SynDaver Labs

Central Line Training System **[160503]**

Setup and Troubleshooting

The Central Line Training System or Central Venous Catheter (CVC) Insertion Trainer consists of a “phantom” base representing the neck and chest of a human patient, two vessels: the internal jugular vein and attached subclavian vein (which medical practitioners will attempt to access with a needle), a carotid artery which they will need to *avoid* piercing and a water pump to produce flow in the vessels. The arterial flow moves up the body from heart to head through the carotid artery. The venous flow moves back down in the internal jugular vein and subclavian vein.

Materials Checklist

-Central Line Trainer with Carotid Artery and Internal Jugular/Subclavian Vein
-Central Line Pump with Charging Cable
-Pitcher of Water
-Clean 60cc Syringe full of water (optional)
-Vein and Artery Insertion Tools (3)

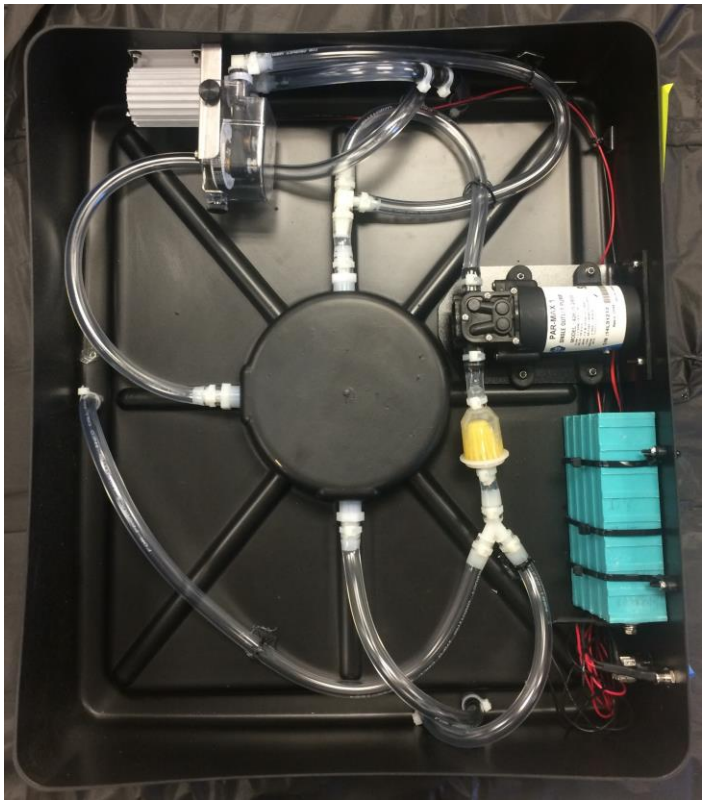
Step by Step Breakdown

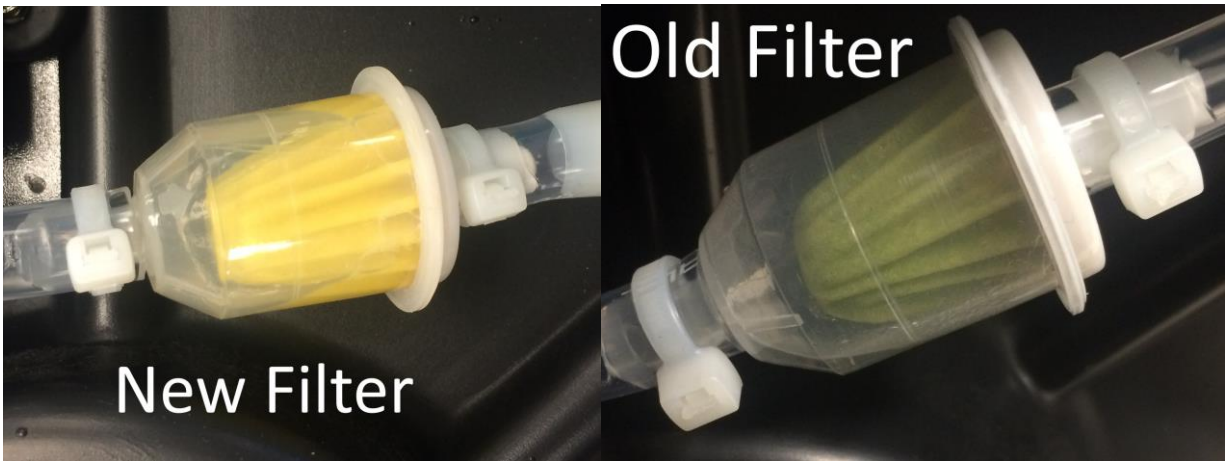
Step 1: Setup the Pump
Step 2: Setup the Central Line Trainer
Step 3: Test the Pump
Step 4: Testing the Subclavian and Internal Jugular Vein
Step 5: Testing the Carotid Artery
Step 6: Ultrasound Imaging

