-articular lidocaine for reduction of anterior shoulder dislocation is effective, safe, and time saving in the emergency department and has few complications. It can be considered as the first line analgesia in managing anterior shoulder dislocation.

1. Introduction

Shoulder dislocation is the most common large joint dislocation which is classified to anterior, posterior, and inferior types.[1] Anterior shoulder dislocation accounts for approximately 95% of all shoulder dislocations, that are commonly presented to emergency department (ED).[2–4] According to the epidemiological data reported from different countries, the incidence of shoulder dislocation is 1–1.7 per 1,00,000 population a year.[4] Male sex, white race, and an age less than thirty years have been introduced as significant demographic risk factors for shoulder injury.[5] Selection of ideal and relatively pain-free reduction method could play a key role in management of shoulder dislocations. Intravenous sedation-analgesia (IVSA) is commonly applied for reduction in EDs and provide a trouble-free condition.[1,4,6–11] Studies showed that IVSA can trigger some side effects such as central nervous system and cardio-respiratory depression, which requires close

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Peer review under responsibility of The Emergency Medicine Association of Turkey

http://dx.doi.org/10.1016/j.tjem.2016.04.001

patient monitoring and medical management.[4,6] Moreover, other side effects including nausea, vomiting, and post reduction lethargy may also occur.[4,6] The use of pain relief method for appropriate management of shoulder dislocation was first described by Lippitt et al who used intra-articular lidocaine (IAL) to ease shoulder reduction and compared it to intravenous narcotic sedation.[12] Meanwhile, IAL is recommended to be used as a probable alternative to IVSA and not the first choice, especially for patients with contraindication to IVSA that is proposed previously.[2,4,6,13] On the other hand, prior reviews had controversies about significant differences between IAL and IVSA in this regard.[13] Despite opposing results in this context, favorable impacts of lidocaine should not be ignored, which include adequate muscle relaxation, less pain and cost, prompt patient discharge, adequacy for patients in whom intravenous access is not easily obtainable, and not needing oxygen saturation monitoring and electrocardiography during or after reduction.[1,4,10,14] Few prospective controlled trials have compared IAL and IVSA from the standpoint of effectiveness, safety, time taken, ED overcrowding, and especially pain intensity in acute anterior shoulder dislocation patients in Iran.[15] Therefore, this prospective clinical trial was performed to compare the safety and efficiency of intra-articular lidocaine (IAL) versus intravenous sedative and analgesic (IVSA) in reduction of anterior shoulder dislocation.

2. Methods

2.1. Study design

This clinical trial was performed at the emergency department of Haft-e-Tir and Imam Hossein Hospitals (Tehran, Iran) between autumn 2012 and winter 2013. All patients with 18–40 years old who had acute anterior shoulder dislocation were considered eligible. Exclusion criteria were as follow: American society of anesthesia (ASA) physical status of $\geq$3, anesthetics allergy, pregnancy, bone fractures on x-ray, signs of increased intracranial pressure, having cognitive disorders, using analgesics including sedatives, and consumption of narcotics, alcohol, psychotropic drugs or active psychotic drugs in the previous two weeks.[16]

2.2. Ethical issues

This study was permitted by the ethics committee of the Shahid Beheshti University of Medical Sciences. Eligible patients were enrolled after signing the informed consent. The Declaration of Helsinki ethical principles were followed and respected throughout the study.

2.3. Population and setting

Patients were randomized into two groups of IVSA and IAL, using an online random number generator according to a statistical consultant for the project. Before sedation, all patients underwent hemodynamic monitoring and continuous pulse oximetry using 3 L of nasal oxygen. IVSA group received an intravenous dose of 0.05 mg/kg midazolam and 1 μg/kg fentanyl and after achievement of proper sedation, underwent reduction. The second group were injected with 20 mL of 1% lidocaine, during 30 s, using an 18–20 gage 0.7 × 40-mm needle, into the shoulder joint about 2 cm below the lateral border of the acromion, towards the glenoid cavity under sterile conditions according to Gleeson and Tamaoki studies.[1,7] In IAL group, reduction was performed 15 min after intra-articular injection. Leidelmeyer method[17] (advocated gentle, smooth traction to the arm while externally rotating it) was employed for reduction in both groups. The whole procedure and maneuvers were performed by an emergency medicine specialist. Neurovascular examination was done before and after reduction. Patient satisfaction (using a 5-choice questionnaire), pain measurement (using a visual analog scale ranging from 0 to 10 points), recovery time, and side effects during and after reduction were assessed and compared between the two groups. After reduction in IVSA group, patients were evaluated for level of consciousness and hemodynamic state. A structured assessment known as the Aldrete Score[18,19] was used to assess patient recovery and safety for discharge. Return to a pre-procedure baseline score or a score of at least 18 indicates that the patient is safe for discharge. In both group, patients were asked about the intensity of pain they felt during and after reduction. Duration of admission to discharge was also assessed in each group. If 2 attempts at reduction by emergency medicine specialists failed, reduction was considered unsuccessful leading to admission for reduction under general anesthesia. All patients in both groups underwent control x-ray to verify complete reduction. If the patients had no problem, they were discharged from the ED. All patients were followed 2 weeks after reduction and their outcome, shoulder range of motions, and complications such as axillary nerve injury and rupture of rotator cuff were evaluated and recorded.

2.4. Statistical analysis

All analyzes were performed using SPSS 20 statistical software (SPSS Inc, Chicago, IL, USA). Quantitative variables are shown as mean, median, frequency and standard deviation and qualitative variables as percentage. To compare the results between the two groups, T-test, Mann–Whitney, Pearson's chi-square and Fisher's exact tests were used. Finally, to eliminate the possible confounding effects, regression methods such as analysis of covariance and logistic regression were performed. P-value < 0.05 was considered significant.

3. Results

Totally 104 patients with acute anterior shoulder dislocation and the mean age of 28.75 ± 7.24 years were included (86.5% male). Twenty six (25%) patients had acute anterior shoulder dislocation caused by multiple traumas. The most common reason for anterior shoulder dislocation in IAL and IVSA groups were spontaneous (50%) and falling (42.3%), respectively. Forty seven (45.2%) patients had a history of anterior shoulder dislocation. The demographic features of patients are shown in Table 1.

No significant difference was seen in average pain intensity before ($p = 0.093$) and after ($p = 0.235$) the reduction in the 2 groups. However, mean pain intensity during reduction in IVSA group was significantly higher than IAL group ($p < 0.001$). Table 2 and Fig. 1 compare pain intensity before, during and after reduction in the 2 groups.

Patient satisfaction in IVSA group was significantly higher than IAL group (p-value = 0.007). Adverse drug reactions were not observed in either group. Other complications including nausea, apnea, hypoxia and headache were only observed in IVSA group, the difference was statistically significant with regard to apnea and hypoxia appearance (both $p = 0.013$). Success rate at first attempt of reduction (73.1% of patients) was similar distribution in both groups ($p = 0.038$). However, success rate at second attempt was higher (25%) in IAL group compared to IVSA (15.4%). Duration time from admission until discharge was significantly longer in IVSA group ($p < 0.001$). Outcome measures are included in Table 3.

Unsuccessful reduction led to admission of 7 (6.7%) cases in orthopedic ward for reduction under general anesthesia. On follow