



GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

Insertion and Management of Peripheral Arterial Catheters

AMY BARDIN

Disclosure

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No off-label use



History

- ▶ Arterial catheter insertion and pressure monitoring began in the early 1950s
- ▶ Invasive hemodynamic monitoring is beneficial for critically ill patients:
 - ▶ Continuous monitoring of blood pressure
 - ▶ Serial blood sampling (gases)
 - ▶ Facilitates frequent titration of drugs
- ▶ Advancing technology – use of ultrasound
- ▶ Guidelines for insertion, care and maintenance are now available

The other plastic catheter



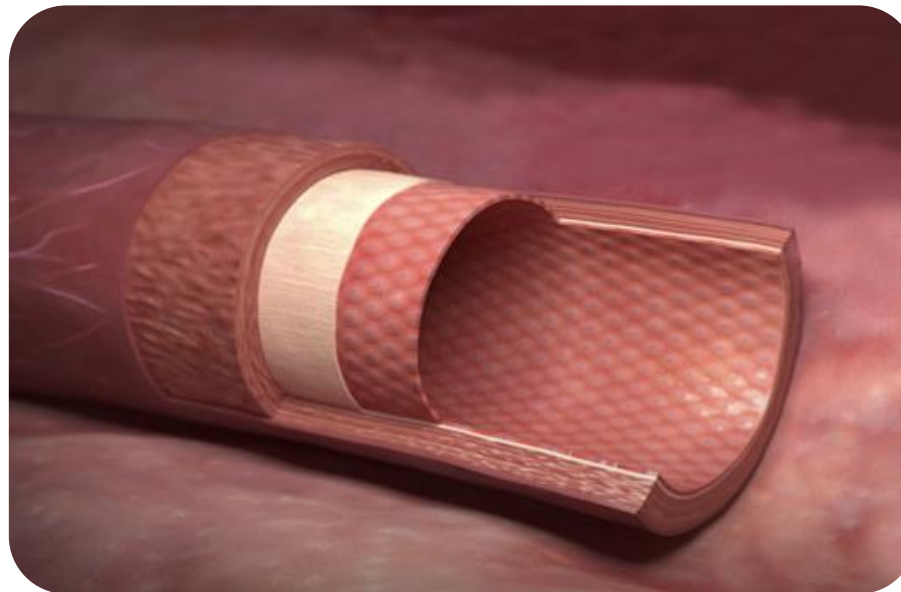
Anatomy

Tunica Intima or Endothelium

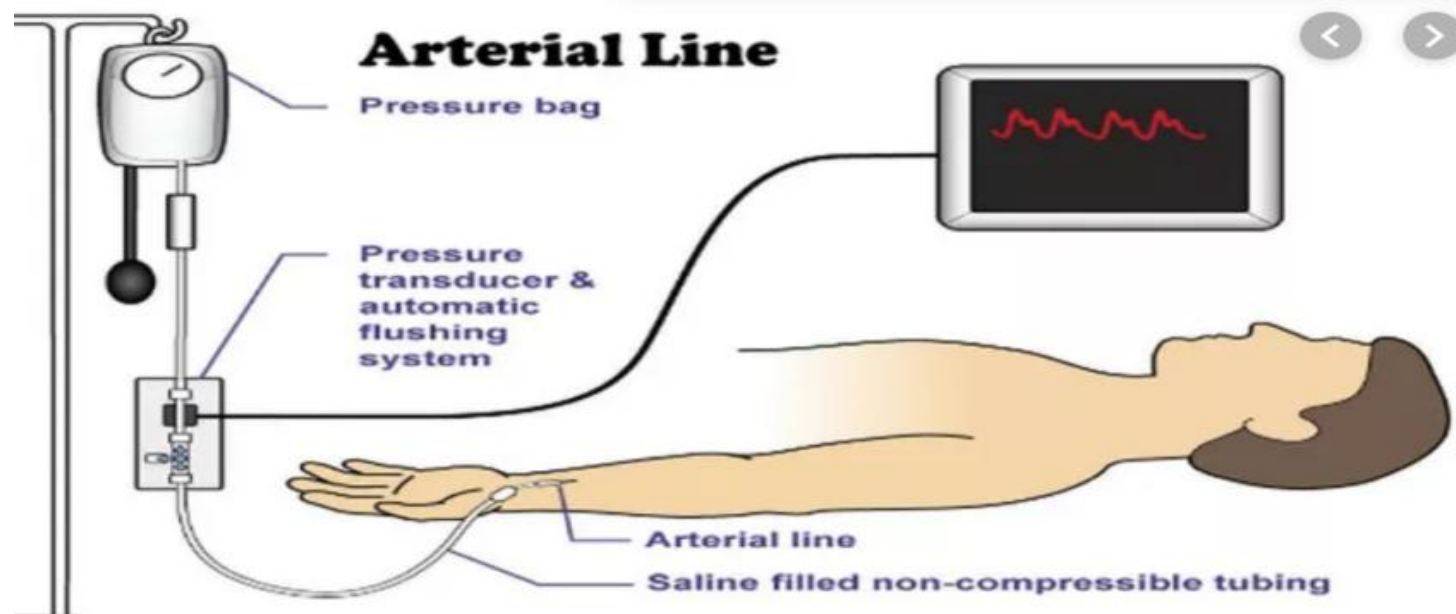
Tunica Media

Tunica Adventitia

Nerve paths



Arterial Monitoring



Insertion Techniques



Blind palpation method

Anatomical landmark

Pulse

Transfix

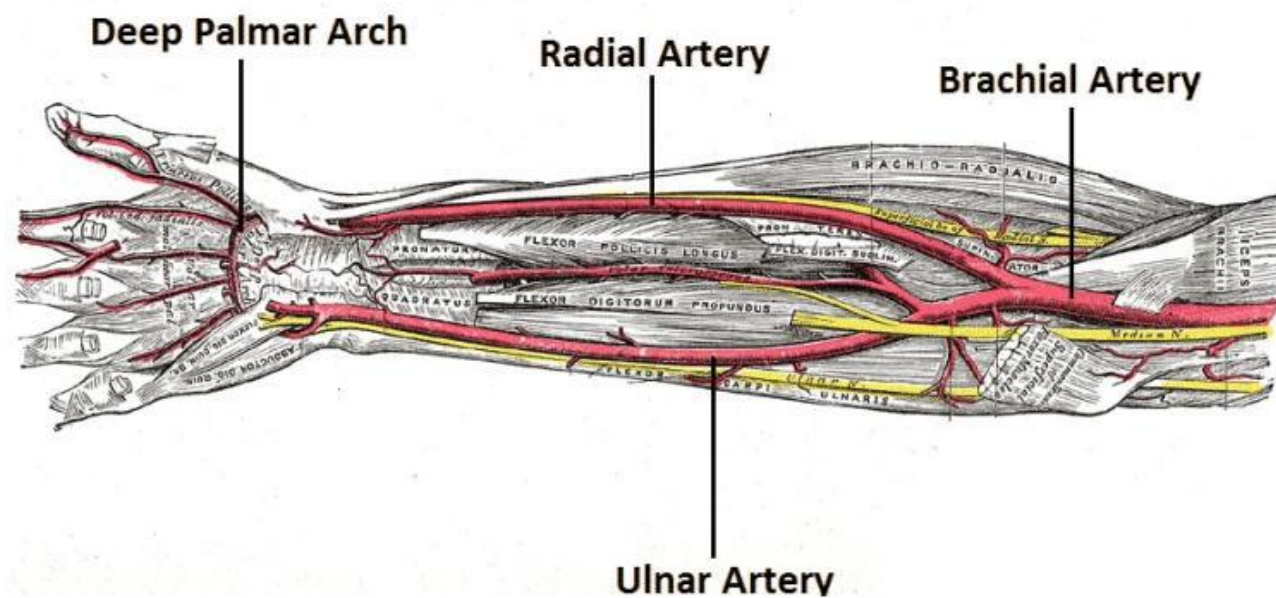


Ultrasound guided technique

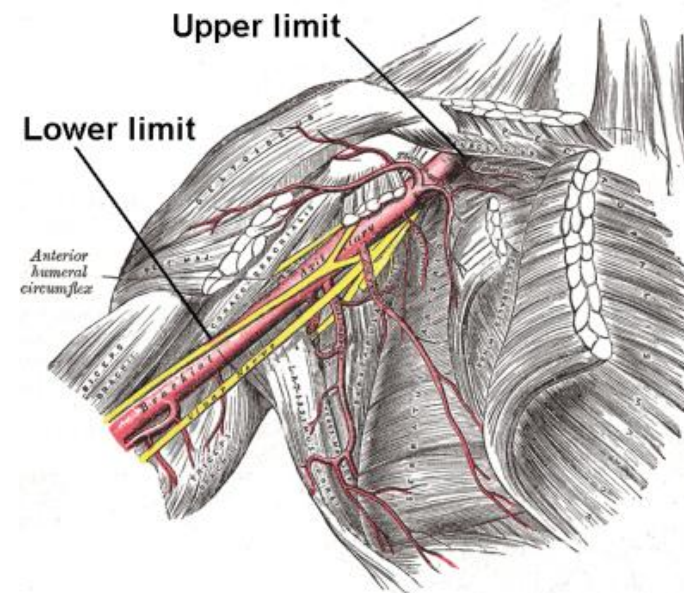
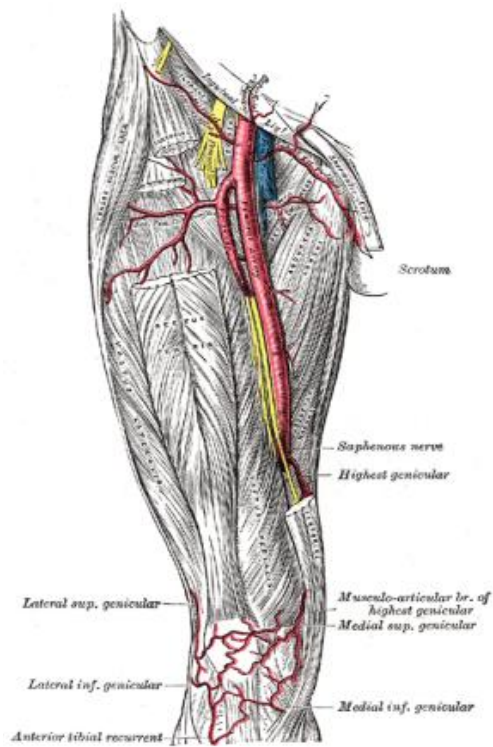
Visualize

