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Comparison of intra-articular lidocaine and intravenous sedation for reduction of shoulder dislocations

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Abstract
Objective: The aim was to evaluate the effectiveness of intra-articular lidocaine compared to intra-venous sedation in the emergency department for reducing acute anterior shoulder dislocation. The study assessed various factors including the duration of Emergency department stay, time taken for reduction, evaluation of pain prior and post reduction, patient satisfaction and occurrence of complications.
Methods: This study was conducted as a prospective randomized trial. The intra articular lidocaine group patients were administered with 20 ml of 1% lidocaine through lateral approach, directly into the glenohumeral joint. On the other hand, patients in Intravenous sedation group received sedation medications 2mg of midazolam and 40 mic g of fentanyl intravenously. Patients were admitted and discharge 24 hours post reduction and a Follow up periods were scheduled 3 weeks, 6 weeks and 3 months to monitor for any complications and functional outcome was assessed with DASH score. This study included a total of 30 patients.
Results: 30 patients with anterior shoulder dislocation presented between January 2021 to January 2023. Patients were divided into groups were od number received intra-articular lidocaine and even numbers were administered with intra-venous sedation. Mean time taken for shoulder reduction was 8 minuets in IAS were as the mean time taken for IA sedation group was 12 minutes. Mean VAS prior to reduction was 6 and post reduction was 2.4 in IA lidocaine and for IV sedation was 6 prior and 2.8 post reduction. There were no significant variation in functional assessment in the follow up period of 3 months. There were no complications noted in IA lidocaine group, however 2 patients required monitoring post reduction in IV sedation group.
Conclusion: We hereby conclude that Intra-articular lidocaine for anterior shoulder dislocation has a good functional outcome with lesser time taken for reduction of dislocation and pain prior and post reduction as compared to traditional intravenous sedation with low incidence of post reduction monitoring of oxygen saturation, vitals and hospital stay.

Keywords: Shoulder dislocation, closed reduction, lidocaine, intravenous sedation

Introduction
Anterior shoulder dislocations account for 95% of all shoulder dislocations, making them the predominant type of joint dislocation observed in the emergency department (ED) [1, 2]. A glenohumeral joint dislocation, commonly referred to as a shoulder dislocation, transpires when the humerus becomes detached from the glenoid of the scapula at the glenohumeral joint [3]. The shoulder joint is classified as a ball and socket joint, inherently unstable because of the shallow glenoid that connects with a portion of the humeral head supported by superior, middle, and inferior glenohumeral ligaments. The yearly occurrence of glenohumeral dislocations is estimated at approximately 17 cases per 100,000 individuals, accounting for 0.017% of the population [4] and is most commonly dislocated joint in the body. Sports injuries are a common cause of dislocated shoulder, other mode of dislocations are seen in trauma. Closed reduction and intravenous sedation have been the conventional methods for managing acute anterior glenohumeral dislocations. However, there is growing support for the use of intra-articular lidocaine as an alternative to sedation, mainly because it eliminates the need for intravenous access and continuous patient monitoring. Types of dislocations seen in shoulder are Anterior, middle and inferior (Luxatio erecta).

Anterior dislocations are the most common type of shoulder dislocation. Various reduction methods, such as those outlined by Kocher, Stimpson, Milch have been utilised. In the emergency department, acute anterior shoulder dislocations are commonly managed with intravenous sedation sling with manual reduction following which the patient joint is immobilised with the help of a shoulder immobiliser brace. Recently, Intra-articular lidocaine has been suggested as a way to provide pain relief and muscle relaxation to the patients. In a toolkit named 'Managing Acute Pain' by the American College of Emergency Physicians, it is suggested that intra-articular lidocaine might be comparable to IV sedation in achieving successful reduction of acute anterior shoulder dislocations. This finding was reported in the Canadian Journal of Emergency Medicine (2022) 24:809–819 [5]. According to a systematic review and meta-analysis conducted by Jiang *et al*. in 2014, they found that intra-articular lidocaine showed comparable efficacy in reduction to IV sedation for acute anterior shoulder dislocations. Additionally, the use of intra-articular lidocaine was associated with an improved safety profile compared to IV sedation [6], despite the inclusion of a trial reporting a lower rate of successful reduction and decreased patient satisfaction with intraarticular lidocaine [7]. This method offers advantages as it eliminates the need for intravenous access or continuous patient monitoring following the reduction. The aim of this study was to evaluate the effectiveness of intra-articular lidocaine in comparison to intravenous sedation when using a standardised Kocher's reduction technique that is not reliant on physician and therefore reduces treatment bias.

