

Use of intra-articular lidocaine as analgesia in anterior shoulder dislocation: a review and meta-analysis of the literature

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Introduction: The shoulder joint is the most commonly injured major joint in patients who present to the hospital emergency department today. In the community the incidence of shoulder joint injuries is 11.2 cases per 100 000 person-years. Traditionally, procedural sedation and analgesia (PSA) has been used to facilitate the reduction of anterior shoulder dislocations. However, there are risks of complication, such as respiratory depression, particularly in certain populations. As such, the use of intra-articular lidocaine (IAL) has been suggested as an alternative method of analgesia.
Methods: We searched EMBASE (Ovid) and MEDLINE (PubMed) databases using the keywords "shoulder, dislocation, and/or reduction" from the respective start dates of the databases until October 2008.
Results: Based on the current literature, it appears that the IAL method provides, at a minimum, the same level of pain control and reduction success as the procedural sedation method, while markedly reducing the time spent by the patient in the emergency department and the cost of treatment. The likelihood of complications is arguably less with the use of IAL.
Conclusion: Although more research is this area is merited, physicians may consider IAL as an alternative to PSA in the management of anterior shoulder dislocations.

Introduction : Parmi les blessures affectant des articulations majeures, ce sont celles de l'épaule qui amènent le plus de patients à se présenter à l'urgence d'un hôpital de nos jours. Dans la communauté, l'incidence des blessures à l'épaule est de 11,2 cas par 100 000 années-personne. On a généralement recours à la sédation-analgésie perthérapeutique pour faciliter la réduction des luxations antérieures de l'épaule. On note toutefois certains risques de complications, comme la dépression respiratoire, particulièrement dans certaines populations, d'où la suggestion d'utiliser de la lidocaïne intra-articulaire comme méthode analgésique de rechange.
Méthodes : Nous avons interrogé les bases de données EMBASE (Ovid) et MEDLINE (PubMed) à partir des mots clés «shoulder, dislocation et/ou reduction» (épaule, luxation et/ou réduction) pour la période allant de la date respective de mise en service des deux bases de données jusqu'à octobre 2008.
Résultats : Selon la littérature actuelle, il semble que la lidocaïne intra-articulaire procure au moins le même degré de contrôle et de soulagement de la douleur que la sédation-analgésie perthérapeutique, tout en réduisant nettement la durée des séjours à l'urgence et le coût du traitement. Il y a lieu de croire que la probabilité de complications serait moindre avec la lidocaïne intra-articulaire.
Conclusion : Il faudra approfondir la recherche dans ce domaine, mais les médecins peuvent d'ores et déjà envisager la lidocaïne intra-articulaire comme solution de rechange à la sédation-analgésie perthérapeutique pour la réduction des luxations antérieures de l'épaule.

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INTRODUCTION

Shoulder reduction techniques date back to the ancient Greeks and Egyptians, with many of these techniques still being used in emergency departments today. The guiding principle of shoulder reduction is to free the humeral head from the anteroinferior glenoid and allow it to be relocated in a controlled fashion.[1–3] Traditionally, this has been performed by overpowering the muscles of the shoulder girdle, which are in spasm and preventing the easy reduction of the shoulder.

In emergency departments today, shoulder dislocations are the most common major joint injury.[4,5] A Danish community-based study by Krøner and colleagues[6] reported that the incidence was 11.2 cases per 100 000 person-years. Procedural sedation and analgesia (PSA), often a combination of opiates and benzodiazepines, is frequently used as a means to alleviate pain and facilitate reduction of the shoulder. Although this form of sedation has proven to be effective in facilitating techniques of shoulder reduction, there are risks and side effects, including central nervous system and cardiorespiratory depression. In some instances where these adverse effects are present, administration of a reversal agent may be required. Other side effects such as nausea, vomiting and postreduction lethargy may also be present. Aside from adverse reactions, the use of PSA also requires supervision by nursing and/or medical personnel and lengthened patient stays in the medical facility, particularly if there are complications arising from sedation.

The use of intra-articular lidocaine (IAL) is a possible alternative to analgesia during shoulder reductions.[7–9] This method was mentioned in the *Manual of Rural Practice*[10] and most recently published in the *Canadian Journal of Rural Medicine*.[11]

Box 1. Intra-articular lidocaine technique

1. Place the patient in a comfortable position (e.g., semirecumbent).
2. Palpate surface landmarks: posterior acromion, coracoid, humeral head and lateral sulcus (formed by the absent humeral head).
3. The full sterile technique is as follows: use a 20- or 22-gauge 3.5-cm needle; direct into the skin about 2-cm inferior and directly lateral to the acromion and in the lateral sulcus (Fig. 1).
4. Direct the needle caudally toward the glenoid cavity.
5. Upon aspiration of serosanguinous synovial fluid, inject 20 mL of 1% lidocaine without epinephrine into the joint for a period of 30 seconds.
6. Patients should note good analgesia 15 minutes postinjection.

