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1492: Blood infused from 3 children into the Pope. All 3 children and the Pope died.
1638: William Harvey described the function of the Human Circulatory System.
1658: Christopher Wren used a quill and Pig’s bladder to infuse wine and opium into dogs.
1667: Successful transfusions between animals.
1818: First successful transfusion in child suffering from hemorrhage.
1832: First use of intravenous saline used to treat Cholera victims.
1933: First IV solution produced.
1940: First fulltime IV nurse in Massachusetts General.
1940 to 1946: IV skills taught to field medics in attempt to save more wounded soldiers on the battle field. It should be noted that up to this point, inserting an IV was deemed to be the job of the physician and outside the scope of nursing practice. Survival rate of wounded soldiers increased by approximately 5%.
1960: Central Venous cannulation first described.
1965: First use of PICC lines.
1990: It is documented that almost 90% of hospitalized patients receive some sort of IV therapy.

Vessels we use for Central Venous Access

Internal Jugular

External Jugular

Subclavian Vein

Axillary Vein

Cephalic Vein

Basilic Vein

Brachial Vein

New approaches for Nurse inserted CVCs (PICCs and Triple Lumens)

Axillary vein insertion.

- Can be challenging but it is a viable site if the patient meets the criteria for use of the site.
- Remember that you are now out of the arm and on the outer borders of the chest.
- Proper insertion will have you outside of the rib cage and safely away from the lungs.
- Positioning of the patient is key (arm to the side and head turned away from the side you are accessing). Placing the bed in the Trendelenburg position might help dilate the vessel.
- Care must be taken when inserting your PICC into this location to prevent catheter migration. If the subclavian vein is accessed, this catheter also has a very similar rate of occlusion as compared to PICCs. However, if you insert the PICC in the cephalic region, the occlusion rate is lower.
- Meticulous care must be taken after the insertion of the catheter to prevent any complications.
1. Thorough venous assessment with ultrasound of the patient should be performed on bilateral extremities to indeed identify that there are no usable vessels for traditional PICC insertion.
2. Thorough history of any vascular access is very important as this will dictate which vessel (right or left) will be attempted.
3. The patient’s chest mass must be taken into account. For example, patient of my mass would not be a very viable candidate for an axillary PICC without a harpoon.
4. As with PICC lines, the presence of medical devices (i.e. pacemakers or history of a pacemaker’s port) should be considered because of the stenosis caused by insertion of the wires into the subclavian vein.
5. It should be noted that this should not be your first stop if at all possible and your assessment of the patient should dictate how to best proceed.
6. Once you have selected your site, vessel entry should be performed again using the Modified Seldinger Technique with a micropuncture kit (this consists of using a 21 ga needle to access the vessel and wiring the vessel for purchase with a 0.018 wire).
7. Obtain a chest x-ray to both confirm placement and ensure that there is no pneumothorax.

Axillary Vein Insertion Candidates:
- Patients with a long history of numerous PICC insertions in both upper extremities and require venous access for treatment in a non-emergent situation.
- Patients that are unable to position their arm for PICC insertion. (Patients that have severe arthritis, rotator cuff problems, shoulder replacements, other conditions).
- Patients that require venous access but have no vessels in the upper extremities of suitable size for cannulation until reaching the level of the axillary vein.
Pectoral Muscle

• This is a big jump in practice. Remember, it’s not if you have a complication; IT’S WHEN.

• Very intricate yet very simple site for insertion.

• Again patient positioning is straightforward (head away from side being accessed and Trendelenburg the bed).

• With this site, air embolism is a VERY real danger, remember what you need to do if this occurs (besides the expletive that will creep out under your breath and behind the mask).

• These lines are excellent for the patient that requires CVP monitoring in the ICU.

• This is not a suitable site for the insertion of PICC lines. (External jugular insertion of PICC lines is still being considered at this time and is actually being performed in some facilities across the country).

1. Again, thorough venous assessment with ultrasound is of the utmost importance to identify the structures at the proposed site of insertion. It is important to the Internal Jugular that you avoid inadvertently accessing the Carotid artery.

2. The right Internal Jugular vein should be your first choice because it is a “straight shot” into the SVC in the coronal position. The left Internal Jugular can be used sometimes (in the acute patient) to access the brachiocephalic which crosses the chest (Accidental perforation can occur when dilating up to insert your catheter).

3. Proper insertion should be as close to the base of the neck to ensure, in most cases, safe positioning of the Internal Jugular from the Carotid artery.

4. Access is best achieved, if not emergent, by using a micropuncture kit and the Modified Seldinger Technique so that if the Carotid artery is hit, you are not dealing with a 14 ga hole but instead a 21 ga hole.

5. If emergent, use great care with the 14 ga needle and perform the procedure as you would normally (Seldinger). If everything is not clear, use the 18 ga needle and perform the procedure as you would normally (Seldinger).

6. To help avoid the development of a hematoma, take the patient out of Trendelenburg as soon as you have the catheter in place.