Lead the needle

Site selection



Site selection

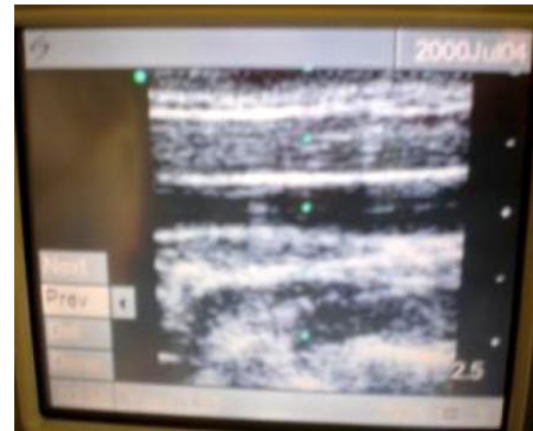




Vessel Health Considerations

- ▶ Size
- ▶ Depth
- ▶ Health
- ▶ Anatomical variation
- ▶ Nerve avoidance
- ▶ Patient safety
- ▶ Exit site management
- ▶ Limited number of sites

Radial Insertion Location



Advantage of Ultrasound



Avoid ROM

Avoid flexion

Decrease pistoning



Ultrasound Use

- ▶ Rescue attempts
- ▶ Blind insertion failure
- ▶ Reduces through and through vessel damage
- ▶ Nerve avoidance



Guidelines

- ▶ INS 2016

- ▶ Use US guidance for arterial puncture and catheter placement in adults and children. 2,28 (I)

Need for clear guidelines that support routine placement of arterial catheters not just rescue insertions.

Shiloh et al ., 2011

- ▶ Shiloh, A. L., Savel, R. H., Paulin, L. M., & Eisen, L. A. (2011). Ultrasound-guided catheterization of the radial artery: a systematic review and meta-analysis of randomized controlled trials. *Chest*, 139(3), 524-529.
- ▶ The use of real-time two-dimensional ultrasound guidance for radial artery catheterization improved first-pass success rate.

Gu et al., 2014

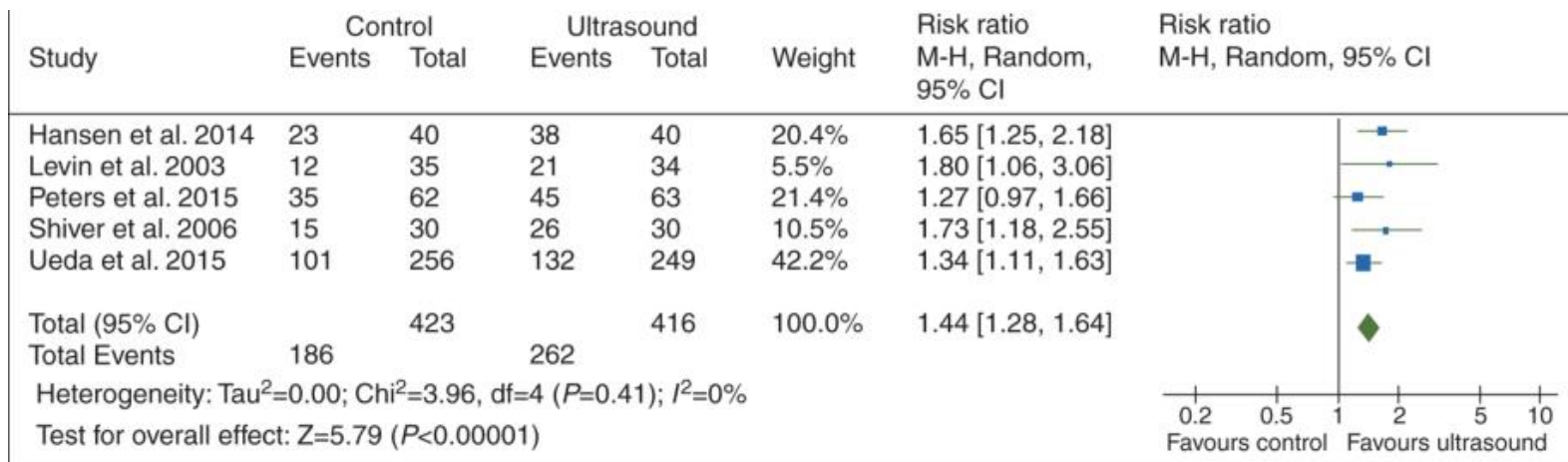
- ▶ Gu, W. J., Tie, H. T., Liu, J. C., & Zeng, X. T. (2014). Efficacy of ultrasound-guided radial artery catheterization: a systematic review and meta-analysis of randomized controlled trials. *Critical Care*, 18(3), R93.
- ▶ In summary, the current available evidence suggests that ultrasound guidance is an effective and safe technique for radial artery catheterization, even in small children and infants.

