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Component Photos

Torso

Heart Bulb, Reservoir, and Connector Tubes
Vascular Insert, Back View

- Internal Jugular Vein
- Neck - Reservoir Tube Connector
- Heart Bulb Tube Connector
- Carotid Arteries
- Spine

Neck

- Spine
- Door Latches
- Door
- Superior Vena Cava
- Left Brachio-cephalic Vein
- Latches for Vascular Insert
- Subcutaneous Layer
Equipment and Supplies

Equipment
Torso
Skin Assembly
Neck
Vascular Insert (inside Neck)
Skin Assembly
Heart Bulb with tube
Water Reservoir
Neck - Reservoir Tube
400 mL beaker (water container)

Supplies / Spare Parts
IJ Veins       Latex Penrose tubing, 6 inches
Subcutaneous Layer Rubber Sheet
Arteries       Latex tubing, 6 inches long
O-rings for holding IJ Veins and Arteries
O-ring for Vascular Insert
Tunneling site cover — Velcro®
Silicone grease
Overview

1. This device is designed to train medical personnel to cannulate the internal jugular vein with large catheters for hemodialysis or other procedures requiring large catheters placed for long duration.

2. Preparing to use the model requires the following steps:
   - Replace IJ veins and, if necessary, arteries
   - Install Vascular Insert into neck
   - Replace the Subcutaneous Layer in the neck
   - Install neck into torso
   - Install heart bulb and water reservoir
   - Install Skin Assembly
   - Install Velcro for subcutaneous tunnel
   - Apply ultrasound gel between the skin assembly and the Subcutaneous Layer.

3. Each Subcutaneous Layer and vein should last for several cannulations. It is not necessary to change the Subcutaneous Layer and vein after each cannulation. Longevity of the Subcutaneous Layer is mostly determined by the availability of suitable places to insert the catheter. Each puncture of the Subcutaneous Layer will leak a small amount of water; much of the water will collect inside the torso.

4. Replacing an artery should not be necessary unless it is punctured during the cannulation procedure.

5. The model is shipped with new Subcutaneous Layer, new veins, and new arteries installed.
Subcutaneous Layer Installation

1. Open the door latches, **the outside latches first, then the center latch**.

2. Open the door, and remove the rubber sheet (Subcutaneous Layer). Here the neck is shown with the Subcutaneous Layer removed.

3. Place the Subcutaneous Layer in the door. The side of the rubber sheet fits next to the hinge. Center it in the door.

4. Close the door with the Subcutaneous Layer.

5. **Close the center latch first, then the other latches.** This centers the door, thereby reducing stress on the outer latches.

6. Check the Subcutaneous Layer placement by looking from the inside. The Subcutaneous Layer should have at approximately the same amount of overlap of the neck all the way around the hole.
**Note: Artery Replacement**

If an artery tube needs to be replaced, it is easier to replace the artery BEFORE the vein is replaced. The procedure is similar to the steps below.

1. Here is the Vascular Insert with one of the veins removed.

2. The vein can be removed by rolling the O-ring toward the center of the vein and then pulling the vein off the tube. Keep the O-rings, discard the vein tube.

3. Set the Vascular Insert upright on a stable surface. It is recommended to start with the flat, inside end of the Vascular Insert. Slide one end of the vein tubing onto the tube. Put the two O-rings on the vein tubing.

4. Roll an O-ring onto the tube until it reaches the recess.
4. Installing the other end of the vein is easiest if the Vascular Insert is on a stable surface. Here it is shown inverted on top of the neck. The other end of the veins has been installed over the tube.

Vein should be stretched so that it is taut. This facilitates insertion of the catheter.

5. Roll the O-rings onto the tube until it reaches the recess. Two O-rings on each end of the vein insures that it will remain taut.

6. Vein installation is now complete.

Notes on Artery Replacement
- The arteries may be replaced using the same procedure as veins.
- Artery installation is easier if it is done with the adjacent vein removed, before the vein is installed.
- Wetting the inside of the artery will make installation easier.
1. Add about 1300 mL water to the neck. This is best done where overflow from the neck can be contained.

2. Install the Vascular Insert in the neck. Align the spine of the Vascular Insert with the spine in the neck.

3. Slowly lower the Vascular Insert into the neck. A small amount of water should overflow out of the neck. Here is the Vascular Insert ready to be latched to the neck.

4. Latch the Vascular Insert to the neck. A small amount of water may squirt out of the top of the Vascular Insert as the air is purged from the arteries and veins.
Install Neck

1. Align the spine of the neck with the spine in the torso. Slide the neck into the torso, being careful to get the latches inside the torso.

2. Neck is fully installed when the stop is seated in the slot in the torso.
1. Fill reservoir about 3/4 full of water.

2. Connect heart tubing to reservoir.

3. Install reservoir in holder. The heart tubing goes into interior of holder so that it does not kink.

4. Holding the bulb with the tube upright, pump it several times until bulb is completely filled, and air bubbles no longer come out.

5. Install **light tan colored** connector on the heart bulb tube into the **light tan colored** connector on the Vascular Insert.
1. Fill water reservoir at least half full of water.

