LEARNING MODULE FOR

LATE ARTERIAL & VENOUS SHEATH REMOVAL
Post Cardiac Catheterization and Percutaneous Coronary Intervention (PCI)

(DELEGATED MEDICAL FUNCTION)

CC 10-060

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LEARNING OBJECTIVES
Following completion of the learning activities, the RN will be able to:

1. Discuss:
   • nursing assessment & interventions pre, during and post arterial or venous sheath removal.
   • assessment and interventions for potential complications

2. Demonstrate competency according to the attached Proficiency Skills Checklist including:
   • appropriate assessment of the patient, pre, during and post sheath removal
   • effective application of arterial clamp and manual pressure post removal of the venous and arterial sheaths
   • management of post procedural complications
   • an ability to effectively teach patients regarding post sheath removal, diet and activity.
   • a calm confident approach to arterial and venous sheath removal and post sheath removal care

METHOD
The RN will perform the following learning activities:

1. Review the Post PCI & Late Cardiac Catheterization Arterial & Venous Sheath Removal Policy & Learning Module.
2. Observe venous and arterial sheath removal by an interventional cardiologist, radiologist and/or clinical associate.
3. Additional observation of sheath removal by RN’s deemed competent in the DMF is also benefcial.
4. Under supervision of an interventional cardiologist or radiologist: remove cardiac sheaths in the cath lab / bay area until competency achieved in early sheath removal. Suggested 10 sheath removals in cath lab / bay.
5. Under supervision of a Clinical Associate, remove arterial and venous sheaths on CDU until competency achieved in late sheath removal. Suggested 5-10 late sheath removals, ensuring opportunity to use both manual and clamp methods.
6. Document sheaths removed under supervision on the appropriate form/competency record.
7. Submit the completed competency record to the manager once competency achieved in late sheath removal.
8. Annual reassessment of competency is required for all DMF’s.
   • Review the policy & learning module
• Seek out learning opportunities / discuss with nurse delegate or physician as needed.
• Be observed by / demonstrate sheath removal procedure to a nurse delegate or Clinical Associate.
• Document your annual self-assessment on the appropriate competency record.

THEORY

Sheath Description
• Arterial & venous sheaths (introducers) are small flexible catheters, used as a guide for wires, stents, balloons, rotoblades etc. that are passed through the sheath to perform diagnostic procedures and percutaneous interventions (PCI’s).
• Arterial and venous sheaths have side arms that allow blood samples to be taken and arterial flush solutions, intravenous fluids and medications to be given.
• Once the procedure in cath lab has been completed, the sheath remains in place for (in general), a short period of time before removal.
• “Early” sheath removal post cath and PCI is associated with lower complication rates.
• Diagnostic procedures usually use smaller catheters, and the sheaths are removed in the cath lab bay.
• Sheath removal for PCI’s generally occurs outside of the cath lab; optimal time for removal post procedure varies according to procedure and the type of antiplatelet and thrombolytic medications administered.
• The anatomy of the inguinal region is shown in Figure 1.
• A mnemonic to remember the important structures crossing the inguinal ligaments is NAVEL where N = femoral nerve; A = femoral artery; V = femoral vein and EL = empty space with lymphatics.
• Move lateral to medial to locate these structures.

FIGURE 1
Late Removal Complications

- A concern with late sheath removal is the vasovagal episode that could lead to abrupt closure of the coronary artery resulting in acute myocardial infarction.
- The drop in blood pressure brought on by a vasovagal episode could lead to thrombus formation and precipitate abrupt closure of the coronary artery.
- Other complications may include excessive blood loss, hematoma and pseudo aneurysm formation in the femoral artery, arteriovenous fistula and femoral arterial occlusion. (These will be discussed, in more detailed in another section of the module).
- With the increased use of a mechanical groin clamp to achieve hemostasis, the potential for a neuropathy of the lower extremities also exists.