Step 1: Setup the Pump

1a. Make sure your pump is fully charged and the charging cable is removed from the pump.

1b. Turn the pump over and look for kinks in the hose or any damage to the filter.

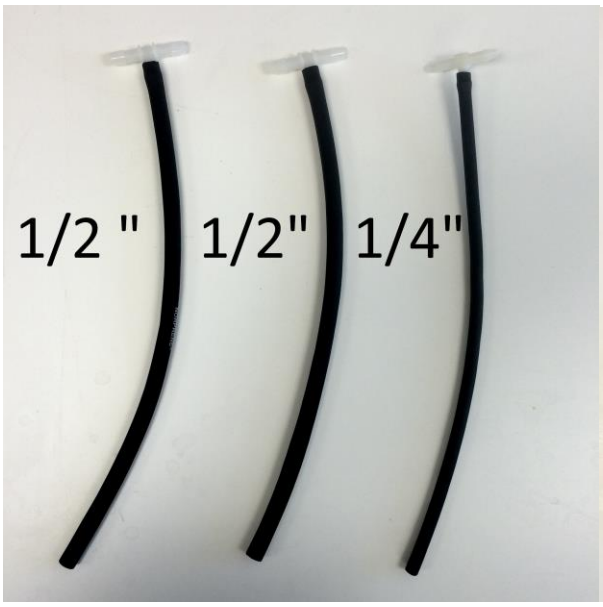




1c. Kinks in the tubing will cause pumps to fail. Sometimes old filters can become dislodged and clog the pumps as well. If the pump is clear of obvious defect, begin filling the pump reservoir with water. Be sure to fill until the channels at the top of the reservoir are full.

Step 2: Setup the Central Line Trainer

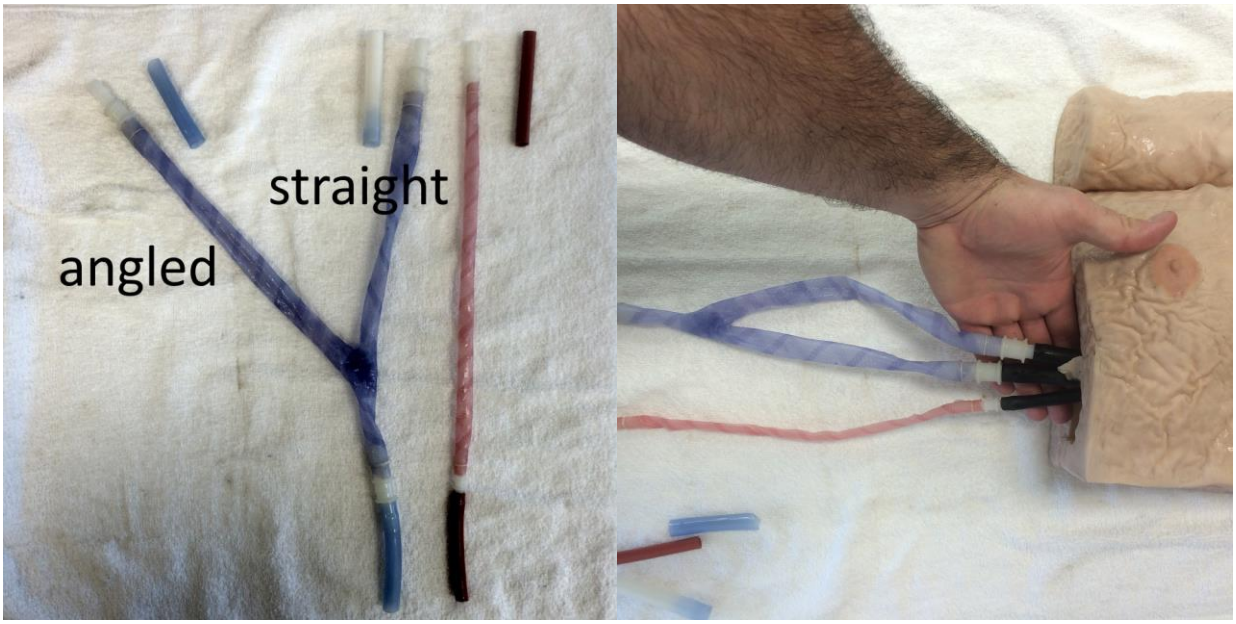
2a. Insert vein and artery into the Central Line Trainer. You'll need all 3 insertion tools to do this: two ½" tools and one ¼" tool (see image).