Materials and methods

Study design

This is a prospective study, comprising of 30 patients dated from Jan 2021-Jan2023. After receiving approval from our institution review board, we implemented a prospective, randomised trial aimed at determining whether local intra-articular lidocaine is as effective as intravenous sedation for facilitating the reduction of shoulder dislocations in the glenohumeral joint. To minimise bias among treating physicians modified kocher's method was done in reducing shoulder dislocation. Prior to practise this study, All patients were explained about the procedure and was provided with written and informed consent for closed reduction and follow up. The inclusion criteria encompassed with individuals aged from 18 to 70 years of age with anterior shoulder dislocations willing for closed reduction were included. Exclusion criteria involved Fracture associated with dislocation, Patient who are not willing to undergo procedure, Allergic reaction to the medications used in the study.

On arrival at the emergency department, all the patients with glenohumeral joint dislocation were physically examined for level of tenderness, axillary nerve damage (Regimental badge sign), peripheral pulses status and capillary refill time, empty glenoid sign. Patient was taken up for Xray of the shoulder joint in AP view. Once the dislocation has been clinically and radiographically confirmed, patient is taken up for reduction of shoulder dislocation who met the study criteria and agreed to participate based on their medical records for closed reduction. Those with odd number received Intra articular local anaesthetic (lidocaine), those with even number received intra venous sedation. The intra-articular injection involved preparing the affected shoulder by painting with povidone-iodine, 20 ml of 1% lidocaine into the glenohumeral joint using 18-gauge needle. In case of intra-venous sedation, nurse establishes an intravenous line and administers 2mg of midazolam and 40 mic g of fentanyl intravenously, patient vitals and saturation is monitored. All patients are asked to rate the pain level on basis of VAS score prior to reduction. Following reduction of dislocation typically led to increase comfort for the patient and noticeable relocation sensation, post reduction patient is asked to rate on pain based on VAS score. Patient shoulder joint is placed in shoulder immobilser brace. Orthopaedic resident documents the time taken for the drug administration, time of shoulder relocation, the time patient left the emergency room. IV antibiotic 2 doses are administered during admission, oral antibiotics was prescribed for 3 days post discharge. Additional data collected by the resident includes patient name, age, sex, mode of injury, previous medical history, history of number of dislocations, success of reduction by kocher's manoeuvre, post reduction monitoring. Patients are admitted in ward for 24 hours for observation. Pain is calculated using VAS score 3 hours post reduction. Patient is discharged 24 hours post observation. Patient review is at the time period of 3 weeks, 6 weeks and 3 months. At the time of review patient functional assessment was done using DASH score. Follow up datas and the scoring were documented in patient case records. Data collected are used in version IBM SPSS version 22.0. Continuous Variables are expressed as mean +/- standard deviation and categorical variables expressed in percentage and numbers. P value of less than 0.05 was considered to be statistically significant.

Results

30 patients with anterior shoulder dislocation, presented between January 2021 to January 2023. Patients were reviewed with a follow up period of 3 months. Patients were divided into group where odd numbers are administered with intra articular local anaesthesia, even numbers were treated with intravenous sedation.

Mean age of patients was 32 years, ranging from 19 to 51 years. There were 9 males and 5 females in this group with right side being more commonly involved in 12 patients (figure1). RTA is the most common cause seen in 9 patients followed by sports injury were seen in 6 patients. Kocher's manoeuvre performed with the help of intra articular lidocaine administration. The mean time taken for shoulder reduction was 8 minutes ranging from 6 minutes to 11 minutes. The mean VAS score before reduction was 6 ranging from 5 to 8 (Figure 3). Mean of VAS score post reduction was 2.4 ranging from 2 to 4 (figure 2). Durations of Follow up period was 3 weeks, 6 weeks and 3 months. The mean Disability Arm, shoulder and hand (DASH) score at 3 months was 7.4 ranging from 4 to 19 (figure 4). The patients were provided with shoulder immobiliser post reduction and was advised to maintain the brace for 3 weeks. None of the patients were lost during the period of follow up. (TABLE 1)