Prevention of Vasovagal Response during late sheath removal

- Pre-medication with sedatives, analgesia, atropine, and fluid bolus will assist in the prevention of a vasovagal episode that may be induced by the pain of manual/mechanical pressure.

Patient Comfort during Late Sheath Removal

- The local lidocaine anesthesia in the groin usually wears off in 60-90 minutes. Therefore, during late sheath removal, additional medication is required for patient comfort.
- The addition of pain medication 30-60 minutes prior to sheath removal may reduce the amount of diazepam required and may increase patient comfort during what can be a painful procedure.

IV Direct Atropine: Patient assessment

- It is imperative that the patient is monitored while receiving direct IV atropine.
- Prior to administering atropine, the nurse will determine the patient’s cardiac status by assessing and documenting the rate and quality of the radial pulse.
- Following the administration of atropine, the nurse will continue to monitor for drug effects; radial pulse is assessed every 5 minutes x 2.
- Do not administer atropine if the pulse is greater than 100/min. Notify the physician immediately if the pulse is greater than 120/minute following administration and the patient is symptomatic or complaining of chest pain. (Excessive cardioacceleration can precipitate or worsen arrhythmias or ischemia or increase degree of infarction.)

Sedation

- It is also important to monitor the patient’s response to diazepam.
- When deciding the dose, consider the patient’s age, weight, anxiety level and response to recent administration of pain medications.
- To prevent inadvertent over-sedation, begin with a smaller dose and administer additional diazepam according to the patient’s response/ need throughout the procedure.
- Obtain baseline pulse, respiratory rate and O₂ saturation level prior to administration.
• Continue to monitor until groin compression is complete and hemostasis achieved.
• Notify the physician if O₂ saturation is less than or equal to 90% or where rapid desaturation from baseline is noted.
• Suction, O₂ and antidote / reversal agent for sedation must be readily available on the unit

Bleeding:

• Platelet aggregation inhibitors and anticoagulant agents are administered before, during and after PCI to prevent restenosis; patients are routinely started on aspirin and clopidigrel (plavix) before the procedure. Heparin or bivalirudin (angiomax) is administered intravenously after vascular access is established. After the PCI is completed, infusions of glycoprotein IIb/IIIa receptor antagonists such as abciximab (reopro) and eptifibatide (integrilin) are administered.
• With the use of multiple adjuvant agents, the tendency to bleed post procedure may be increased.
• Sheath removal times post-procedure consider the type of antiplatelet & antithrombin therapy.
• Careful assessment for bleeding, and increased groin compression time following sheath removal is required.

Other Considerations:

• In some patients, because of a recent unstable course or angiographic concerns with dissection at the angioplasty site or apparent thrombus, the arterial sheath will be left in place for 24 hours.
• If the sheath is to be left in, then a pressurized arterial flush setup is required to avoid thrombus formation in the sheath and the potential for embolization.
• These patients are generally sent to CCU following their procedure.
• Some patients may experience excessive bleeding around the arterial sheath. To deal with this problem, the interventional cardiologist may replace the sheath with a larger size of sheath, discontinue anticoagulants or remove the sheath early.

Sheath Removal Procedure:

• The patient is assisted to move closer to the side of the bed and positioned so that the arterial clamp can be applied if needed.
• The patient is then pre-medicated.
• The occlusive dressing is carefully removed from the sheath

