



Case Report

Ultrasound-guided infraclavicular brachial plexus block for emergency management of a posterior elbow dislocation ^{☆,☆☆}



We present the first description of an ultrasound-guided infraclavicular brachial plexus block (ICB) performed by emergency physicians for reduction of an elbow dislocation. Although there is increasing interest in regional anesthesia for emergency procedural anesthesia as a potential alternative to sedation, many emergency providers are justifiably concerned for the potential complications and technical difficulty. Herein, we describe in detail how to perform an ultrasound-guided ICB, which may be a superior alternative to interscalene or supraclavicular approaches to brachial plexus anesthesia for the arm below the midhumeral level. By moving the target injection area below the clavicle and out of the neck, there is reduced systemic uptake of local anesthetic and reduced risk of local anesthetic migration leading to unwanted complications such as systemic toxicity, phrenic nerve paralysis, and Horner syndrome. Rare but catastrophic complications such as cervical spinal cord syrinx are avoided altogether. In addition, the ICB involves targeting the brachial plexus in a less anatomically constrained space and requires both less needle to nerve proximity and fewer needle redirections (both procedural characteristics associated with reduced risk of nerve injury). Elbow dislocations of the radius and ulna are best treated with timely, emergency reduction—the longer an elbow is allowed to remain dislocated, the more difficult the reduction becomes, and risk of avascular necrosis increases. In our experience, the ultrasound-guided ICB is a potentially ideal technique that provides safe, fast, effective analgesia and anesthesia for major upper extremity trauma below the midhumeral level worthy of further study in the emergency department setting.

Fractures and dislocations of the upper extremity are common emergency department (ED) complaints. Among those requiring the prompt and timely reduction are radial and ulnar head dislocations at the elbow. Indeed, time is function with the elbow, as delay in reduction greatly increases risk of a failed reduction as well as avascular necrosis [1,2]. Pain management for procedures and major trauma to the upper extremity below the level of the midhumerus such as an elbow dislocation can be achieved with a brachial plexus block. Although the interscalene and supraclavicular brachial plexus blocks (SCB) are well known in the emergency setting, the ultrasound-guided infraclavicular brachial plexus block (ICB) is a potentially safer, more effective technique that has not yet been described in the emergency medicine literature [3,4].

The ultrasound-guided ICB has several potential advantages vs the SCB. Several studies suggest a higher success rate for both novice and experienced providers with the ICB vs SCB [5–8]. In addition, the risk of complications such as paresthesias from needle to nerve contact, Horner syndrome, and phrenic nerve paralysis is significantly less likely with the ultrasound-guided ICB than with the alternative SCB [5–9]. Potentially devastating complications related to cervical spinal cord injection are eliminated altogether. The increased safety and success rates associated with the infraclavicular approach to brachial plexus analgesia, it is a potentially important addition to the emergency provider's regional anesthesia technical armamentarium. We describe the technique and present a case where an ultrasound-guided ICB was used as anesthesia for a successful reduction of a posterior elbow dislocation.

A 29-year-old male presented to the ED to a level complaining of left elbow pain with a shortened left forearm held in flexion with a closed, prominent olecranon posterior deformity (Fig. 1). Neurologic examination of the ulnar, median, and radial nerves revealed intact function. Plain films confirmed a posterior elbow dislocation without fracture (Fig. 2). After discussion of the risks and benefits, patient consent was obtained, and a single-injection ultrasound-guided pericoracoid ICB was performed [10]. The ultrasound-guided ICB was performed by a trainee provider (>20 blocks) supervised by an experienced provider with greater than 100 blocks experience. A linear transducer was placed 2 cm inferior and 2 cm medial to the coracoid process in the parasagittal plane; the brachial plexus was visualized at the level of cords, adjacent to the axillary artery (Fig. 3). A 30-mm 22-gauge blunt tipped block needle was advanced under ultrasound-guidance in the parasagittal plane from cephalad to caudad toward the posterior/dorsal aspect of the axillary artery; 25 mL of mepivacaine 1.5% was injected in small aliquots after negative aspiration just deep to the axillary artery, obtaining the “double bubble” sign as local anesthetic spread in the periplexus space [10] (Figs. 4 and 5). Twenty minutes later, the elbow was easily and painlessly reduced without complications (Fig. 2). The patient experienced no dyspnea or other clinical sign of pneumothorax or phrenic paralysis.

Management of painful fracture dislocations is common in the ED. In adults, the elbow is the most commonly dislocated joint after the shoulder and the most common dislocation in pediatrics [1,2]. Regional anesthesia presents a practical, efficient option for analgesia and anesthesia that is available urgently at bedside as alternative to deep sedation. Indeed, regional anesthesia is a particularly attractive option in the increasingly common opioid tolerant patient with increased risk for sedation-related complications [4]. Although the ultrasound-guided ICB is potentially the safest, easiest to learn, and most reliable brachial plexus block, it has previously not been described in emergency medicine.

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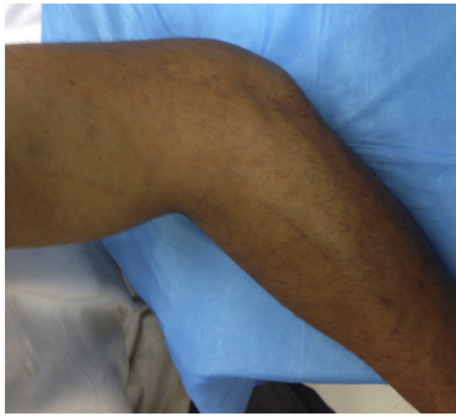


Fig. 1. Left elbow posterior dislocation before reduction.



Fig. 2. Plain films showing posterior dislocation of both the radial and ulnar head before reduction (top panel) and after successful reduction (bottom panel).

The ultrasound-guided ICB is an important alternative to interscalene and supraclavicular techniques for emergency providers who use brachial plexus anesthesia in their practice [3]. Benefits include reduced incidence of complications such as paresthesias (needle-to-nerve contact during the procedure), phrenic paralysis, and Horner syndrome; easy positioning and technical simplicity; and reduced systemic absorption of local anesthetic [3,5–11]. Rates of pneumothorax for the ultrasound-guided ICB are also very low. Some providers may be concerned with depth of the target space—approximately 3 to 4 cm—in most patients; however, this has not been shown to slow or complicate the procedure [5–9]. We chose 1.5% mepivacaine because it has a rapid onset (10–20 minutes) with 2 to 3 hours of dense surgical anesthesia followed by up to 8 hours of analgesia with excellent safety record comparable with that of lidocaine.

The ultrasound-guided ICB single-injection technique described aims to produce a shallow saucer-shaped spread of local anesthetic posterior/dorsal to the axillary artery, which is visualized as a “double bubble” sign on ultrasound (Fig. 5). This simple technique has been shown to have superior rates of success among novice and experienced providers with fewer complications [7,10]. In emergency medicine, simplified techniques are particularly important given the intermittent nature of procedural practice and multiple simultaneous responsibilities placed on emergency providers while working. The role of ultrasound-guided ICB as an alternative to SCB or sedation warrants further study.

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