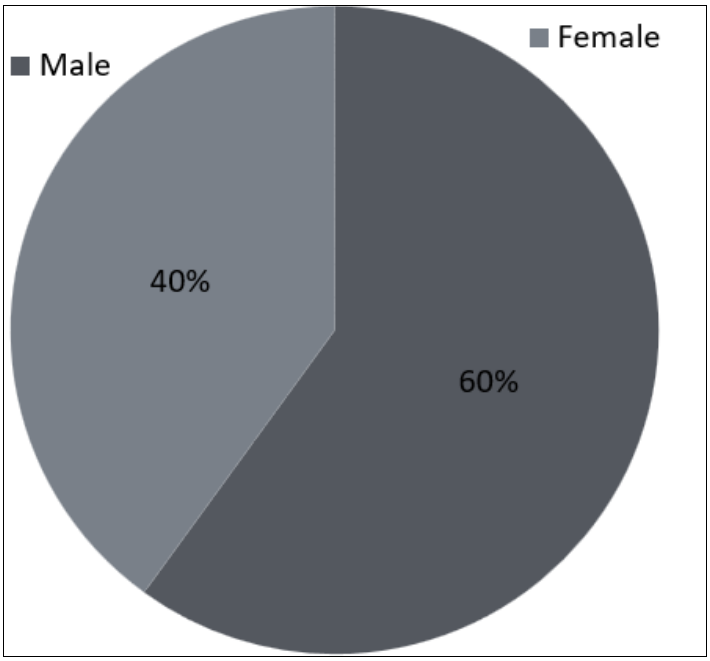

Fig 1: Sex distribution

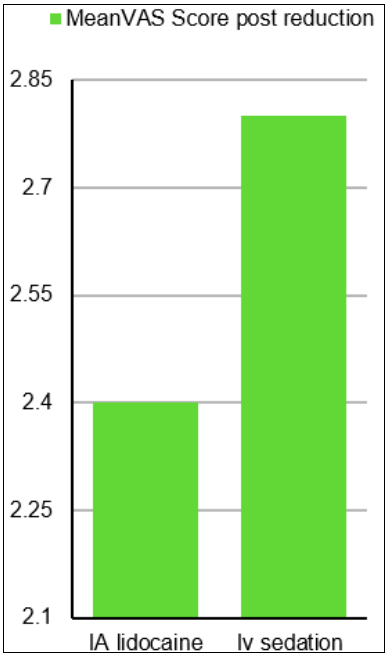

Fig 2: VAS score

Group 1: Patients treated with intra articular local anesthesia (LIDOCAINE)

