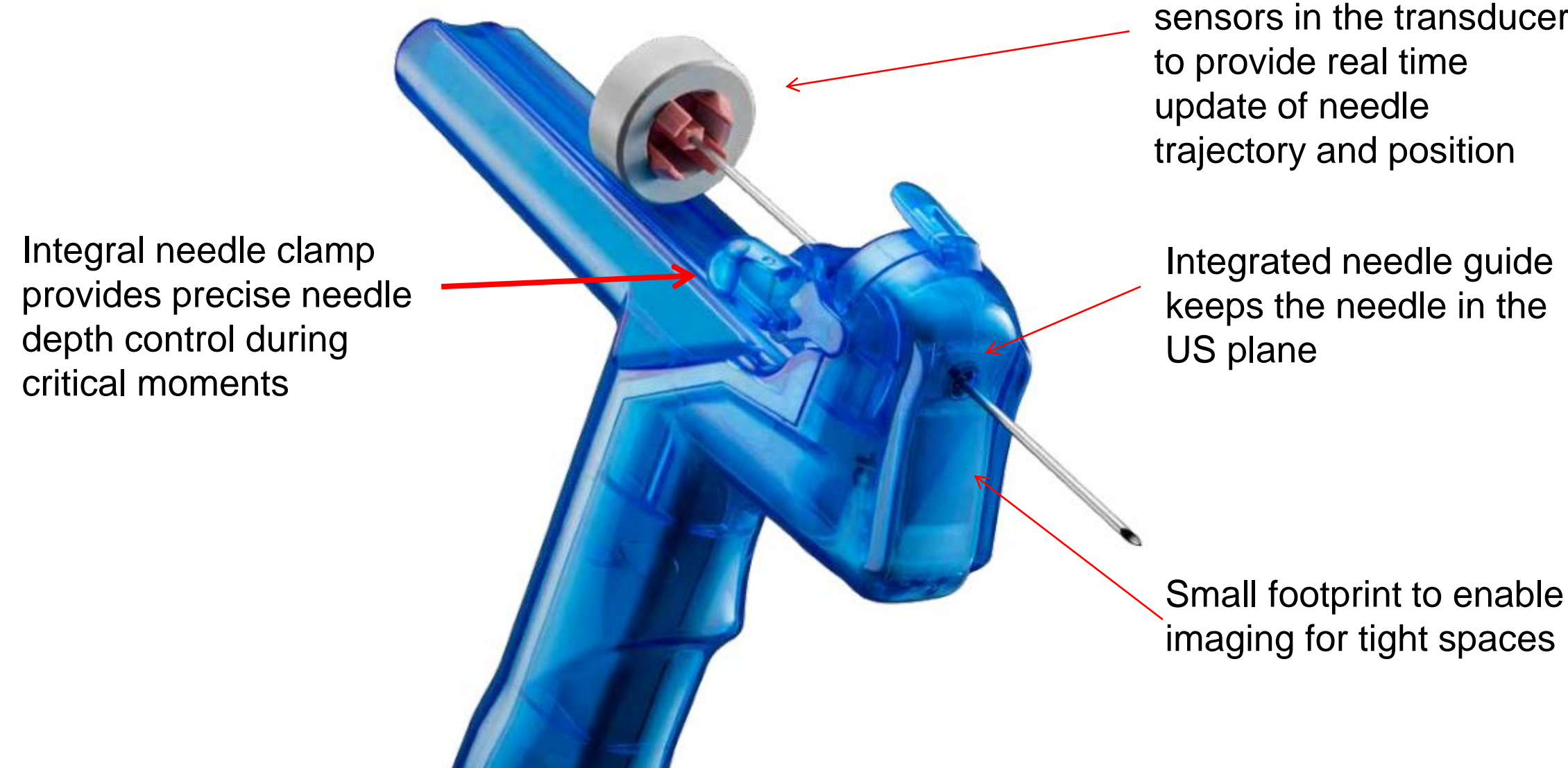


A NOVEL ULTRASOUND DEVICE FACILITATES A UNIQUE APPROACH TO SUPRACLAVICULAR CENTRAL VENOUS CATHETER INSERTION

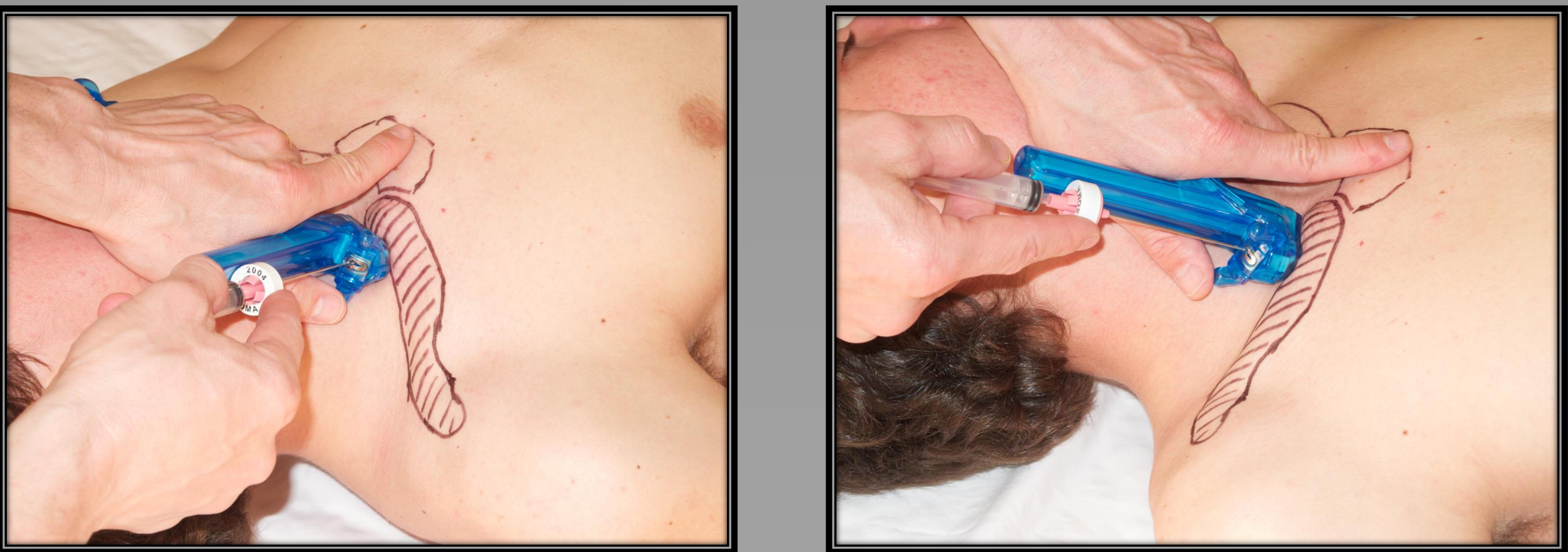
MARK MERCIER, MD*, ROBINSON FERRE, MD**

