TITLE: REMOVAL OF A FEMORAL VENOUS/ARTERIAL SHEATH AND MANAGEMENT OF FEMORAL HEMOSTASIS (car11)

DATE: 6/03
REVIEWED: 2/17
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ISSUED FOR: Nursing

RESPONSIBILITY:
Qualified RN for CAC, CVICU, Invasive Cardiology
Radiology Nurse for ACT’s
Qualified LPN II for CAC
Qualified LPN II and Multi-skilled tech for Invasive Cardiology
Multi-skilled Tech/PCT-Critical Care
Certified Cardiovascular Technologists (CVT’s)
Radiology Technologists for Interventional Radiology
Qualified RN for Cardiac Progressive units for maintenance use of Femostop

PURPOSE: To establish a procedure for removal of femoral arterial/venous sheath(s) and hemostasis management after sheaths are removed.

RESOURCES: Staff of Cardiac Acute Care (CAC), Invasive Cardiology (Cath Lab), Cardiovascular Intensive Care (CVICU).

DEFINITIONS: Qualified RN, qualified LPN II for CAC, qualified LPN II and multi-skilled tech for Cath Lab, multi-skilled tech/PCT for critical care, or Angio-Technologist for Interventional Radiology is one who has had education and training regarding the discontinuation of femoral arterial/venous sheath(s) and has demonstrated competency.

Qualified RN for Cardiac Progressive units is one who has had education and training regarding the use of the Femostop for maintenance of hemostasis.

FemoStop™Gold: Femoral compression system that consists of an arch with a sterile pneumatic pressure dome, a belt, and an attached pump with a digital manometer.

The Activated Clotting Time (ACT-LR) is a point-of-care test used to
determine clotting time following administration of heparin.

The ACT-LR protocol may be performed by an RN (or qualified LPN II) in Cardiac Acute, the Cardiac Intensive Care, Invasive Cardiology or Interventional Radiology. Annual competency in ACT-LR testing is conducted under the direction of the Laboratory Point of Care Coordinator.

An ACT-LR is not required for patients who have had a closure device placed, and no other sheaths to be removed.

An ACT-LR is not required for patients who received bivalrudin (Angiomax) in place of heparin, and have no other sheaths to be removed, because bivalrudin has a stable half-life of 25 minutes. Sheaths may be pulled 2 hours after bivalrudin (Angiomax) infusion is completed. Dialysis patients are an exception to this statement, and sheath removal time should be directed by physician.

Clinical staff initiating use of the FemoStop™Gold should be proficient in using manual pressure to achieve hemostasis, and management of complications.
PATIENT EDUCATION:

- Explain the procedure to the patient
- Explain the importance of bed rest, of not lifting the head off the pillow, of maintaining the head of the bed elevation as ordered, and of keeping the affected extremity straight for a specified time to maintain hemostasis after the procedure
- Explain the procedure may produce discomfort and that pressure will be felt at the site until hemostasis is achieved.
- After sheath removal, instruct the patient to report any warm, “wet feeling” or pain at the puncture site. Also instruct the patient to report any sensory or motor changes in the affected extremity.

EQUIPMENT:

Assemble the following and have emergency equipment readily available for sheath removal:
1. Sterile 4 x 4’s;
2. Disposable suture set;
3. Clean gloves and sterile gloves;
4. Occlusive dressing
5. Personal protective equipment (goggles/face shield/gown);
6. Red biohazard bag;
7. FemoStop™Gold
8. Atropine 1mg for PRN usage for symptomatic bradycardia.
9. Normal Saline 1000 ml for PRN use if vasovagal response occurs and fluids are needed.

PROCEDURE:

1. Check physician’s orders regarding sheath removal. MD orders may give specific orders regarding sheath pull. If the MD orders do not reference the ACT protocol (see below), or give specific orders regarding when to discontinue the sheath post angioplasty/stent, contact physician for orders. 
   NOTE: For radial-access procedures, refer to car13. For a brachial sheath post angioplasty/stent, pull when specified by the MD order.
2. Check for last dose of Low Molecular Weight Heparin (LMWH, i.e. Lovenox or enoxaparin) administration time. Normally, there is an expected wait time of 6-8 hours after its administration, before sheath(s) are pulled. Consult with physician, as this may differ with lower prophylactic doses.
3. The ACT-LR is performed for sheath removal on the following units: CAC, CVICU, Invasive Cardiology and Interventional Radiology. All patients receiving heparin
in the Cath Lab or Interventional Radiology will have an ACT-LR performed prior to sheath removal. The procedure for ACT-LR is found on the SMH Pulse site’s Laboratory page, under Point of Care Procedures, and is titled “HEMOCHRON® Signature Elite Low Range Activated Clotting Time (ACT-LR) Test.”