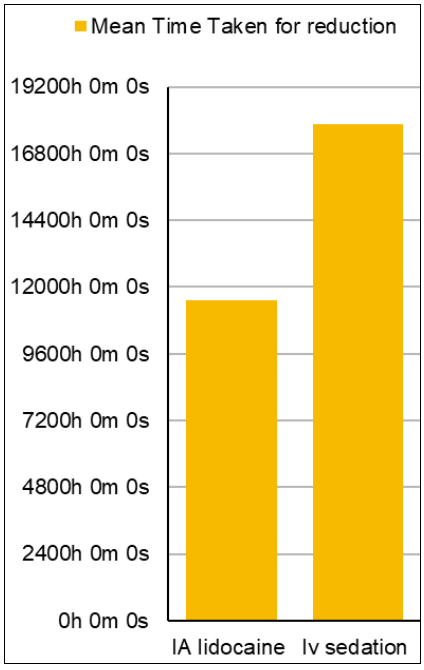

Fig 3: Mean time taken for reduction

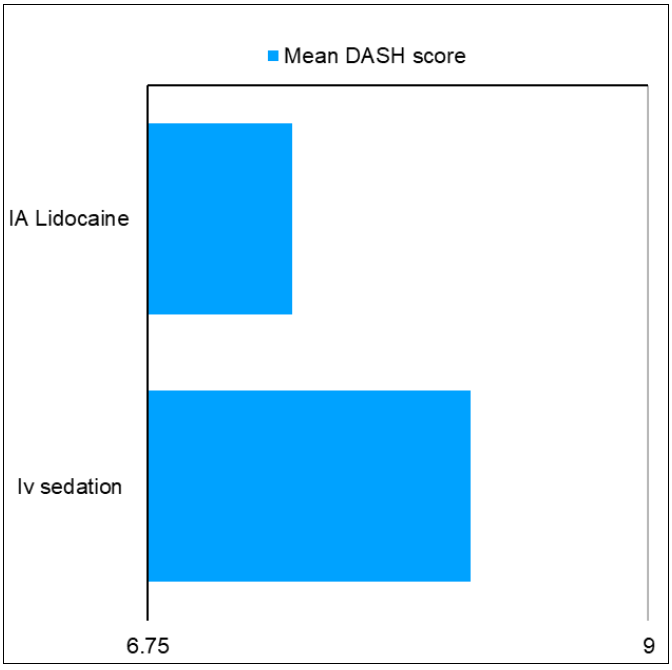

Fig 4: DASH score for functional outcome

Group 2: Patients managed by intravenous sedation

The patients in this group had a mean age of 38, ranging from 19 to 63. The leading cause of injury was road traffic accident (RTA) seen in 11 patients followed by slip and fall in 4 patients. All cases under went Kocher's manoeuvre following iv sedation 2mg of midazolam and 40 mic g of fentanyl. The average time taken for shoulder reduction was 12 ranging from 9 minutes to 15 minutes (figure2). The mean time taken for shoulder reduction was 12.4 minutes ranging from 9 minutes to 15 minutes (figure 3). The mean VAS score before reduction was 6 ranging from 5 to 8. Mean of VAS score post reduction was 2.8 ranging from 2 to 4 (figure2). The mean disability of arm, shoulder and hand score at 3 months was 8.2 ranging from 3 to 13 (figure 4). There were no changes in the score list 6 months, No complications occurred within the group and no patients lost to follow up. (TABLE 1)

Discussion

Shoulder dislocation occurs when humerus separates from glenoid of the scapula at the glenohumeral joint. The Shoulder joint is a ball and socket joint,naturally an unstable joint. This particular type of dislocation accounts for more than 50% of all significant joint dislocations and is most commonly dislocated joint in the body. Type of dislocations seen in shoulder are anterior, middle and inferior. Anterior type of shoulder dislocations is most common type of shoulder dislocation. Patients who present to Emergency department with shoulder dislocation are managed by reducing the dislocation by reductions methods. In our study, we aim to evaluate the effectiveness between intra-articular lidocaine in comparison to intra-venous sedation when using a standard Kocher's reduction technique. We compare the

effectiveness of pain evaluation before and after shoulder dislocation reduction, time taken for the reduction, post reduction complications

In 1995, Matthews and Roberts [8] conducted a prospective randomised study involving thirty patients who had anterior shoulder dislocation. They were divided into two groups: one group received intravenous sedation. Each group further underwent either traction counter traction or scapular rotation to reduce the dislocation. In case these initial methods failed, physicians had the discretion to use alternate approaches the deemed suitable. The physicians subjective assessed the difficulty of performing the manoeuvre. Although Matthews and Roberts noted that intra-articular lidocaine effectively induced muscle relaxation for all the fifteen patients who received it, the use of different manual reduction techniques by different physicians made it challenging to compare the two pain control methods.

In 1995, Suder *et al*. [9, 10] conducted a prospective randomised study involving fifty-two patients who experienced recurrent shoulder dislocations. The objective was to compare the effectiveness of intra-articular steroid lidocaine and intravenous narcotics in facilitating reduction. The treating physician had the discretion to choose the method of manipulative reduction. The results had no significant differences in the success of reduction between the two analgesics approaches. However, three patients who received intravenous sedation encountered respiratory side effects that necessitated medical intervention. Among these three patients, two had to remain hospitalised for one day, But the patients who received intra-articular lidocaine had no such complications.