2b. Use lube or water to lubricate your tools.

2c. Starting at the neck and shoulder, insert the ½” tools through the vein channels in the Central Line Trainer. Insert the ¼” tool through the artery channel.


2d. Remove the colored silicone tubing from one side of the artery and from the top of the “y” of the vein, exposing the “leurs.”



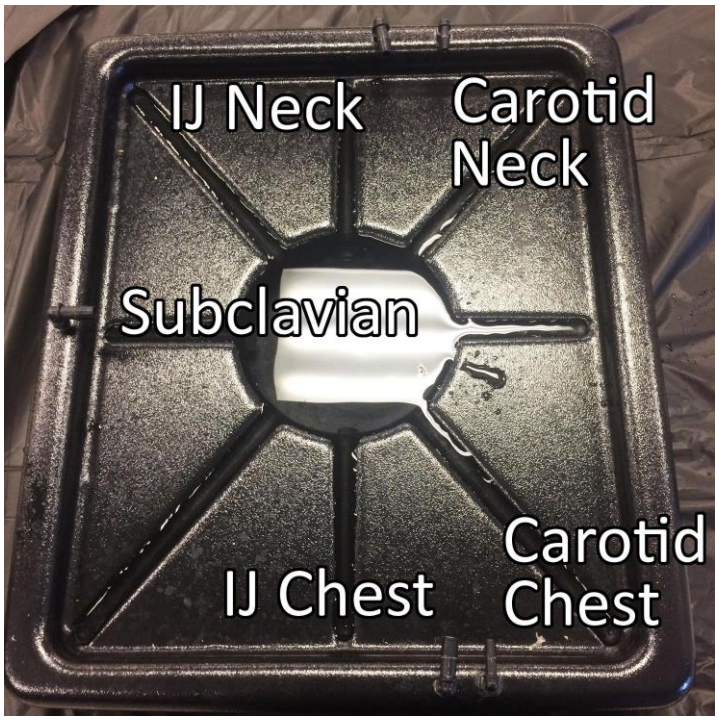
2e. Attach the straight vein leur to the ½” tool which you inserted from the neck. Attach the angled vein to the ½” tool which you inserted through the shoulder. Attach the artery leur to the ¼” tool you inserted from the neck.

2f. Now, once the vessels are connected to the tools, slowly and carefully pull all three vessels through the trainer using the tools. Once the vessels are in position, remove the tools and replace the colored silicone tubing.


2g. You are now ready to install your trainer onto its pump and troubleshoot the vessel flow if necessary.

Step 3: Test the Pump

3a. Making sure that your pump's charging cable is removed from the pump, switch the button to its "On" position and wait for the water to begin flowing.