4. Electronic Quality Control (EQC) will be performed automatically by the ACT-LR machine. Liquid QC will be manually performed every 30 days.

5. **ACT Protocol (for sheath removal):**
   a. A 6 French or smaller femoral sheath is pulled when the ACT is less than 200 seconds if patient had a diagnostic-only procedure, and is not on IIb/IIIa inhibitor.
   b. A 7 French or larger femoral sheath is pulled when the ACT is less than 170 seconds.
   c. For a brachial or radial sheath post PCI, pull when specified by MD order.
   d. Contact procedural physician for specific orders for any other scenarios which fall outside this protocol.
   e. If ACT-LR level is too high to pull the sheath, the line used to draw blood should be flushed and re-capped. The ACT-LR should be repeated at intervals according to the following sliding scale until the ACT-LR is at the desired level: ACT-LR > 250, repeat and flush at two-hour intervals; ACT-LR < or = 250, repeat and flush at hourly intervals.
   f. Once ACT-LR is at desired level, or if the patient did not receive procedural anticoagulation, venous and arterial sheath removal should be a priority, to prevent thromboembolism. Once ACT-LR is < 250, each sheath that does not have an attached flush solution or IV fluid must be manually aspirated and flushed every hour. This is done by drawing back 4-6 ml blood with a syringe to ensure absence of clot, and then flushing with normal saline flush solution. If a pressurized flush bag is present (arterial sheath) or IV solution running to sheath (venous), manual flushing is not necessary. NOTE: Special consideration must be given to VTE prevention when multiple venous sheaths are used for electrophysiology studies. Sheath size, number of sheaths, and amount of anticoagulation may affect the risk of femoral thrombosis. If the patient is in the PACU and ACT-LR or flushing is required, the PACU staff will call Invasive Cardiology, Cath Lab Recovery, or Cardiac Acute to assist with aspiration and flushing.
If the ACT-LR value should increase over time instead of decrease, or stay the same over a two hour period, options available for troubleshooting include:

- Utilize a different ACT-LR machine if one is available.
- Initiate Electronic QC
- Perform Liquid QC

Any results exhibiting inconsistency with the patient’s clinical status should be repeated. If still inconsistent, the physician should be notified, and a PTTh should be drawn as a guideline for sheath removal. A PTTh of <40 is appropriate for sheath removal.

**PREPARATION FOR REMOVAL OF SHEATH(S):**

1. Ensure additional nursing staff is available and notify Health Unit Coordinator/CMT on nursing unit of planned sheath removal.
2. If patient on IIb/IIIa platelet inhibitor (such as Reopro, Integrelin or Aggrastat), verify that a blood bank clot (BBC) has been received/processed by the Blood Bank prior to the discontinuation of the sheaths, and activate the conditional order for 2-hour Hemogram with Platelet if not already done.
3. Review patient’s medical history for bleeding disorders.
4. Note last CBC and coagulation profile on the chart
5. Assess femoral site for presence of hematoma or bleeding.
6. Assess distal pulses and note color and temperature.
7. Assure IV line is patent.
8. Obtain Vital Signs including pulse oximetry. Assess for elevated BP because that makes it more difficult to apply pressure on the femoral artery.
9. Allow the patient to empty his/her bladder or catheterize if unable to void and MD order applies.
10. Pre-medicate if medications are ordered and appropriate for patient.
11. Consider using a leg immobilizer if the patient is confused or has restless leg syndrome.
12. Perform hand hygiene.
13. Position the patient flat with hips straight; may slightly laterally rotate the leg for ease of access to the arterial site
14. *If you are using the FemoStop™Gold for sheath removal instead of manual pressure, refer to the section below titled FemoStop™Gold Use for Sheath Removal.
15. Remove the old dressing using clean gloves. Assess the current condition of the site and ensure that this is documented.
16. Remove clean gloves and perform hand hygiene.
17. Don protective equipment.
SHEATH REMOVAL PROCEDURE:

Note: To minimize the risk of AV-fistula formation, the venous sheath and the arterial sheath should be removed separately. If resistance is met when removing the sheath, stop and reassess the site and the sheath and notify MD.

