



EM CASES SUMMARY

Episode 53 – Pediatric POCUS CH. 1 Nerve Blocks

With Dr. Jason Fischer

Prepared by Dr. Jason Fischer, November 2014

The Forearm Nerve Block:

Ultrasound-guided regional anesthesia (UGRA) offers the opportunity to greatly improve pain control in pediatric patients presenting to the ED. This technique not only provides all the recognized benefits of regional anesthesia, but has **many advantages over conventional landmark techniques** including increased success rates, decreased procedural duration and improved patient safety.

The forearm nerve block is one of many blocks used in the ED for emergent pain control and procedural anesthesia. This block targets the median, radial, and ulnar nerves, and is effective in delivering anesthesia to the hand. The technique is **highly effective in scenarios which have been traditionally challenging for pain control** in the pediatric patient (burns to the hand, complex lacerations, fracture reduction and abscess incision and drainage).

Forearm Nerve Block Technique:

- *Preparation:*

The patient is placed in a position of comfort that allows the target limb to be accessible and movement limited. Infants and toddlers often require immobilization of their fingers (tape, papoose) to reduce movement of the target nerve. The ultrasound screen and the injection site are aligned in the operator's direct line of vision to reduce unnecessary head movement during the procedure.

Adjunctive topical anesthesia can be used to anesthetize the injection site topically to reduce discomfort with needle entry. Adjunctive intranasal delivery of anxiolytics (midazolam) and analgesics (ketamine, fentanyl) can be used to reduce pain and anxiety as well.

The skin is cleaned and prepped in a semi-sterile fashion. A high-frequency linear transducer is ideal for identification of nerves.

- *Nerve Identification:*

It is best to have a systematic approach to nerve identification. Peripheral nerves have a "honeycomb" appearance, round or elliptical with hypoechoic fascicles in a hyperechoic homogenous background.

The **radial nerve** is identified in two steps:

1) The transducer is placed over the radial artery in a transverse plane at the wrist (see image).



2) The transducer is moved proximally to the mid-forearm until the radial nerve is observed on the radial side of the artery. For an instructional [video](http://vimeo.com/59253442) by POCUS expert Dr. Mike Stone on how to find the radial nerve visit: <http://vimeo.com/59253442>

The **ulnar nerve** is identified in the same fashion using the ulnar artery, and appears on the ulnar-side of the artery in the forearm (see image).



[Video](http://vimeo.com/59253492) of ulnar nerve block by Dr. Mike Stone here: <http://vimeo.com/59253492>

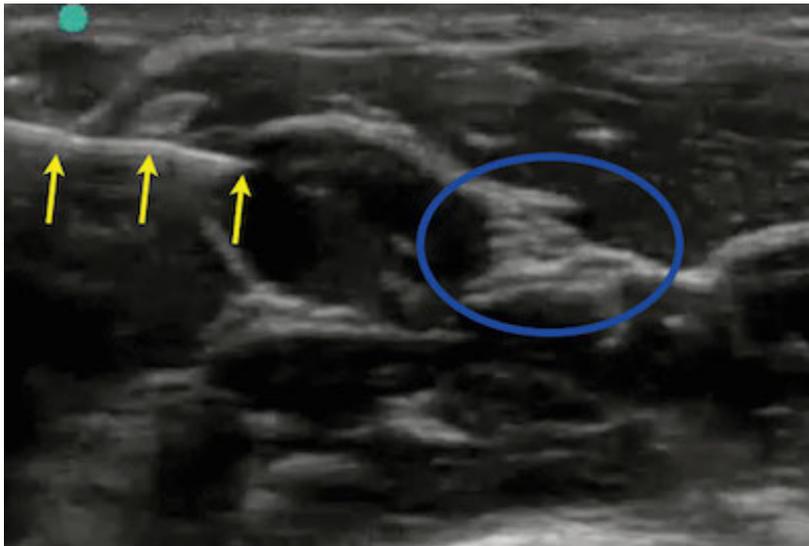
The **median nerve** does not have an associated artery and is located in the mid-forearm in the flexor digitorum muscle bundle.

[Video](http://vimeo.com/59253370) of median nerve block by Dr. Mike Stone here: <http://vimeo.com/59253370>

- *Anesthesia Delivery:*

The best path is chosen for the needle to avoid surrounding vascular structures.

The needle is inserted and advanced in-plane with the transducer. The needle tip is visualized in real-time as it is advanced toward the target nerve (see image) *Visualization of the needle tip should be continuous throughout the procedure to avoid accidental puncture of vascular structures.* Anesthesia agent is delivered adjacent to the target nerve and ideally surrounds the nerve circumferential. Redirection of the needle may be required to bathe the nerve adequately.



Yellow arrows show the needle advancing. Blue circle shows the nerve bundle.

Video of lecture on principals of nerve blocks by Dr. Michael Stone here: <http://vimeo.com/51230079>

ACEP guidelines on ultrasound-guided forearm block here: <https://www.acep.org/Content.aspx?id=82259>

References:

Frenkel, O., Mansour, K., & Fischer, J. W. (2012). Ultrasound-guided femoral nerve block for pain control in an infant with a femur fracture due to nonaccidental trauma. *Pediatric emergency care*, 28(2), 183-184. Full PDF available at : http://journals.lww.com/pec-online/Abstract/2012/02000/Ultrasound_Guided_Femoral_Nerve_Block_for_Pain.21.aspx

Liebmann, O., Price, D., Mills, C., Gardner, R., Wang, R., Wilson, S., et al. (2006). Feasibility of forearm ultrasonography-guided nerve blocks of the radial, ulnar, and median nerves for hand procedures in the emergency department. *Annals of emergency medicine*, 48(5), 558-562. Full PDF available at : <http://www.sciencedirect.com/science/article/pii/S0196064406006196>

Herring, A. A., Stone, M. B., Fischer, J., Frenkel, O., Chiles, K., Teismann, N., et al. (2011). Ultrasound-guided distal popliteal sciatic nerve block for ED anesthesia. *The American journal of emergency medicine*, 29(6), 697. e3-697. e5. Full PDF available at: [http://www.ajemjournal.com/article/S0735-6757\(10\)00263-9/abstract](http://www.ajemjournal.com/article/S0735-6757(10)00263-9/abstract)

Ganesh, A., & Gurnaney, H. G. (2009). Ultrasound guidance for pediatric peripheral nerve blockade. *Anesthesiology clinics*, 27(2), 197-212.

<http://bj.oxfordjournals.org/content/98/6/797.short>

Ivani, G., & Mossetti, V. (2009). Pediatric regional anesthesia. *Minerva anesthesiologica*, 75(10), 577-583. Full PDF available at:

<http://www.ncbi.nlm.nih.gov/pubmed/19798014>

Tsui, B. C., & Suresh, S. (2010). Ultrasound imaging for regional anesthesia in infants, children, and adolescents: a review of current literature and its application in the practice of extremity and trunk blocks. *Anesthesiology*, 112(2), 473-492. Full PDF available at:

<http://webmail.anestecoop.com/archivos/Junio/s0003302210600365.pdf>