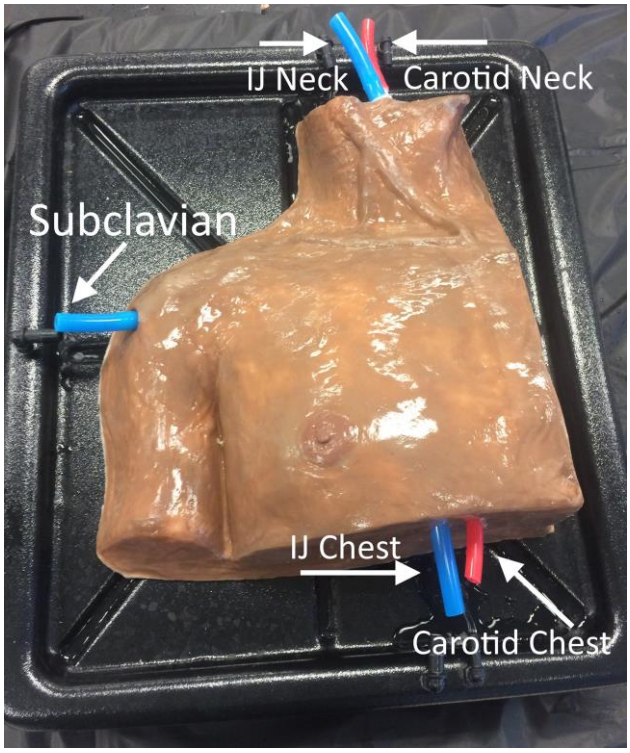


3b. 3 of the 5 "ports" should begin flowing. The Subclavian port, IJ neck port and Carotid chest port should begin flowing. ***Please note terms like "Carotid Chest" are just meant to indicate the port positions and are not necessarily anatomical markers.**

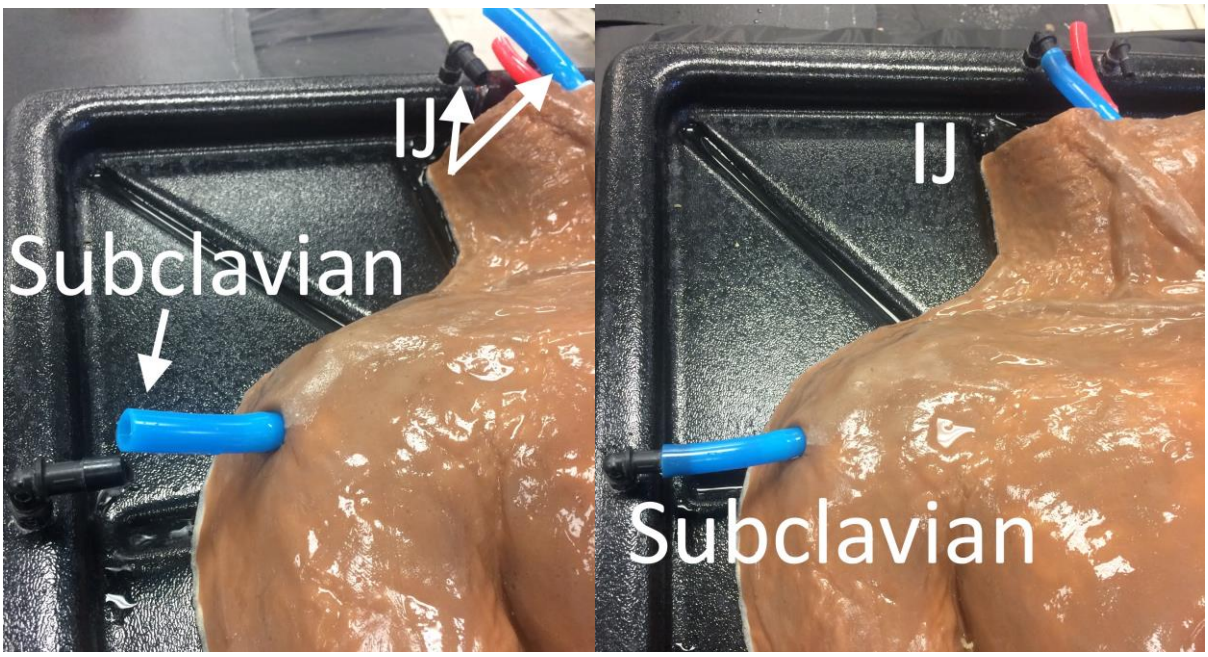
3c. If these ports do not being flowing, there may be a kink or issue with the pump filter or possibly trapped air. To deal with potentially trapped air, you can fill a clean 60cc syringe with water and use it to push water into the 3 intake ports within the pump reservoir. If a flow problem persists, submit the pump to the current pump assembly and maintenance personnel for testing and repair and use a different pump to proceed with your testing.