1. Venous site:
   a. Attach 10-12 ml syringe to sheath port and aspirate 5-10 ml blood to ensure no clot has formed in sheath. If aspiration is not possible, pull sheath slightly out (approximately 1 cm) and attempt aspiration again. If aspiration is still unsuccessful, maintain negative pressure to sheath with syringe during removal.
   b. Preferred Technique: Using gloved fingers of one hand; apply increasingly firm pressure to groin using middle 2-3 fingers as you remove the venous sheath with the other hand.
   c. Apply manual pressure distal to and at the insertion site for a minimum of 15 minutes (ColumbiaHeartSource, 2016).

2. Arterial Site:
   b. Preferred Technique: Place index finger approximately 2 cm proximal and slightly medial to the skin puncture site on the arterial pulse. This should allow compression of the arterial puncture site.
   c. The middle 2-3 fingers will compress the artery proximal to the arterial puncture site.
   d. Continue to apply manual pressure proximal to the skin insertion site (over the arterial pulse) for at least 20 minutes or until hemostasis is achieved.
   e. The length of time necessary to achieve hemostasis depends on several factors, including the size of the sheath used, the type of procedure, the use of heparin and antiplatelet medications during the procedure, the ACT-LR level at the time of sheath removal and the patient’s anatomy at the femoral insertion site. Additionally, patients who are hypertensive or obese may require longer application of pressure.

CAUTION NOTE: Hemostatic pressure should not be so great as to obliterate the distal peripheral pulses in the affected extremity for more than 2-3 minutes. If hemostasis not achieved at the end of twenty (20) minutes, reapply pressure and check site every five (5)
minutes until bleeding stops.

EXCEPTIONS:
For **antegrade arterial punctures**, pressure must be held above and below the skin puncture, involving both hands. Rationale: The arterial puncture is distal to the skin puncture; so one hand is above the arterial puncture and one is directly over it.

For **brachial and radial arterial punctures**, pressure should be held directly over the skin puncture site.

10. Once hemostasis is achieved, apply dressing over the site, unless FemoStop™Gold is going to be utilized.
11. May apply FemoStop™Gold at low pressure (20-40 mm/Hg) to maintain hemostasis if ordered. FemoStop™Gold use at low pressure may be indicated for maintenance of hemostasis when risk of rebleeding is increased, such as when Glycoprotein IIb/IIIa Inhibitors have been given. The FemoStop™Gold should be used only for a limited time, the device should be released and reapplied every 2-3 hours while in use, and the puncture site and surrounding tissue under the device should be reassessed frequently.
12. Inform the patient of activity restrictions and reinforce patient teaching including:
   a. Bed rest per physician’s order. Keep affected leg straight and head of bed at less than 30 degrees elevation unless otherwise ordered.
   b. Splint groin for coughing/sneezing.
   c. Ask for assistance with elimination.

POST SHEATH REMOVAL MONITORING
1. Monitor vital signs, dressing checks and pedal pulses as per physician order set.
2. If bleeding or hematoma occurs, immediately remove FemoStop™Gold if in use, apply manual pressure and notify the procedural physician or covering physician.
3. Report to procedural physician:
   - Any change in sensation or pain in the affected extremity
   - Any changes in pulses of the affected extremity
   - Pallor or cyanosis of the affected extremity
   - Signs of retroperitoneal bleeding, hypotension, tachycardia and back pain.

FEMOSTOP™GOLD USE FOR SHEATH REMOVAL
1. Follow steps 1-15 in “Preparation for Removal of Sheath(s)”. Open the FemoStop™Gold package maintaining sterility of the dome until placed on the
patient. Loosen the control knob on the pump to enable pulling the red battery release. Pull the red battery contact release in the direction of the arrow. When “---” is shown on the display, the pump is activating. When “0” is shown, the activation sequence is complete, and the pump is ready to use.

2. Place belt under and around the patient’s hips pulled up equally on both sides and directly in line with the puncture sites.

3. Insert belt through the arch beginning on the opposite side of the sheaths. Press the lever and insert the belt through the arch leaving the belt slightly loose.

