Femoral - Central Venous Catheterization

INTRODUCTION:
Commonly placed in the ED for rapid infusion of fluids, placement of transvenous pacemakers, and administration of medications needing reliable central access. Sites of placement are the internal jugular vein, subclavian vein and femoral vein.

The femoral central line commonly place in the setting of trauma for emergency access or when a patient has difficult peripheral access. It carries a higher risk of infection and DVT compared to the other sites, but has less risk of serious complications given its location. The line can be done easily with or without ultrasound.

GOALS OF THE PROCEDURE:
- Obtain reliable central venous access without complications

INDICATIONS
- High volume resuscitation
- Emergency venous access
- Inability to obtain peripheral access
- Administering medications needing central access (ie vasopressors)
- Hemodialysis
- Infusion of hyperalimentation and other concentrated solutions
- CVP monitoring

GENERAL CONTRAINDICATIONS
- Infection overlying site of placement
- Distorted local landmarks due to trauma, mass, etc.
- Uncorrected coagulopathy (risk of bleeding much lower than other sites)
- Prior vessel injury or procedures
- Pathological conditions
- Uncooperative patient

FEMORAL LINE SPECIFIC CONTRAINDICATIONS
- Suspected intraabdominal hemorrhage
- Injury to the pelvis, groin, iliac vessels, or IVC
- Suspected DVT present
- Ambulatory patients that require central access

COMPLICATIONS:
- Arterial puncture and/or hematoma
- Vessel injury
- Air embolism
- Femoral nerve injury
- Infection
- Thrombosis
- Catheter or guidewire misplacement
EQUIPMENT
- +/- Ultrasound machine with sterile probe cover
- PPE (sterile gown & gloves), mask, eye protection and hair covering
- Triple Lumen or Cordis Central Venous Catheter kit
- Extra Lidocaine 1% for the awake patient
- Tegaderm
- Antibiotic impregnated biopatch
- 3 dead heads
- 3 saline flushes (if sterile drop on field, if not sterile squirt onto kit tray)

ANATOMY
Anatomical Location:
- Below the inguinal ligament and 1 cm medial to the femoral artery
- NAVEL mneumonic (lateral → medial)
  - Nerve, Artery, Vein, Empty space, Lymphatics

![Image](image_url)

STEPS
1. Position the patient supine
2. Open your central line kit, prep the skin with chlorhexidine, and get sterile
3. If you are using ultrasound, place sterile probe cover and then identify the femoral vein (medial to femoral artery)
4. Anesthetize the skin making sure to aspirate when you enter the skin to avoid infiltration into the vessel
5. If doing procedure blind, palpate your femoral artery 2 finger breaths below the inguinal ligament
6. Insert your needle:
   a. 1 cm medial the femoral artery (hold non-dominant fingers over the femoral artery for landmark)
   b. At a 45-degree angle cephalad towards parallel to the leg
   c. Alternatively (good in hypotensive trauma)
i. Place your middle finger on the ASIS and thumb on the pubic symphysis, insert your needle where your first dorsal web space is located

7. The femoral vein is usually 2-3cm deep depending on the pt’s body habitus
8. Insert the central line as described in the Internal Jugular Section

VIDEO INSTRUCTION:
- https://www.youtube.com/watch?v=KW1gjL-hMhk

DEEP DIVE
- Further Reading:
  - Roberts & Hedges’ Clinical Procedures in EM. 6th edition. pg 397-431
- Recommended FOAM and other videos
  - Life in the Fastlane
    - Central Venous Cannulation
  - EMCrit
    - Central Lines
      - http://emcrit.org/central-lines/
    - Review article on central line complications and preventing them
  - ALiEM
    - Approach to difficult access
      - http://www.aliem.com/approach-difficult-vascular-access/

- Femoral Line Pearls
  - During chest compressions, pulses can often be felt in the femoral vein or artery
  - If you start too inferiorly, you may cannulate the saphenous vein making it difficult to introduce the guidewire
  - If you start too superiorly (ie above the inguinal ligament), you have the risk of cannulating the femoral artery, as it starts course anteriorly over the femoral vein, instead of side-by-side, after the inguinal ligament
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| Internal Jugular           | - Good external landmarks  
- Improved success with ultrasound  
- Less risk for pneumothorax than with SV access  
- Can recognize and control bleeding  
- Malposition of the catheter is rare  
- Almost a straight course to the superior vena cava on the right side  
- Carotid artery easily identified | - More difficult and inconvenient to secure  
- Possibly higher infectious risk than with SV access  
- Possibly higher risk for thrombosis than with SV access |
| Femoral                    | - Good external landmarks  
- Useful alternative with coagulopathy | - Difficult to secure in ambulatory patients  
- Not reliable for CVP measurement  
- Highest risk for infection  
- Higher risk for thrombus |
| Subclavian, infraclavicular| - Good external landmarks | - Unable to compress bleeding vessels  
- “Blind” procedure  
- Should not be attempted in children younger than 2 yr |
| Subclavian, supraclavicular| - Good external landmarks  
- Practical method of inserting a central line in cardiorespiratory arrest | - “Blind” procedure  
- Unable to compress bleeding vessels |