Possible Nerve Damage Associated with PICC Insertion

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Disclosure
• President and program director of Infusion therapy institute.

• Vascular access consultant for 3M and RyMed technologies.

• Occasionally Provide expert opinion.

Objectives:
• Define Peripherally Inserted Central Catheter (PICC).

• Describe vascular Anatomy as it applies to PICC insertion.

• State signs and symptoms of nerve damage associated vascular access device insertion.
Define Peripherally Inserted Central catheter (PICC)

Central Catheter (Central venous access device CVAD): A device that permits access to the central venous system. Catheter tip resides in the lower 1/3rd of the superior venacava (SVC) or above the level of diaphragm in the inferior venacava.” Infusion Nursing standards of Practice, 2011

- CVAD tip
PICC: “A central venous access device inserted into an extremity and advanced until the tip is positioned in the vena cava” Infusion Nursing standards of Practice, 2011

Vascular Anatomy as it applies to PICC insertion.
Basilic Vein, Cephalic vein and Brachial veins.

- Antecubital fossa and the upper arm

Basilic vein: Large and straight. Right side closer to the SVC.

Cephalic vein: Travels upwards over the biceps of the shoulder, crosses the shoulder, takes a sharp turn and merges into the axillary vein distal to the clavicle.

- Higher incidents of malposition.
**Brachial veins:** Begin where radial veins and ulnar veins join, join the basilic vein to form the axillary vein.

- Deep and lie close to the brachial artery and brachial nerves.
- Care must be taken not to puncture the brachial artery as it crosses in front of the brachial vein.
- Nerve injury most likely occurs during brachial vein puncture.
Median Nerve: Roots C5-T1
Runs with the brachial artery on the median side of the upper arm.
Enters the hand through the carpal tunnel.
Supplies sensory innervation to lateral palm supply the radial 3 1/2 digits (palmar) can also supply the index, long, and ring fingers dorsally.

Ulnar Nerve: C8 – T1
Runs near the ulna bone.
This nerve is directly connected to the little finger, and the adjacent half of the ring finger,

Ultrasound images
• Veins should completely collapse with light to moderate probe pressure.

• Artery will appear to pulsate with each heart beat.

“Median nerve appears shiny round cluster, similar to a grouping of grapes in a circle. Small non-compressible structure with a thick rim that is more echogenic/ brighter than the blood vessels in the brachial bundle”.

* Courtesy to Ultrasound for regional Anesthesia
Signs and Symptoms of Nerve injury associated with Vascular Access Devices Insertion.

Vascular access devices inserted to the UE:
- Short Peripheral Catheter
- Midline Catheter
- PICC
- Phlebotomy needles

- PIV insertion site selection: Avoid the lateral surface of the wrist for approximately 4-5 inches because of the potential risk for nerve damage. For adult and pediatric patients: avoid the ventral surface of the wrist due to the pain on insertion and possible damage to the radial nerve. INS Standards of practice 2011.

Antecubital Fossa: Frequently used for VAD insertion and phlebotomy location
Compression of the nerve may cause nerve damage.

Hematoma

IV infiltration

INS standard 2011.

“With any patient reports of discomfort or pain related to short peripheral catheter, the catheter should be removed”

“The nurse should monitor clinical outcomes associated with infiltration, which may include compartment syndrome with the need for rapid surgical intervention, and nerve injury from excessive compression producing neuropathies and complex regional pain syndrome”

During insertion, if the nerve is Accidental nicking nerve during venipuncture attempts.

• Patient reports sudden “electric shock” like pain shooting down the arm.

• Involuntary and rapidly movement of the arm, when nerve is touched.

• Remove the needle immediately. The symptoms usually will resolve.

Weakness of extremity after initial shock of pain.

Tingling and numbness in the extremity or fingers.

Persistent symptoms.

“If an artery is inadvertently accessed, or if the patient complaints of paresthesias, tingling or numbness upon VAD insertion the catheter should be immediately removed and the LIP promptly notified, as rapid attention may prevent permanent injury; nerves and arteries are often located in very close proximity to the venipuncture site” 2011 INS Standards of practice.
Prevention:
VAD inserter possess knowledge of anatomic location of the nerve.
If brachial nerve to be accessed for PICC insertion, visualize and identify median nerve with ultrasound.
Prompt removal of needle or other materials.

Conclusion:
• “Nerve injury (less than 1% of cases), is rare, but can occur during insertion of VADs insertion. Not Just PICC.

• Identification of median nerve, in respect to the brachial veins is important prior to accessing brachial vein for PICC insertion.

• Clinicians require proper training in all aspects VAD insertion, prevention and management of complications.

• Nerve damage associated with PIV insertion, phlebotomy, infiltration, hematoma can be overlooked.

Thank you.
Reference:

- Infusion Nursing Standards of practice, 2011
- Applied Radiology, Volume 27: PICC insertion
- Inside Radiology: Venous access by Dr. Tuan Phan Dr. Stuart Lyon. Date last modified: 1/31/2011.
- Infusion Nursing an Evidence Based Approach: INS
- Study guide for vascular Access Certification: Association for vascular Access