SUPRACONDYLAR RADIAL NERVE BLOCK FOR TREATMENT OF DISTAL RADIUS FRACTURES IN THE EMERGENCY DEPARTMENT

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Abstract—Background: Patients with acute distal radius fractures are frequently treated in the emergency department (ED) with closed reduction and splinting. Many of the anesthesia methods frequently employed may either lack efficacy or require additional monitoring and resources. Case Report: An 18-year-old woman presented to the ED with a dorsally angulated distal radius fracture (Colles fracture). As an alternative to procedural sedation, an ultrasound-guided block of the radial nerve proximal to its bifurcation into the deep and superficial branches was performed. The resulting anesthesia was adequate to reduce and splint the fracture with minimal discomfort for the patient. Conclusion: Ultrasound-guided supracondylar block of the radial nerve proximal to the origin of the deep and superficial branches provides safe and efficacious anesthesia for distal radius fracture reduction in the ED. © 2011 Elsevier Inc.

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INTRODUCTION

Distal radius fracture is a common complaint in United States (US) emergency departments (EDs) and is often associated with significant pain and discomfort. These fractures are most commonly treated with closed reduction and splinting. The successful reduction of these injuries requires adequate muscle relaxation and anesthesia, presenting an ongoing challenge to their ED management. Current commonly used methods include hematoma block, Bier block, and procedural sedation, all of which have significant drawbacks, and none of which has proven to be superior in systematic reviews (1). A less commonly used method is brachial plexus block, usually performed with a supraclavicular approach (2). However, this approach may be “overkill,” resulting in total paralysis of the entire extremity, as opposed to a specific area of injury, and introducing additional risks of large vessel puncture or pneumothorax.

A recent cadaver study reported that most innervation to the dorsal distal radius originates from the posterior interosseus nerve (PIN) (3). This nerve itself is a terminal branch of the radial nerve, which splits proximal to the elbow into the deep and superficial branches providing safe and efficacious anesthesia for distal radius fracture reduction (4). In our experience, block of the radial nerve above the elbow, proximal to its bifurcation into deep and superficial branches, is effective and potentially may be a less painful, less resource-intensive, and more focused...
alternative to the use of hematoma block, Bier block, procedural sedation, or brachial plexus block.

**CASE REPORT**

An 18-year-old woman presented to the ED with pain, swelling, and an obvious “dinner fork deformity” of her right wrist after suffering a fall on an outstretched hand. Plain radiographs showed a minimally displaced, dorsally angulated fracture of the distal radius. The patient complained of a pain level of 9 out of 10 with minor manipulation of her fracture.

After informed consent was obtained, a supracondylar radial nerve block was performed. With the patient maintaining the position of least discomfort (mid-supination) on her side, the provider stood facing the lateral aspect of the affected arm. Placing the ultrasound system on the opposite side of the patient allowed for an unobstructed view of the screen in the same visual field as the needle during anesthetic injection. A high-frequency linear transducer (L-38 SonoSite M-Turbo; SonoSite Inc., Bothell, WA) was used to locate the radial nerve on the lateral aspect of the humerus, approximately 2 cm above the lateral epicondyle.

In this location, the oval-shaped hyperechoic nerve travels in the intermuscular septum between the surrounding more hypoechoic brachialis and brachioradialis muscle bellies, facilitating its rapid identification. The nerve was then followed proximally, visualizing the bifurcation of the nerve into deep and superficial branches. This was found to occur at a point approximately one-third of the distance along a straight line drawn from the lateral epicondyle to the acromion (Figure 1A).

The area was prepped in a sterile fashion with a chlorhexidine solution. A sterile Tegaderm™ (3M, St. Paul, MN) was placed over the ultrasound probe and sterile surgical lubricant spread on the intended injection site. The authors utilized the in-plane technique to instill a 5-mL mixture of 1:1 0.25% bupivacaine and 1% lidocaine with epinephrine around the singular radial nerve (proximal to its branching) under direct ultrasound guidance (Figure 1A). The patient reported no discomfort during the injection process. Fifteen minutes post injection, the patient reported no pain at rest and she was comfortably placed in hanging finger traps for fracture traction. Shortly thereafter, the dorsally angulated distal fragment was reduced with minimal discomfort. After confirmatory radiographs showed adequate reduction, the patient was placed in a sugar-tong splint and then discharged home, with orthopedic follow up in 2–3 days.

**DISCUSSION**

Other authors have demonstrated the utility of ED ultrasound guidance for regional anesthesia for analgesia, fracture reduction, and laceration repair (2,6,7). To our knowledge, this is the first description of a supracondylar ultrasound-guided nerve block used for treatment of a distal radius fracture in the ED.

In our experience, the supracondylar block has been superior to the hematoma block because it is a less painful procedure and achieves denser anesthesia with similar medication volume. Although a systematic review suggested that a Bier block may be better than hematoma block for distal radius fracture, this technique is not taught to most emergency physicians and carries the risk of infusing cardiotoxic anesthetic directly into the vascular system (1). Procedural sedation, although a commonly used ED approach, especially in pediatric patients, requires a larger time and resource commitment, and can be contraindicated.
in patients with high American Society of Anesthesiologists (ASA) scores (8). Brachial plexus blocks can be very effective as anesthesia for closed distal radius reduction, but they result in more paralysis than necessary and introduce the risks of pneumothorax and large vessel puncture that are minimized with a more distal block. Stone et al. showed that brachial plexus blocks resulted in shorter ED length of stay, required fewer resources, and resulted in higher patient satisfaction when compared to procedural sedation (9). We believe the same may hold true for supracondylar radial nerve blocks, providing similar success rates for this indication while offering a lower risk profile.

In this case, a single-nerve injection technique allowed for almost complete analgesia and facilitated reduction of a distal radius fracture. Although the ease of locating the proximal radial nerve (with its various landmarks) allows the emergency physician (EP) to perform a rapid single injection technique to reduce pain in distal radius fracture, complete analgesia may not occur in all patients. The complete innervation of the distal radius has yet to be determined. Cadaveric studies have demonstrated the major role of the PIN, a proximal branch of the radial nerve, to supply innervation to the periosteum of the distal radius, but other nerves may also provide clinically relevant sensory innervation, most notably the anterior interosseus nerve, a proximal branch of the median nerve (3). Like previous ED studies that have investigated pain control with a simplified single injection technique, we recognize that the varied sensory innervation of bony structures may force the EP to use supplemental nerve block injections (eg, median nerve) or parenteral analgesia (6). Although we have not witnessed this consistently in our practice, a single proximal injection at the brachial plexus would be more strongly advised for this indication despite its additional risks.

Currently, the novel technique described above provides an extremely valuable adjunct for the practicing EP to facilitate pain reduction and manipulation in patients with a common injury pattern encountered in the ED.

CONCLUSION

Supracondylar ultrasound-guided radial nerve blockade potentially can provide a less painful, less resource-intensive anesthesia for closed reduction of distal radius fractures in the ED. Further research is needed to both elucidate the functional anatomy of this area and to directly compare nerve blocks to other methods before this can become a standard ED treatment.

REFERENCES