4. Don protective equipment.

5. Don sterile gloves.

6. Clip and remove sutures.

7. Note the small circle in the center of the dome. Place the circle approximately 2cm superior and slightly medial to the skin puncture site after removing the plastic cap. Thread other side of the belt through the holder.

8. Tighten both sides of the belt, making sure both sides of the belt are even so that when the device is inflated, the arch sits squarely and does not tilt. **NOTE:** Belt should hold dome securely but should not exert any pressure on the groin until the dome is inflated.

9. Be sure the position of the dome is correctly (2cm superior and slightly medial to the skin incision).

10. Using the pump, inflate the dome pressure to 20 - 30 mm/Hg. Control knob rotates for inflating and deflating the dome – clockwise or closed to inflate, counterclockwise or open to deflate. (Ensure pinch clamp on tubing of device is open when inflating or deflating dome.) Remove the venous sheath. Allow 15 minutes for hemostasis at venous site before removing the arterial sheath. Venous hemostasis should be achieved prior to removal of the arterial sheath to minimize the risk of arterial/venous fistula formation.

11. Inflate the dome pressure again to 60-80 mmHg. Remove the arterial sheath at 60-80 mmHg. Quickly increase the pressure to 10 -20 mmHg above the patient’s SBP. Monitor the puncture sites for any bleeding. Assess pedal pulses. To prevent limb ischemia, do not leave artery completely blocked (with pedal pulses occluded) for more than 3 minutes.

12. Pressure can be gradually decreased to the lowest pressure that will allow for a balance between palpable pedal pulses and controlled hemostasis.

13. Monitor pressure gauge to make sure pressure is maintained.
14. Check puncture site for hematoma or bleeding, BP and pedal pulses throughout the procedure

15. After about 10 minutes begin to gradually lower the pressure until pressure is completely released or maintenance pressure is reached (20-40 mmHg).

**NOTE:** If a hematoma develops at any time while the FemoStop™Gold is on, immediately remove the FemoStop™Gold and apply manual pressure. Notify the physician of any new hematoma or rebleed. FemoStop™Gold may be reapplied once the hematoma is resolved.

16. Apply dressing unless you are going to continue to use the FemoStop™Gold at low pressure.

17. Inform the patient of activity restrictions and reinforce patient teaching including:
   a. Bed rest per physician’s order. Keep affected leg straight and head of bed elevation as ordered.
   b. Splint groin for coughing/sneezing.
   c. Ask for assistance with elimination.
   d. Do not lift head off of pillow or mattress

18. Follow steps for “Post Sheath Removal Monitoring” as previously noted.

**USE OF THE FEMOSTOP™GOLD FOR MAINTENANCE OF HEMOSTASIS (APPROPRIATE FOR UNITS THAT REMOVE SHEATHS, AS WELL AS CARDIAC PROGRESSIVE UNITS: CP2, CP3, AND CAC/CP):**

Note: FemoStop™Gold use at low pressure may be indicated for maintenance of hemostasis when risk of rebleeding is increased, such as when Glycoprotein IIb/IIIa Inhibitors have been given. The FemoStop™Gold should be used only for a limited time, the device should be released and reapplied every 2-3 hours while in use, and the puncture site and surrounding tissue under the device should be reassessed frequently. **If a hematoma develops at any time while the FemoStop™Gold is on, immediately remove the FemoStop™Gold and apply manual pressure. Notify the physician of any new hematoma or rebleed.**

1. With clean gloves, remove any dressing over puncture site so that sterile dome of device may be placed directly over site. Perform hand hygiene.
2. Open the FemoStop™Gold package, maintaining sterility of the dome until placed on the patient. Loosen the control knob
on the pump to enable pulling the red battery release. Pull the red battery contact release in the direction of the arrow. When “---“is shown on the display, the pump is activating. When “0” is shown, the activation sequence is complete, and the pump is ready to use.

3. Place belt under and around the patient’s hips pulled up equally on both sides and directly in line with the puncture sites.

4. Insert belt through the arch beginning on the opposite side of the sheaths. Press the lever and insert the belt through the arch leaving the belt slightly loose.

5. Note the small circle in the center of the dome. Place the circle approximately 2cm superior and slightly medial to the skin puncture site after removing the plastic cap. Thread other side of the belt through the holder.