7. If possible, secure the catheter down to the collar bone ensuring that you have a gentle curve in the catheter.

8. Again obtain a chest xray to both confirm placement and ensure that there is no pneumothorax.
1. The patient has limited selections for venous access. Upper extremity co-morbidities preclude PICC placement.
2. The patient needs access in a more emergent situation.
3. Patients that need the most accurate CVP monitoring possible.
4. Patients that will require large volumes of fluid, and/or blood products (e.g. septic patients, GI bleeds, patients in cardiogenic shock (s/p cardiac arrest)).
5. Patients with CKD.
6. Patients with known coagulopathies may not be candidates for this procedure. (Platelet count of less than 50,000 or an elevated INR).
7. Any other patient that you think would benefit from have a large bore central line for treatment of their condition.

**Internal Jugular Criteria**

- 4.2% of time
- 71.4% of time
- 16.4% of time
- 9% of time

**Common Presentation of Vessels of the Right Neck on Ultrasound**

- 4.2% of time
- 71.4% of time
- 16.4% of time
- 9% of time

**Common Presentation of Vessels of the Left Neck on Ultrasound**

- 6.3% of time
- 75.5% of time
- 9% of time
- 9% of time
Complications related to the IJ and Axillary Procedure

- **Pneumothorax:**
  - Turn patient onto their right side to allow for full expansion of the left lung and vice versa if approaching from the left IJ.
  - Notify the primary care physician immediately so that further interventions can be instituted.
  - Monitor: respiratory effort, oxygen saturation, blood pressure, heart rate, and level of consciousness.
  - In severe cases, call a Code to get a physician to the bedside immediately. Emergency needle decompression can be performed until the physician arrives to place a chest tube.

- **Hemothorax:**
  - Most often a result of a “through and through” arterial stick while attempting access. (This is much more common in your patients that have coagulopathies).
  - Again, immediately notify the primary care physician and if necessary, call a Code to get a physician immediately to the bedside.
  - Monitor blood pressure, heart rate, respiratory effort, and level of consciousness.
  - Chest tube placement must be performed in order to evacuate the blood and if severe enough an emergency thoracotomy to stop the bleeding.

- **Air Embolism:**
  - This event requires that the patient be placed immediately on the Left side with the bed in Trendelenberg position to prevent the “air bubble” from entering the region of the pulmonic valve in the right ventricle.
  - Again closely monitor the patients blood pressure, respiratory effort, level of consciousness, and administer 100% O2.
  - Notify the primary care physician immediately for orders on how to proceed.
  - If the catheter tip is in the region of the right atrium, an attempt can be made to aspirate the air (this should be done at the discretion of the clinician inserting the line and/or the physician).
Complications related to the JU and Axillary Procedure

- Vessel Access, Cannulation, and Line Removal:
  - If the patient presents with sclerotic vasculature and as the clinician you have difficulty accessing the vessel, the patient should be referred to the Interventional Radiology department and the ordering physician notified. This is why it is very important to perform a thorough assessment of your patient with ultrasound and familiarizing yourself with the patient’s medical history before proceeding.
  - If you are unable to advance and/or retract your wire then the procedure should be halted and again notify the ordering physician for further direction.
  - Difficulty in dilating the tissue for line insertion or inadvertent vessel perforation with the dilator are complications that can be encountered.
  - When in doubt, PUNT.

So what about infection rates?

- Infection rates for Internal Jugular lines catheters averages 22% per 1000 catheter days or 113 lines out of 515 lines placed in a study published in the European Journal of Microbiology and Infectious Diseases.
- The most common organism causing infections being a Gram-positive bacteria (Coagulase-negative staphylococci).
- Another study (Lippincott’s Nursing Center www.nursingcenter.com) stated that for PICC’s, the infection rate was 2.4% or 2.1 episodes per 1000 catheter days compared to CVC rates of 4.4% or 2.7 episodes per 1000 catheter days.

Proper documentation of Internal Jugular Placement

- Sample Note:
  Order received and verified for Central line placement. Risks, benefits, and alternative treatments/options discussed with the patient and signature on consent witnessed. Patient’s medical records, to include allergies, were reviewed. Time out called and patient identifiers verified. ## neck was then prepped with ########## and draped in the usual sterile manner. # ml of 1% lidocaine was used as a local anesthetic. With the use of ultrasound guidance, the vessels were assessed, imaged and determined patent. The ## internal jugular vein was accessed using the modified Seldinger technique on the # attempt. Blood return was non-pulsatile and venous in color. An S/D/T imaging Central line was then inserted and flushed with ## ml normal saline per port. The Central line was then secured with 3-0 Ethilon sutures and covered with a Tegaderm with CHG gel dressing. Stat chest x-ray ordered for tip placement. Charge/Primary nurse instructed to not use line until tip confirmation obtained. EBL <# ml. Tip of catheter in PM/PD SVC on chest xray. Charge/Primary nurse notified of tip position and given clearance to use line at this time.

Thank You

Questions??