Step 4: Testing the Subclavian and Internal Jugular Vein

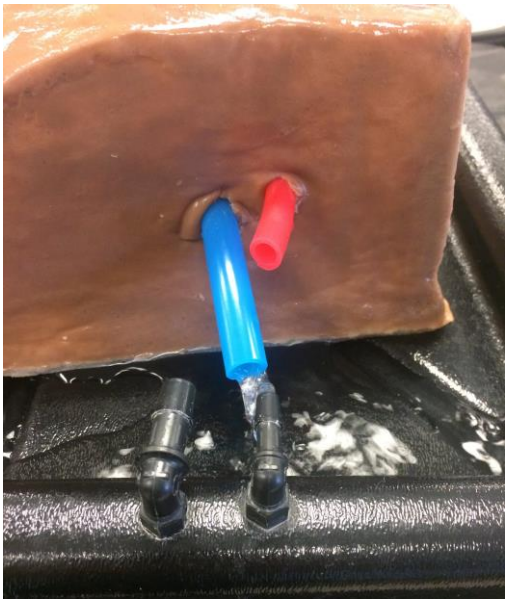
4a. Shut the pump off. Place the Central Line Trainer onto the pump with the subclavian vein toward the subclavian port. For easier access to the ultrasound window (neck area) on the trainer, it is easier to place the pump and trainer in such a way that the neck of the trainer is closest to you.



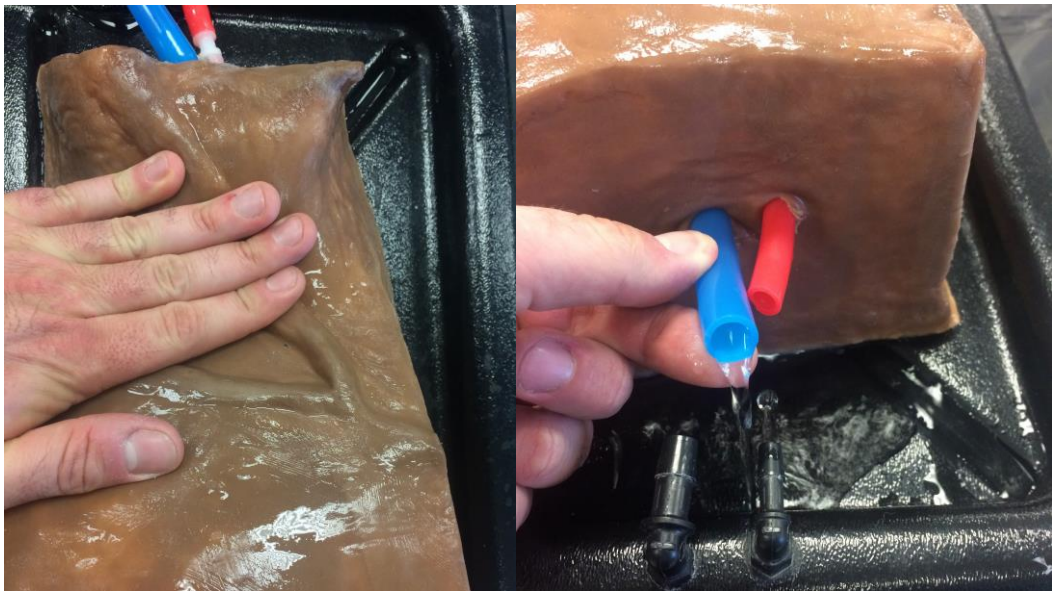
4b. First attach the subclavian vein to the subclavian port and the IJ (Internal Jugular) vein to the IJ neck port.



4c. Turn the pump on. Water should begin pouring out of the chest end of the vein in the trainer.



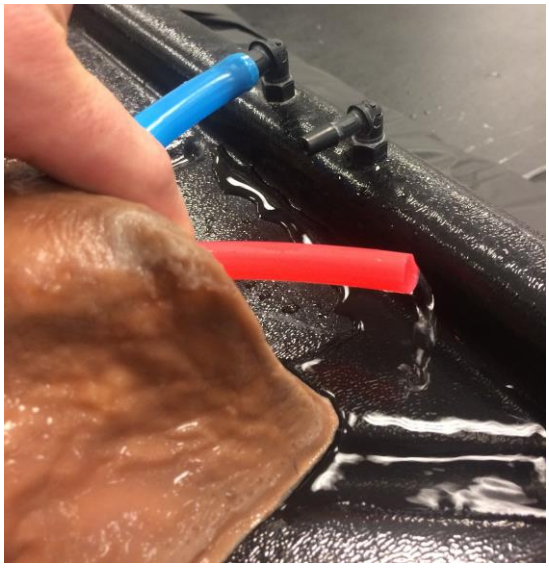
4d. You may use your hand to lightly depress the vein inside the trainer to force out any air trapped inside. You could also lift the exit vein slightly to tilt the pump back to release air.