Method

• The base of the arterial clamp is placed under the mattress (or under the patient with some models) and positioned so that the extension arm of the clamp will rest over the skin directly over the puncture site of the artery.
• After positioning the patient and the clamp, the extension arm and compression button are removed from the clamp and placed in a nearby location so that it can be reached with the free hand if needed. When required, the compression button and extension arm are placed on the clamp and brought down into position over the femoral artery.
• Generally, the left hand is used to compress the right femoral artery while the right hand is used to compress the left femoral artery.
• Manual pressure is applied to the artery so that the index finger is placed on the site where the sheath enters the femoral artery.
• The middle and ring fingers of the same hand are used to reinforce compression.
• After the hand is placed on the artery, manual pressure is applied as the arterial sheath is gently removed from the site.
• Just enough pressure is applied to avoid excessive blood loss; however, a small amount of blood should be allowed to escape from the artery in case of thrombus formation associated within the sheath.
• After allowing a small amount of blood to escape, firm pressure is applied. Apply just enough pressure to achieve hemostasis but not obliterate the pedal pulses.
• Expect the pulses to be diminished. An assistant can determine by Doppler the presence of the pedal pulse prior to compression and the diminution of the pedal pulse when sufficient pressure has been applied to the femoral artery.
• Maintain this pressure level for a period of 3-5 minutes.
• Gradually release the pressure to allow the pedal pulse to progressively strengthen. Maintain a delay between when the pulse is felt by the compressing hand and when it is felt by the hand palpating the pedal pulse. Maintain this amount of pressure for another five minutes.
• The pressure is gradually removed over 5-10 minutes allowing for a progressive strengthening of the pedal pulse.
• With the non-compressing hand, palpate the femoral area around the compressing hand to ensure there is no occult hematoma formation.
• If there is evidence of bleeding from the puncture site or increasing hematoma formation as pressure is released from the femoral artery, apply more pressure to the artery.
• When applying manual pressure, remove the venous sheath 5-10 minutes after pulling the arterial sheath as long as control of arterial bleeding has been achieved manually or with the groin clamp.
• If despite 15-20 minutes of manual pressure there is bleeding or continuing hematoma formation, then the clamp should be applied.

Clamp Application:
• Place the compression button and extension arm on the clamp and bring it down into position on the femoral artery.
• remove the venous sheath first, then apply pressure for 3-5 minutes until bleeding controlled, then remove, arterial sheath and apply clamp
• The “notch” of the compression button should be directly over the skin incision. There may be a brisk episode of bleeding when the hand is removed and the clamp is being quickly applied to the femoral artery.
• The clamp should be applied in such a manner that hemostasis is achieved but the pedal pulses are only diminished and not obliterated.
• If active bleeding or a hematoma develops, the clamp must be released and reapplied increasing the pressure. If only a moderate degree of compression is required to stop the bleeding, then the clamp may be applied with only this degree of pressure and slowly released every 5-10 minutes until totally removed from the artery.
The clamp may be applied as a prophylactic measure to prevent bleeding in high-risk patients.

Page the interventional cardiologist or designate for assistance if bleeding cannot be controlled manually or by the clamp.

**Which method: clamp or manual pressure?**
- Once fully certified in sheath removal, the nurse may choose to achieve hemostasis by using a groin clamp exclusively. Please refer to the policy and procedure for this process.
- Keep in mind that it may not always be appropriate to remove sheaths with the groin clamp exclusively. For example, you may find it difficult to position a clamp effectively on an obese patient and at other times you may find it necessary to “cross-over” from the clamp to the manual method.
- For this reason, it is a good idea to become proficient and comfortable with both the manual and clamp method of sheath removal.

**Why not concurrent removal of venous and arterial sheath?**
- Removing both sheaths at the same time increases the risk of arteriovenous fistula formation.
- Compress above and below the sheath entrance as the sheath is gently removed.
- Maintain firm pressure for five minutes.
- If desired, venous sheath removal may be delayed until complete control of arterial bleeding has been achieved (manual/clamp pressure has been removed with no evidence of bleeding).
- Prolonged pressure on the femoral vein should be avoided.
- Although rare, prolonged venous occlusion, especially where a clamp is used, may lead to venous thrombosis.
- Leg/foot cyanosis, pain and swelling of the affected limb could be an indication of venous thrombosis and should be reported immediately.

**Potential Complications of Sheath Removal**

1. **Excess blood loss around the sheath.**
   - Possible Cause: Burring (roughening of the edges) of sheath as it is inserted, leads to larger opening in the artery than the sheath can occlude.
   - Nursing Action:
     - Notify interventional cardiologist or designate.
     - Assist interventional cardiologist or designate with insertion of a larger sheath if appropriate.
     - Apply pressure dressing to groin area.