A step-by-step description of the application of IAL is given in Box 1 (Fig. 1). Intra-articular lidocaine has long been used in the glenohumeral joint for management of pain, such as during arthroscopic examination, and also for pain relief in patients with chronic degenerative joint disease. The technique of shoulder injection is relatively straightforward and may be an attractive alternative to PSA.

METHODS

We searched EMBASE (Ovid) and MEDLINE (PubMed) databases using the keywords "shoulder, dislocation, and/or reduction" from the respective start dates of the databases until October 2008.

RESULTS AND DISCUSSION

Our search retrieved about 100 articles. Of those, 20 were related to the topic at hand. A review of the reference list from each article did not produce further appropriate papers.

Pain management

Shoulder dislocations, both traumatic and atraumatic, are excruciatingly painful. By the time the patient arrives in the emergency department, the musculature surrounding the shoulder is often in spasm and stiff. The aim of emergency management in this situation is 2-fold: 1) to decrease the patient's discomfort and anxiety, and 2) to induce muscular relaxation to facilitate reduction.

When compared with the traditional PSA method, IAL has been shown to offer similar pain relief and muscular relaxation. In all 6 randomized controlled trials (RCTs) that are summarized in



Fig. 1. Shoulder landmarking in intra-articular lidocaine injection.

Table 1, overall pain scores were the same with the use of both PSA and IAL.

Ease of reduction and success rate

There have been no systematic outcome measurements taken to examine ease of reduction. Anecdotes from emergency physicians who participated in the RCTs detailed in Table 1, suggested that PSA allowed for increased patient relaxation and, ultimately, easier reduction.[12–15] The ease of reduction as perceived by the emergency physician is important on a practical level. This may be related to prior training and/or comfort in the use of intra-articular injections, which would alter their perception of ease of reduction. The common techniques for shoulder reduction used by physicians in the cited studies are detailed in Table 2.

Table 1. Studies comparing intra-articular lidocaine and procedural sedation and analgesia in the reduction of shoulder dislocations

Study	Patients (IAL/PSA)	Reduction technique	Outcome measures	Results	Adverse events
Orlinsky et al.[12]	29/25	External rotation and traction–countertraction	Recovery time	Clinical significance only	None significant
			Prereduction pain score	IAL superior	
			Overall pain reduction	No significant difference	
Kosnik et al.[15]	29/20	Traction–countertraction	Time delay	No significant difference	None significant
			Success rate	No significant difference	
			Pain score	No significant difference	
			Difficulty of reduction	No significant difference	
Suder et al.[14]	26/26	Kocher, hippocratic and others[6]	Success rate	No significant difference	Respiratory depression in the PSA group (n = 10)
			Pain score	No significant difference	
			Difficulty of reduction	No significant difference	
Matthews and Roberts[17]	15/15	Traction–countertraction, Bosley, Milch and Kocher	Success rate	No significant difference	None significant
			Pain score	No significant difference	
			Difficulty of reduction	No significant difference	
			Complications	No significant difference	
			ED time	IAL superior	
			Costs	IAL superior	
Miller et al.[18]	16/14	Stimson, with and without scapular manipulation	Success rate	No significant difference	None significant
			Pain score	No significant difference	
			Time of reduction	No significant difference	
			Complications	No significant difference	
			ED time	IAL superior	
			Costs	IAL superior	
Moharari et al.[16]	24/24	Traction–countertraction	Pain score	No significant difference	PSA group with more complications*
			Success rate	No significant difference	

ED = emergency department; IAL = intra-articular lidocaine; PSA = procedural sedation and analgesia.
*Complications included drowsiness, respiratory depression, hypotension, headache, nausea and localized paresthesia.

Table 2. Common intra-articular lidocaine techniques for shoulder reduction used by physicians in the included studies