4e. If everything looks good, attach the chest end of the vein to the third vein port.

Step 5: Testing the Carotid Artery

5a. Just like we did with the vein, we will now attach the artery to the the pump ports but we will first attach the artery at the chest port.

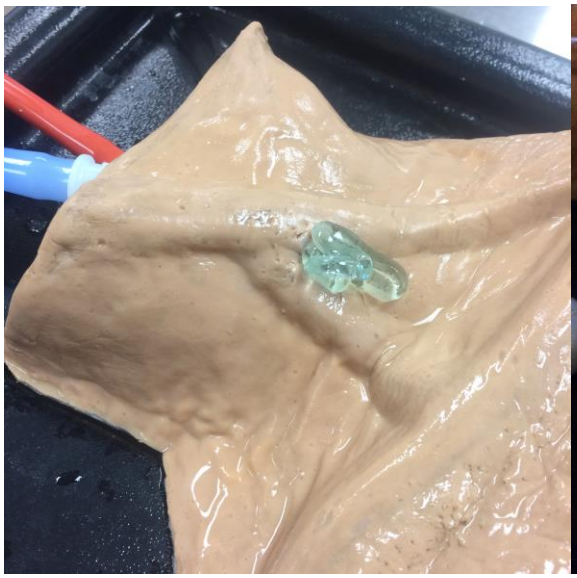


5b. Water should now pour from the Carotid Neck port.

5c. Now attach the Carotid Neck vessel to the neck port.

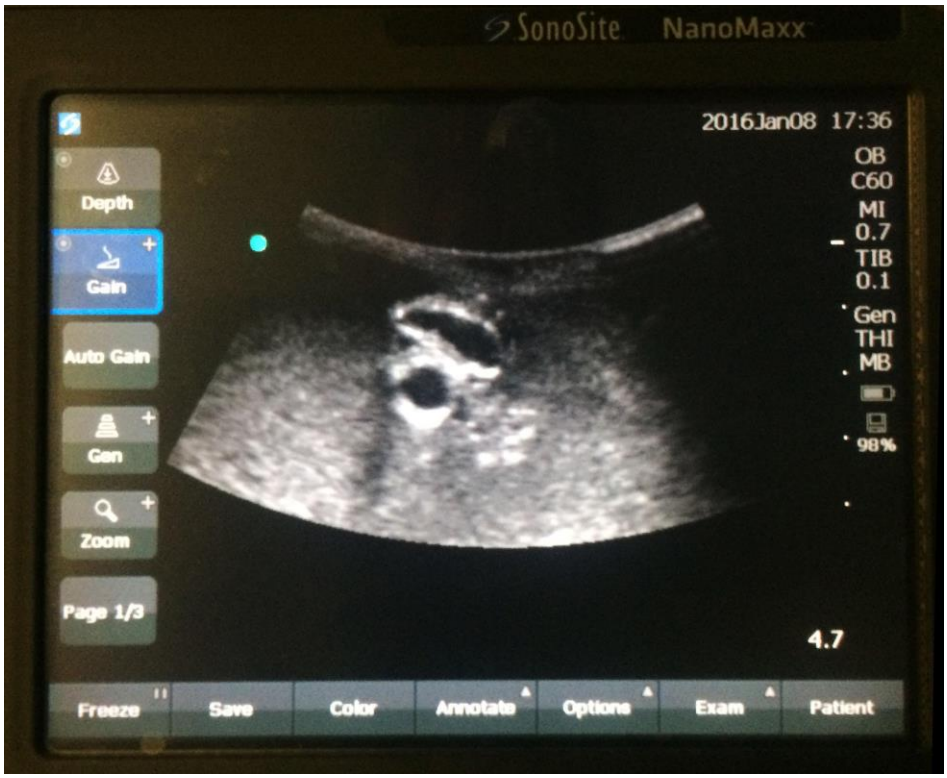
Step 6: Ultrasound Imaging the Internal Jugular Vein and Carotid Artery
6a. If you are unfamiliar with the ultrasound machine that we are currently using in-house please refer to instructions outside this document. **But, as a quick reminder, think of your ultrasound probe like a flashlight. Wherever you point your probe, you'll be able to see.**
6b. We use a **Curvilinear Probe** to look into a Central Line Trainer.
6c. Apply ultrasound gel to the Curvilinear Probe.