2. Install neck-reservoir tube in the reservoir. Close the clamp on the tube.

3. Place reservoir in its holder with the cap down inside.

4. Purge air from the tube by opening the clamp. Clamp to stop water flow.

5. Install the white connector of the neck-reservoir tube in white connector on Vascular Insert.

6. Open the clamp.

7. Replenish water in the reservoir as necessary.
Install Subcutaneous Tunnels

1. Model without Velcro top pieces. Position the Skin Assembly so that the catheter entrance and exit sites are desirable.

2. Velcro tunnels simulate the subcutaneous tissue that the catheter must traverse. Place a Velcro piece on each side of the model with the tunnel exit site under the skin exit site. The tunnel should be directed toward the catheter insertion site.

3. Add ultrasound gel to each catheter insertion site.

Notes:
- Spare Velcro pieces can be used to make custom subcutaneous tunnels.
- The standard subcutaneous tunnel is 4 3/16 inch (105mm) long with a centered catheter insertion hole 3/16 by 1/2 inch (5 x 12 mm).
1. To improve realism of ultrasound location of the IJ vein, have an assistant pump the heart bulb. The arteries will pulsate.

2. Put ultrasound gel on the outside of the skin. Insert the needle into the vein using ultrasound to guide the placement.

3. Test needle placement by removing the syringe from the needle and watch the fluid drip out of the needle hub.

4. Advance the guide wire into vein as far as desired.

5. Remove the needle from the vein, leaving the guide wire installed.
6. Insert the tunneling tool through the hole in the Velcro toward the vein.

7. Advance the catheter into the tunnel until the hub is at the skin incision.

8. Insert the first dilator over the guidewire into vein. Remove this dilator. Repeat with next size dilator if desired.

9. Insert the largest dilator and catheter sheath over the guide wire.
10. Remove the dilator and guidewire.

11. Insert the catheter into the sheath. Split the sheath hub.

12. Pull the two halves of the sheath apart until the sheath is completely removed.

13. Fully installed catheter.
CLEANING

♦ Drain all water from Neck, Reservoir, and connecting tube.
♦ Wash Skin Assembly, Neck and Torso with warm water and mild detergent to remove ultrasonic gel.
♦ If mold grows on the rubber parts after they have been stored wet, discard the veins and arteries, rinse the Vascular Insert and neck with 10% chlorine bleach and install new veins and arteries.
♦ Clean the surface of the neck and door on the neck where it had contacted the Subcutaneous Layer. Residual from the latex sheet can build up and reduce the sealing ability of the door.
♦ Allow to air dry thoroughly.

STORAGE

♦ Store the model with the latches on the Subcutaneous Layer Clamp and the Neck Insert OPEN. If the models are stored long periods of time in operating condition, the plastic parts will tend to deform under stress and the sealing ability may be reduced.

MAINTENANCE

Latch Problems
• If lid latch sticks, check that the hook is straight with respect to the body and re-latch.

Vascular Insert O-ring
• Do not install this O-ring by rolling it on, because it will then roll off. Instead, stretch it and put it in place. It will stay in place after it has been used for a while.
• If the neck leaks at the O-ring, remove, wash, and re-install the O-ring. If small leaks persist, apply a small amount of silicone grease to the O-ring.
Anatomy of the Neck Vasculature

Illustration from:
http://accweb.itr.maryville.edu/myu/image/ThyroidVein.gif
Replacement Components

**IJ Vein**
Penrose tubing, 3/4 inch diameter x 6 inches long (about 1¼ in wide when flat)
[McMaster-Carr part number 5308T127]

O-ring: 3/4” ID by 1/16” thick, extra hard Buna-N, Size 018
[McMaster-Carr part number 5308T127]

**Carotid Artery**
Latex tubing, super soft, 5/16 inch ID, 1/16 inch wall, 6 inches long
[McMaster-Carr part number 5234K34]

O-ring: 3/8” ID by 1/16” thick, extra hard Buna-N, Size 012
[McMaster-Carr part number 5308T121]

**Subcutaneous Layer**
Natural latex rubber film, 0.050 inch thick x 6.1 inch x 4.5 inch
[McMaster-Carr part number 85995K32]

Clear: Silicone rubber, 1/16 inch thick x 6.1 inch x 4.5 inch
[McMaster-Carr part number 86915K16]

**Seal for Vascular Insert**
O-ring: 3-3/8” ID by 1/8” thick, medium soft Buna-N, Size 237
[McMaster-Carr part number 2418T192]

**Subcutaneous Tunnel**
Velcro®, 2 inch wide, sew-on

Hole for inserting catheter is 3/16 x 1/2 inch (5 x 12 mm)

Insertion site is 2.0 inches (50 mm) from each end of Velcro piece

**Skin Assembly**
Natural latex rubber film, 0.020 inch thick x 13.0 in wide x 10.0 in
[McMaster-Carr part number 8611K16]

Velcro loop patches are attached with heavy duty staples

**Silicone Grease**
Dow Corning Molykote 111  McMaster P/N 1204K32

Most replacement parts can be purchased from McMaster-Carr Supply Company, Inc. at [www.mcmaster.com](http://www.mcmaster.com).

Penrose tubing for the IJ vein can be purchased from medical supply companies.

HemoCleanse will supply replacement parts upon request. Contact David Carr at dcarr@hemocleanse.com