PALMETTO HEALTH BAPTIST, COLUMBIA, SC | VANDERBILT UNIVERSITY MEDICAL CENTER, NASHVILLE, TN

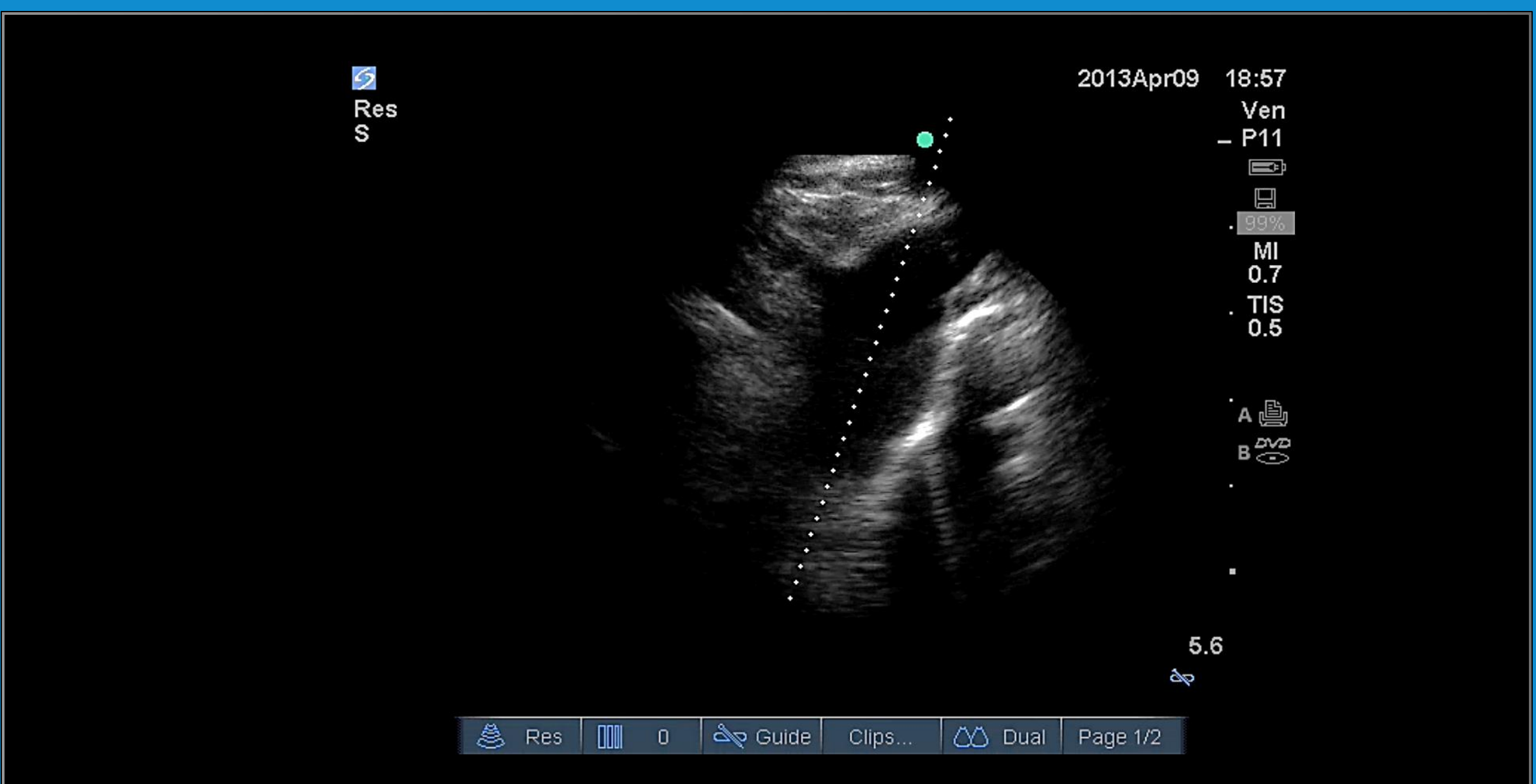
AxoTrack™



Approach



The ultrasound probe is positioned just above the clavicle, over the low IJ, between the sternal and clavicular heads of the sternocleidomastoid muscles. Then it is rotated towards the coronal plane until the target line is aligned with the confluence of the IJ and subclavian veins.