6d. Also apply gel to the areas of the trainer where you will use the probe. This will be along the neck and where the neck reaches the shoulder.



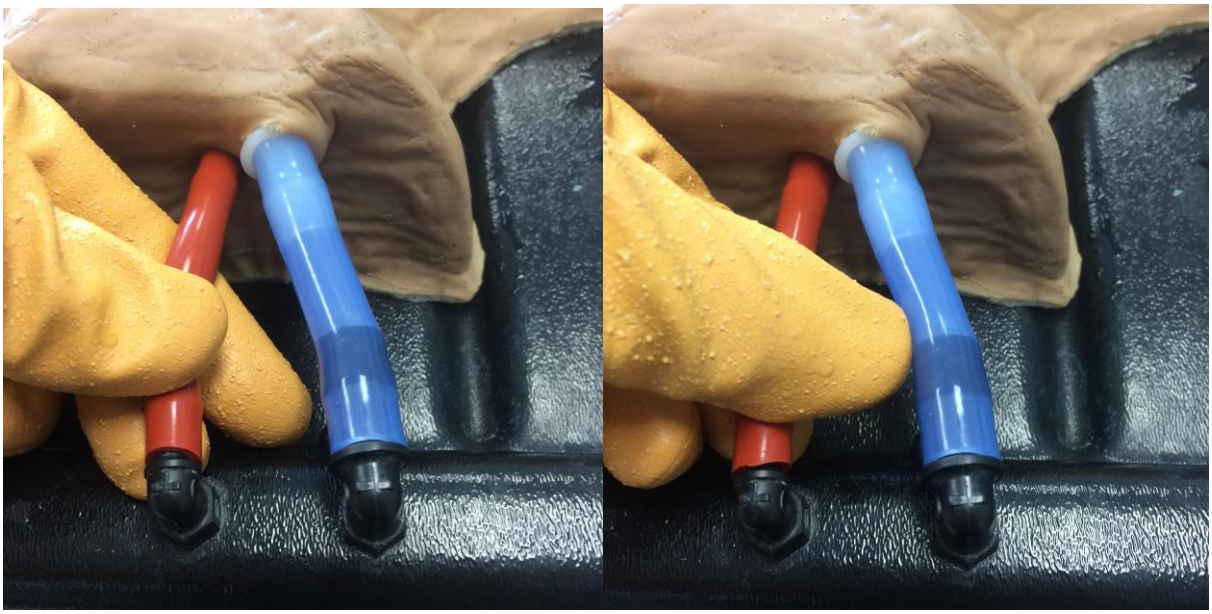

6e. Note: trainees will maneuver the trainer so that the neck is closer to the trainee than the chest. This simulated a real life scenario and brings the area of focus closer to the trainee. See image:

6f. Gently place the probe onto the neck area of the trainer. There is no need to apply anything but very gentle pressure. The gel acts like a conduit and will allow you to see perfectly into the trainer even if the probe isn't touching trainer at all. You may have to adjust **depth** and **gain** on the ultrasound machine but soon you should see something like this:



6f. Your vein is larger and on top of the smaller artery. If you apply pressure to the trainer then the **vein should collapse slightly** but the **artery should not**.