In a different study conducted by Kosnik at al. [11] forty-nine patients were randomly assigned to receive either intravenous sedation or intra-articular lidocaine. The Rockwood and Wirth traction/counter traction method were employed to reduce the dislocation in all patients. There was no significant distinction between two groups in terms of pain reported by the physicians. Among the twenty-nine patients who received lidocaine, twenty-four had a successful reduction, while all twenty patients who received intravenous sedation also had a successful reduction, while all twenty patients who received intravenous sedation also had a successful reduction. However, this difference was not statistically significant. Furthermore, half of the patients who had previously undergone intravenous sedation did not prefer the intra-articular lidocaine injection as a method of pain control. In our study, we observed that there was no significant distinction in the success rate of Kocher's manoeuvre or the duration needed to reduce the shoulder between two groups. Similar to the findings of Matthews and Roberts, we discovered the patients who received intra-articular lidocaine were able to leave the emergency room significantly earlier. This finding is significant because it indicates that there was no need for additional staff to monitor the patient foray extended period, potentially up to three after the reduction. Pain based on VAS score compared prior and post reduction of shoulder dislocation was significantly less in intra-articular lidocaine than intravenous sedation. Additionally, the level of pain reported by the patients did not show any notable difference between the two groups. Compared to intravenous sedation, intra-articular lidocaine injection offers several advantages. One notable benefit is that there is no need for continuous patient monitoring such as Oxygen saturation monitoring or performing electrocardiography, during or after reduction. Additionally, complications like respiratory depression and cardiac issue issues have not been reported with intra-articular lidocaine. Moreover, it is a more cost-effective option. The only potential serious concern associated with intra-articular lidocaine injection is the possibility of developing a shoulder infection, although no cases have been reported so far as a complication of this technique. Based on our experience, utilizing intra-articular lidocaine in combination of Kocher's manoeuvre for reducing acute shoulder dislocation requires fewer resources in terms of manpower, expenses and time compare to intravenous sedation.

Table 1: Functional scores

Group	Age of patients (mean)	Vas score prior to reduction Mean	VAS score post reduction	Time taken for reduction Mean	DASH score (mean)
IA lidocaine	32	6	2.4	8	7.4
IV sedation	38	6	2.8	12.4	8.2

Table 2: Patient demographics and data

S.no	Age	Sex	Side	Intra-articular lidocaine	Iv sedation	Time taken (mins)	Average time inter mins	Pain prior to reduction vas score	Pain post reduction vas score	Dash Score
1	36	M	Right	+		8	60	6	2	4
2	47	M	Right		+	10	185	7	4	7
3	34	M	Right	+		7	72	6	2	4
4	29	F	Right		+	14	130	6	3	4
5	24	F	Right	+		11	75	7	4	5
6	48	F	Left		+	13	160	6	3	9
7	32	M	Right	+		8	68	5	2	4
8	33	M	Right		+	14	175	5	2	8
9	29	M	Right	+		7	78	5	2	7
10	32	F	Left		+	10	190	7	4	6
11	44	F	Right	+		9	75	6	2	8
12	35	F	Right		+	9	195	7	4	9
13	51	M	Left	+		8	80	8	3	12
14	49	M	Left		+	11	160	7	2	11
15	31	M	Right	+		9	75	8	4	7
16	27	M	Right		+	14	175	8	2	6
17	26	M	Left	+		6	60	7	2	7
18	36	M	Left		+	11	185	6	2	9

19	34	F	Right	+		9	70	7	2	11
20	19	F	Right		+	14	190	6	2	3
21	34	M	Left	+		11	75	6	2	19
22	20	M	Right		+	15	170	6	2	3
23	38	F	Right	+		8	80	6	2	6
24	45	M	Right		+	13	180	7	3	12
25	19	F	Right	+		9	55	6	2	4
26	49	F	Left		+	12	170	7	2	13
27	21	F	Right	+		7	60	6	2	4
28	38	M	Right		+	13	180	7	4	12
29	29	M	Right	+		8	70	7	2	9
30	63	M	Right		+	14	130	8	3	11

Conclusion

We hereby conclude that Intra-articular lidocaine for anterior shoulder dislocation has a good functional outcome with lesser time taken for reduction of dislocation and pain prior and post reduction as compared to traditional intravenous sedation with low incidence of post reduction monitoring of oxygen saturation, vitals and hospital stay.

Declarations

Funding: None

Conflict of interest: None declared

Ethical approval: Not required

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