INTRODUCTION

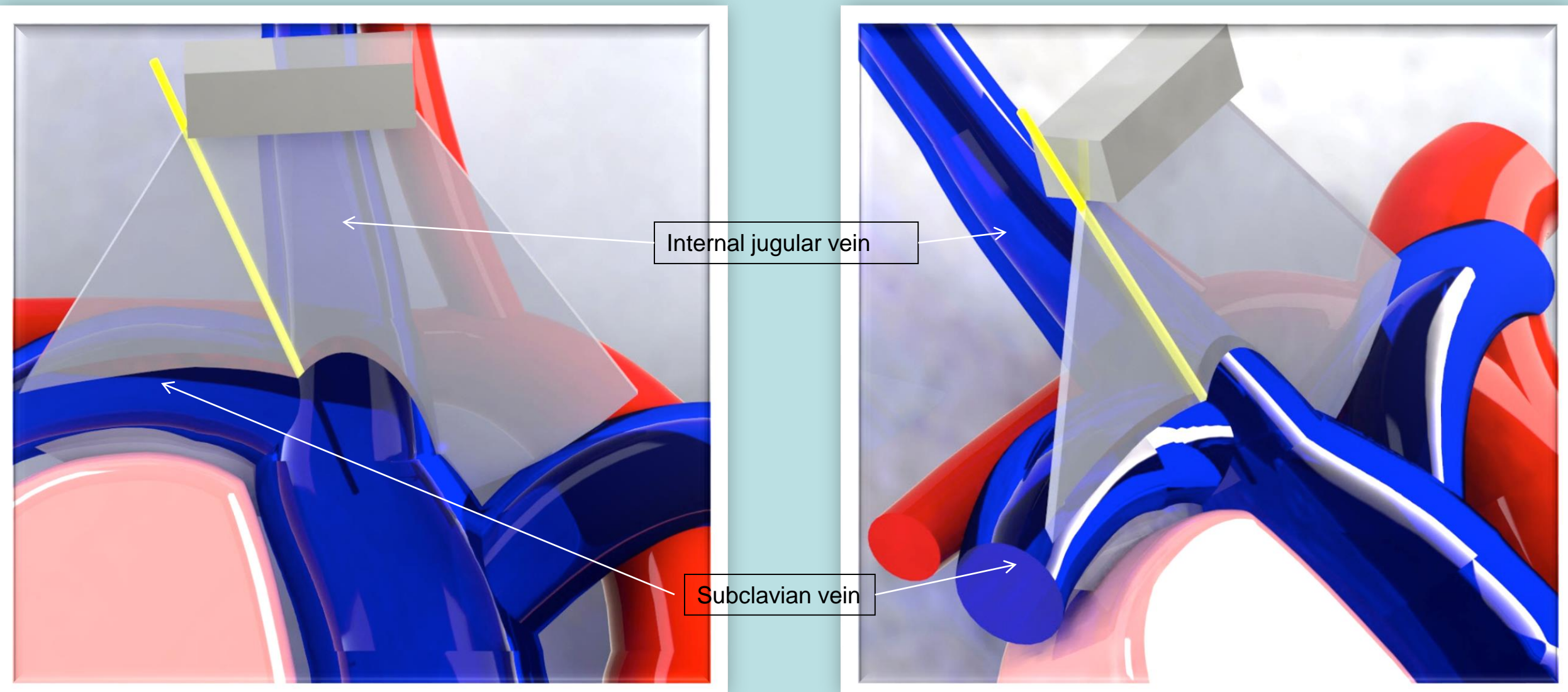
Real-time ultrasound guidance is considered to be the standard of care for central venous access for non-emergent central lines. Traditional sites for ultrasound guided central line placement are the internal jugular and subclavian veins. The AxoTrack™ system (Soma Access Systems, Greenville, SC) recently cleared for human use by the United States Food and Drug Administration is a novel needle guidance system developed to simplify ultrasound guided central venous access by eliminating the hand-eye coordination challenges of conventional ultrasound needle guidance. The AxoTrack™ system includes a small footprint ultrasound probe with a needle guide that extends through the body of the ultrasound probe, making the path of the needle coincident and coplanar within the ultrasound beam. A target line is programmed into the display that allows the operator to plan the course of the needle prior to puncturing the skin. The ultrasound probe houses a separate set of magnetic sensors that, in real-time, precisely monitors the depth of the needle and projects a virtual image of the needle on the ultrasound system monitor as it moves through the tissue toward and into the target vein. We intend to show that this technology facilitates a safe and unique approach to supraclavicular central venous access.

The supraclavicular approach to subclavian vein access is described in the literature since 1965. Despite being infrequently employed, studies report that the supraclavicular approach is equally effective and by some measures, superior to the infraclavicular approach. The AxoTrack™ device enables real-time visualization of the needle during the entire course of this procedure. The needle passes directly through the probe, puncturing the skin just above the clavicle between the two heads of the sternocleidomastoid muscles. Cannulation occurs at the confluence of the subclavian vein and the internal jugular vein with the needle passing into the brachiocephalic vein in co-axial alignment.