Technique	Description
Stimson method[20,21]	After adequate sedation or analgesia, the patient is placed prone on the stretcher with the affected arm hanging down, and traction weight (most often 10 lbs, or 4.5 kg) is applied to the affected extended arm.
Traction–countertraction method[22]	The patient lies on a stretcher, and the wheels of the stretcher are locked. An assistant pulls on a folded sheet wrapped around the patient's chest. A second practitioner pulls the affected limb down and laterally 45°. After the humerus is dislodged, slight lateral traction on the upper humerus may be needed.
Kocher method[23,24]	The patient's elbow is flexed at a 90° angle. Traction is applied in the same plane as the humerus. The arm is externally rotated and the elbow is pulled across the body. The arm is then internally rotated, allowing the humeral head to fall back into the glenoid.
External rotation	This is a modification of the Kocher manoeuvre that involves flexing the elbow to 90° and slowly adducting the arm to the patient's side. The arm is then carefully externally rotated, stopping every few degrees to wait for the muscle spasms to subside until eventual reduction is achieved.
Milch method[25]	For a right-sided dislocation, the physician places his or her right hand on the patient's right shoulder; the thumb is braced against the dislocated humeral head. The right hand fixes the head as the left hand gently abducts the patient's arm into the overhead position. Once the patient's arm has been brought into complete abduction in this overhead position, the humeral head can be gently pushed over rim of glenoid, and the dislocation reduced.

The objective success rate of a reduction using IAL is arguably one of the most important measures for considering it as a legitimate technique to facilitate reductions. In reviewing the literature, all 6 RCTs summarized in Table 1 reported that the success rate with the use of IAL is not significantly different when compared with traditional procedural sedation. In the study by Kosnik and colleagues,[15] 5 of 29 patients in the IAL group did not have a successful reduction with the use of this technique. This study showed the greatest proportion of procedural failures with theuse of IAL of all the RCTs. However, this was still not a statistically significant result ($p = 0.07$).

Side effect and adverse events profile

Based on the available data, there does not appear to be an increased risk of adverse effects with the use of the IAL technique. In fact, Moharari and colleagues[16] observed greater complications with the use of PSA. The use of IAL does not carry the same risk of central nervous system and cardiorespiratory depression as that of procedural sedation. This is particularly noteworthy in the context of caring for patients who are at an increased risk of adverse reactions, such as the elderly and patients with multiple traumas. The major theoretical adverse event associated with IAL is septic arthritis. There were no reported cases of infection in the studies thus far, which suggests that perhaps joint sepsis is an uncommon occurrence.

The risk of systemic effects of lidocaine are likely minimal, since IAL is injected into the joint space. However, in the case of a traumatic shoulder dislocation, lidocaine may be able to leave the joint space from a tear in the capsule and potentially leak into the systemic circulatory system. Even if the entire dose leaked into the patient's circulation, the adult dose of 20 mL of 1% lidocaine intra-articularly represents 200 mg, which is well below the recommended 3–5 mg/kg dose (up to 7 mg/kg may be given) described in the cardiac literature. Although this complication is not entirely benign, there appears to be a minimal risk of lidocaine toxicity.

Cost profile

Given the budget constraints in the health care system, it has been a priority to maximize use of resources. Although the cost of using IAL versus conscious sedation will undoubtedly be different depending on the hospital and jurisdiction, we can nevertheless comment on trends. In 2 studies, Matthews and Roberts[17] and Miller and colleagues[18] reported that IAL is significantly less expensive than PSA.

There are many reasons for the reduced cost of IAL. First, less equipment is required. Procedural sedation requires the administration of an intravenous line. A second clinician such as a physician, nurse or respiratory therapist is recommended to be present to help monitor and assist with airway management if necessary.[19] This increases cost. In the study by Miller and coauthors,[18] the cost of administration of IAL was $0.52 compared with $97.64 for PSA. Although other facilities will surely have other cost estimates, this study nevertheless shows an unequivocal cost benefit of IAL.

Discharge time

In the RCTs summarized in Table 1, 3 of the studies reported that the patient's time spent in the emergency department was reduced with IAL. In the study by Miller and colleauges,[18] patients left the hospital 75 (standard deviation 48) minutes post-reduction with the use of IAL compared with 185 (standard deviation 26) minutes with the use of PSA. The study by Matthews and Roberts[17] showed a similar result.

Time spent in the emergency department for sedated patients may have been longer in the above studies for various reasons. The aspiration of gastric contents is a rare but dangerous risk of sedation. The national guidelines detailed by Innes and coworkers[19] recommend that patients, before receiving PSA, should not have had solid or liquid foods during the previous 6 and 2 hours, respectively. Therefore, patients who have just had a meal could be waiting at least 5–6 hours before the reduction with PSA is attempted.

CONCLUSION

The current literature thus far strongly suggests that IAL is a safe and viable alternative to the traditional PSA technique for the reduction of the dislocated shoulder. A review of the literature has shown that in terms of success rate, pain relief and complications, lidocaine analgesia compares favourably to procedural sedation in the reduction of shoulder anterior dislocation, and has advantages in personnel requirements, cost and time spent by the patient in the emergency department. Although further research is still merited to answer other clinical

questions of interest, physicians can consider using IAL in their clinical practice for the treatment of anterior shoulder dislocation.

Competing interests: None declared.

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