Gao et al., 2015

- ▶ Gao, Y. B., Yan, J. H., Gao, F. Q., Pan, L., Wang, X. Z., & Lv, C. J. (2015). Effects of ultrasound-guided radial artery catheterization: an updated meta-analysis. *The American journal of emergency medicine*, 33(1), 50-55.
- ▶ Adult and pediatric patients benefited from ultrasound-guided radial artery catheterization in terms of the rate of first-attempt success. Given the potential bias and significant heterogeneity of the available data in the present study, further investigation is required to confirm the present findings and to identify other effects of the ultrasound-guided technique.

White et al., 2016

- ▶ White, L., Halpin, A., Turner, M., & Wallace, L. (2016). Ultrasound-guided radial artery cannulation in adult and paediatric populations: a systematic review and meta-analysis. *BJA: British Journal of Anaesthesia*, 116(5), 610-617.
- ▶ This is the first level one systematic review to demonstrate strong evidence for the use of ultrasound guidance in radial artery cannulation in adult and paediatric populations. In the adult population, ultrasound use significantly increased first-attempt success rate, which subsequently resulted in a significant reduction in the number of attempts. The benefits of ultrasound were also shown in the paediatric population, with a significant increase in first-attempt success rate and reduction in the number of attempts. The use of ultrasound as an adjunct to radial arterial cannulation should now be considered best practice.



Pacha et al., 2018

- ▶ Pacha, Homam Moussa, et al. "Ultrasound-guided versus palpation-guided radial artery catheterization in adult population: A systematic review and meta-analysis of randomized controlled trials." *American Heart Journal*. 204 (2018): 1-8.
- ▶ Ultrasound-guided technique for RA access has higher first-attempt success and lower failure rate compared with palpation alone, with no significant differences in access site hematoma or time to a successful attempt. These findings support the routine use of US guidance for RA access.

Yeap et al., 2019

- ▶ Yeap, Y. L., Wolfe, J. W., Stewart, J., & Backfish, K. M. (2019). Prospective Comparison of Ultrasound-Guided Versus Palpation Techniques for Arterial Line Placement by Residents in a Teaching Institution. *Journal of graduate medical education*, 11(2), 177-181.
- ▶ Found that residents using USG in an academic institution resulted in significantly faster placement of the arterial lines, fewer attempts, and fewer catheters used.

Position statement



ASSOCIATION FOR VASCULAR ACCESS

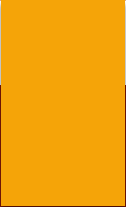
POSITION PAPER

Ultrasound Guided Peripheral Arterial Catheter Insertion by Qualified Vascular Access Specialists or Other Applicable Healthcare Clinicians

Protect the Patient • Educate the Clinician • Save the Line

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In conclusion

- ▶ New literature repeats existing findings
- ▶ Practitioners must see the value in US to use it for peripheral access
- ▶ Arterial catheters should be inserted with Ultrasound Guidance
- ▶ Ultrasound increases first time success
- ▶ Ultrasound saves time
- ▶ Arterial catheter insertion needs more research as arterial sites are limited and should be preserved with evidence-based practices

Reference

- ▶ Yeap, Y. L., Wolfe, J. W., Stewart, J., & Backfish, K. M. (2019). Prospective Comparison of Ultrasound-Guided Versus Palpation Techniques for Arterial Line Placement by Residents in a Teaching Institution. *Journal of graduate medical education*, 11(2), 177-181.
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