METHODS

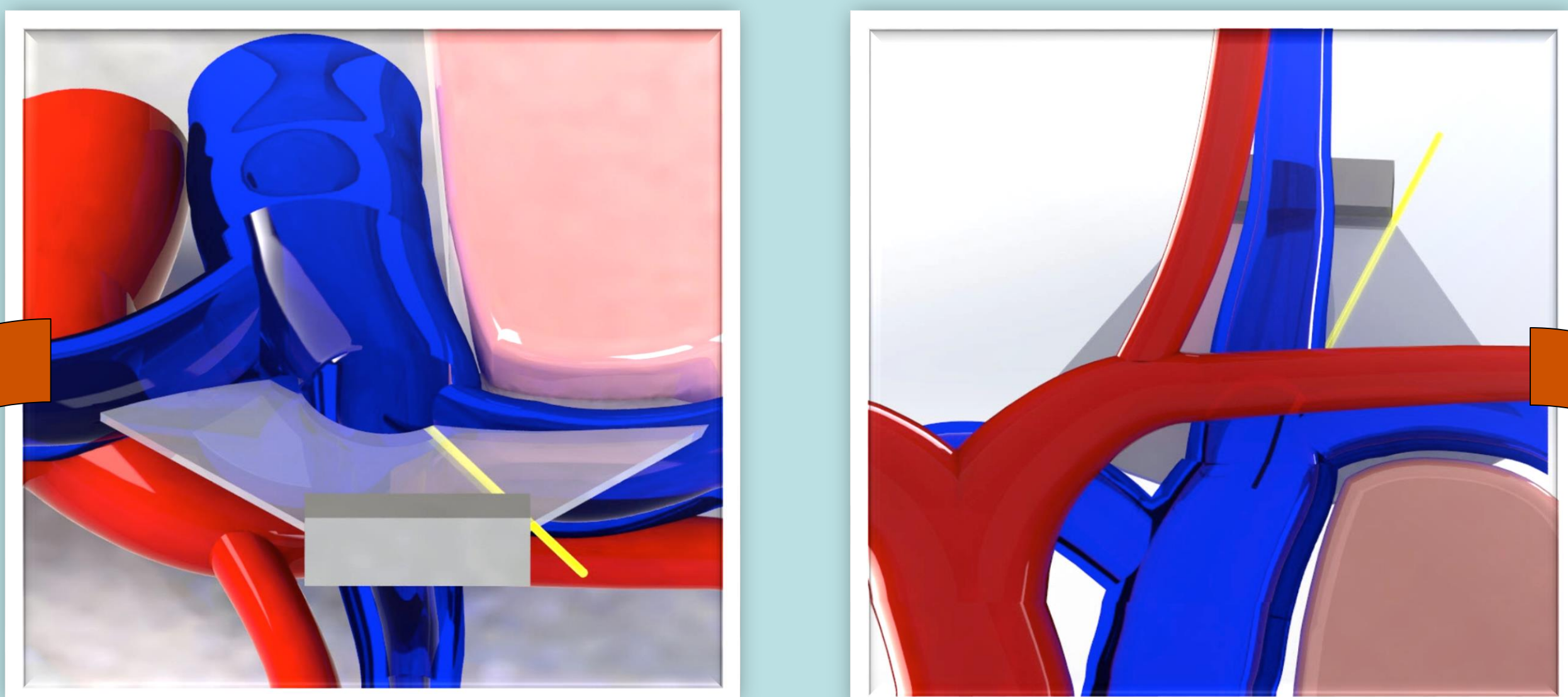
After FDA clearance, the AxoTrack™ system was released to three hospitals in the United States. Physicians and Nurse Practitioners who work in the Intensive Care Unit or Emergency Department and who place central venous catheters were trained to use the AxoTrack™ system. Training consisted of either watching a brief introductory video or a hands-on introduction to the system describing the device function and set up followed by 10-20 minutes of practice using the device on a vascular phantom. De-identified data about central lines placed in living patients with the AxoTrack™ system was prospectively gathered at each of the three hospitals for quality assurance purposes. After IRB review, we consolidated the data for the first 100 central line procedures for retrospective review.