6. Tighten both sides of the belt, making sure both sides of the belt are even so that when the device is inflated, the arch sits squarely and does not tilt. **NOTE: Belt should hold dome securely but should not exert any pressure on the groin until the dome is inflated.**

7. Be sure the position of the dome is correctly (2cm superior and slightly medial to the skin incision).

8. Ensure pinch clamp on tubing of device is open. Using the pump, inflate the dome pressure to 40 mm/Hg.

9. Close pinch clamp on tubing to maintain pressure.

10. Inform the patient of activity restrictions and reinforce patient teaching including:
   a. Bed rest per physician’s order. Keep affected leg straight and head of bed elevation as ordered.
   b. Splint groin for coughing/sneezing.
   c. Ask for assistance with elimination.
   d. Do not lift head off of pillow or mattress

11. Monitor vital signs, site checks, and distal pulses as per physician order set.

If a hematoma develops at any time while the FemoStop™Gold is on, immediately remove the FemoStop™ Gold and apply manual pressure. Notify the physician of any new hematoma or rebleed. FemoStop™Gold may be reapplied once the hematoma is resolved.

12. Report to procedural physician:
   - Any change in sensation or pain in the affected extremity
   - Any changes in pulses of the affected extremity
   - Pallor or cyanosis of the affected extremity
   - Signs of retroperitoneal bleeding, hypotension, tachycardia and back pain.

13. Remove after ordered time period by releasing belt from the arch. Dispose of device per current hospital guidelines.

14. Apply dressing over the puncture site(s).

15. Continue to assess site and distal perfusion following removal of device per orders or per unit standards of reassessment.
C-CLAMP USE FOR SHEATH REMOVAL  
(APPROPRIATE FOR POSTCATHETERIZATION  
RECOVERY ROOM)

a. See steps 1-18 in “Preparation for Removal of Sheaths”. May need to pull patient’s body toward edge of bed or stretcher with a draw-sheet to ensure accurate positioning of clamp.
b. Place metal base of C-clamp on flat surface directly under patient or under mattress directly below hip.
c. Place sterile disc firmly on tip of arm slide.
d. Lift top lever to release shaft lock, and swing arm over puncture site. Lock shaft by pressing top lever down.
e. Adjust slide at end of arm so that pressure disc is proximal and medial to femoral puncture site.
f. As catheter is withdrawn, press clamp arm downward, making sure puncture site is centered in v-notch of disc and remains visible.
g. Maintain firm pressure over femoral artery site while ensuring adequate distal perfusion, until hemostasis occurs.
h. Adjust arm lock into position above arm.
i. Check patient regularly for bleeding, hematoma and thrombosis while device in use.
j. When hemostasis achieved with device for 10 to 15 minutes, gradually (over 2-3 minutes) release the pressure by slowly moving release lever, located directly above the arm, up and down.
k. Final release should occur when hemostasis is complete and pulses are palpable. If bleeding is noted, increase pressure of device until bleeding stops.
l. Apply dressing over the puncture site(s).

USE OF CELOX™HEMOSTATIC PAD AS AN  
ADJUNCT TO MANUAL OR MECHANICAL  
COMPRESSION

a. Open sterile package and maintain aseptic technique in handling of pad.
b. Place pad over the access site and point of compression, ensuring that the indicated side is touching the skin.
c. Remove sheath, ensuring some blood touches the pad. Apply firm manual compression for 15 minutes, or until
hemostasis is achieved.

d. Leave pad in place. Apply adhesive bandage over pad.

e. Remove pad the next morning, or instruct patient to remove no later than 24 hours after application.

f. To remove, gently peel away the adhesive bandage, then the pad, using saline if required to loosen.

**DOCUMENTATION:**

Document patient teaching, pre-medication, pain level and relief with PRN medications, the removal of femoral venous/arterial sheath, patient assessment including heart rate, blood pressure, presence of distal pulses, color of extremity and site appearance, presence or absence of hematoma or ecchymosis and tolerance of procedure before and after sheaths removed and/or FemoStop™Gold applied. Documentation of a hematoma should include the approximate size in centimeters.

CAC/CVICU: Document on the Vascular Flowsheet in SCM.
Cath Lab: Post Procedure Menu in the Xper system
REFERENCES:


St. Jude Medical FemoStop™Gold package insert.


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APPROVAL: Clinical Practice Council  2/2/17