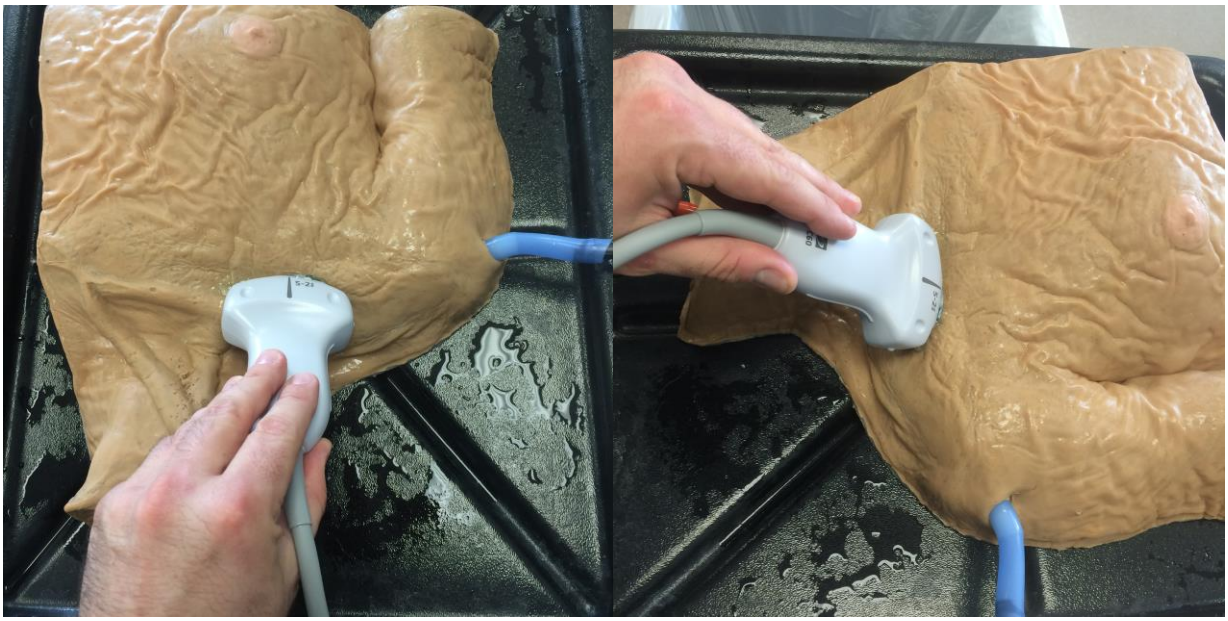
6g. <u>If the vein or artery seem to be collapsing or folding, they may have become twisted during the insertion process.</u> If you are seeing this, try to twist the connection points until the vessels unfold.

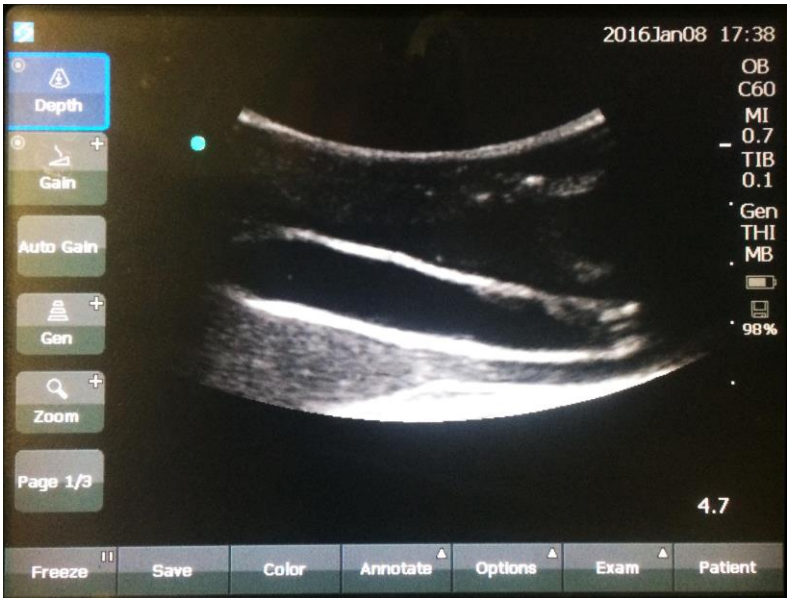


Step 7: Ultrasound Imaging the Subclavian Vein

7a. Don't forget to look at the **subclavian vein** under ultrasound as well. You'll have to gel the probe and subclavian area of the trainer and angle the probe under and around the clavicle bone within.

7b. Placing the probe across and under the clavicle will give you a longitudinal view through the length of the subclavian vein. You should be able to follow it left and right.





7c. This trainer looks good to go.