Anatomy of the Supraclavicular Approach to Subclavian Vein



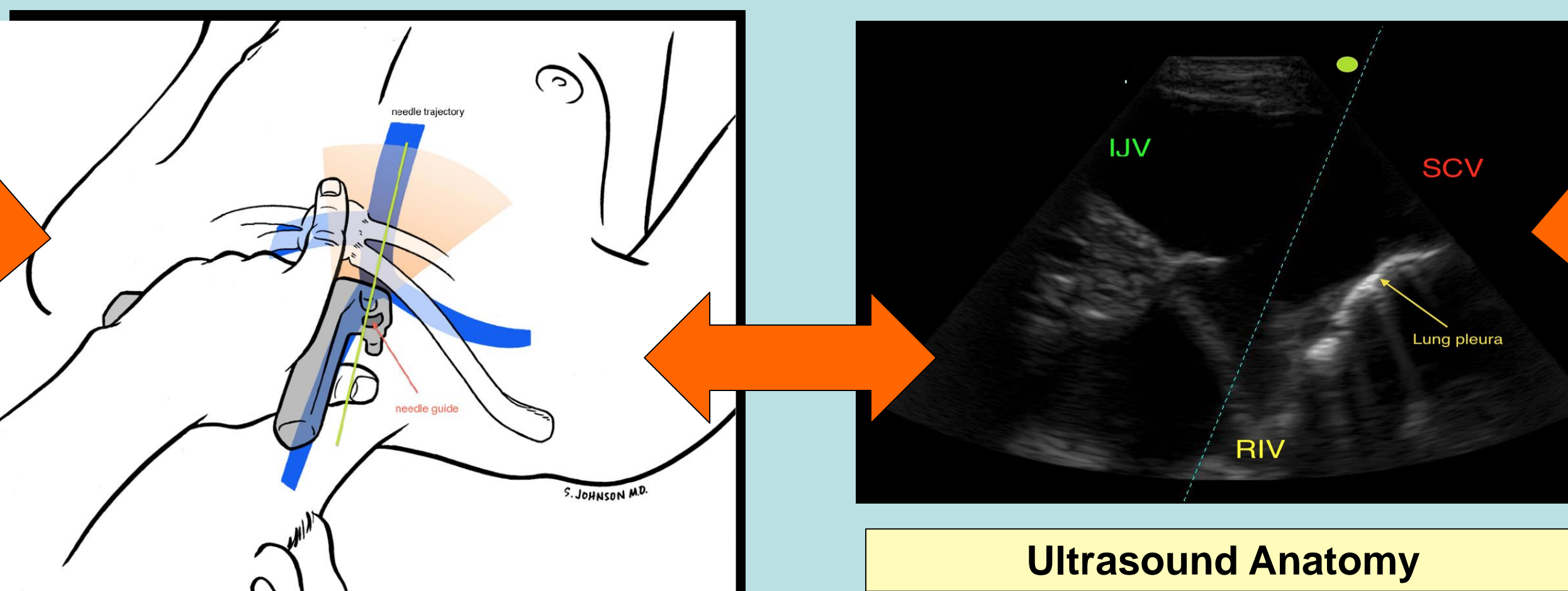
Facing the patient A/P view

View from patient's right



View from head of bed

View from behind – P/A view



Ultrasound Anatomy

RESULTS

The AxoTrack™ system was used in 100 consecutive patients undergoing central venous cannulation from September 2012 to July 2013. A subset of 33 patients underwent supraclavicular access with no reported complications, including pneumothorax, hemothorax, arterial puncture, or arterial cannulation.

HYPOTHESIS

Conventional ultrasound guidance requires a relatively large procedural footprint which includes the footprint of the ultrasound probe itself and some area adjacent to the probe where skin puncture occurs. The skin puncture location must be at a large enough distance from the ultrasound probe to allow for a needle trajectory shallow enough to facilitate ultrasound needle visualization. Because AxoTrack™ employs a needle guide that passes directly through the ultrasound probe, the effective procedural footprint is simply the footprint of the probe itself. This enables the AxoTrack™ probe to be used in tight locations and with approaches that are impossible with conventional ultrasound probes, including the supraclavicular approach to cannulation of the subclavian vein.

CONCLUSION

Based on the experience of 33 central venous access procedures, the use of AxoTrack™ for the novel approach of supraclavicular cannulation of the subclavian vein is safe and easy to learn. This technique has the potential to simplify and perhaps, lower the technical hurdles that currently slow adoption of ultrasound guidance during vascular access, which is encouraged by multiple academic and regulatory agencies. Even more importantly, this approach has the potential to decrease complications, improve the safety of central venous access and decrease the number of catheter malpositions.