2. **Vasovagal Episode**
   - Possible Cause:
Arterial & Venous Sheath Removal – Learning Module

i. Discomfort/pressure caused by the indwelling arterial sheath.
ii. Discomfort from compression during sheath removal.
iii. Hematoma
iv. Blood loss may make the patient more susceptible to vasovagal episodes. In fact, the mere “sight” of blood may actually precipitate a vasovagal event.

The above result in bradycardia and vasodilation that leads to hypotension.

b. Nursing Action:

i. Avoid vasovagal episodes by ensuring the patient has voided prior to sheath removal to prevent any discomfort associated with bladder distension while hemostasis is being achieved. For the same reason, pain medication should be offered 30-60 minutes prior to sheath removal if appropriate. Encourage the oral intake of fluids and administer IV fluids as ordered to offset the diuretic effect of the contrast dye. Avoid repositioning of fingers during manual pressure.

ii. Recognize vasovagal by patient’s signs and symptoms – yawning, cool, clammy skin, nausea, a decreased level of consciousness, reduction in systolic blood pressure to less than 90-100mmHg and heart rate less than 50-60 beats per minute where patients are beta blocked.

iii. Check for hematoma formation or blood loss from groin site and re-apply manual pressure if appropriate.

iv. Check vital signs q5 minutes until heart rate and blood pressure return to pre-vasovagal episode level.

v. If the patient displays decreased BP or pulse and/or is symptomatic, notify the physician to administer a second dose of atropine and obtain an order for a second fluid bolus if appropriate. Administer metoclopramide 10-20 mg IV if necessary for nausea.

3. Chest Pain

a. Possible Cause:

Cardiac pain may be caused by:

i. vessel closure post PTCA
ii. Peri PTCA site spasm.

Non-cardiac pain may be caused by chest wall problems or GI causes.

b. Nursing Action:
i. Obtain accurate description of chest pain. Assess intensity, quality, radiation, relieving or aggravating factors and associated symptoms. Inquire if the pain is similar to discomfort with balloon inflation, previous MIs or previous pain experienced with exertion.

ii. Record vital signs and note any changes (increases in blood pressure and heart rate suggest cardiac source).

iii. Treat suspected cardiac pain with O2 sublingual nitroglycerin q5 minutes x 3 and if no response, notify interventional cardiologist.

iv. Obtain a 12 Lead ECG and have physician assess for any changes in ST segments and compare to any observed during balloon inflation.

v. If return to cath lab is indicated following assessment by interventional cardiologist, prepare patient for transport.

vi. If following assessment of chest pain, GI origin is suspected, treat with an extra strength antacid 5-10 mL. If pain is chest wall in origin, treat with acetaminophen 325 mg i-ii po, may repeat x 1 in four hours.

4. Post Sheath Removal Bleed or Hematoma

a. Possible Cause

Despite the most meticulous technique, some patients will bleed spontaneously or develop a hematoma following sheath removal. A hematoma may also cause compression of the femoral nerve that in turn may cause weakness of the quadriceps muscle for several months. Patients with aortic insufficiency and brisk wide pulse pressures, hypertensive patients, obese patients and those on anticoagulants are most susceptible. Bleeding is also more common in females.

b. Nursing Action:

i. Immediately re-apply pressure to femoral artery site.

ii. Check vital signs and observe closely for any evidence of a vasovagal reaction and treat appropriately if it occurs.

iii. After 10-15 minutes of further manual pressure, position and apply clamp.

iv. If bleeding cannot be controlled with manual or clamp pressure, page attending/catheterizing physician to attend the patient.

5. Retroperitoneal Hematoma

a. Possible Cause
Although rare, this is a potentially fatal complication. This can occur when the common femoral artery is punctured above the inguinal ligament. The puncture site should be below the ligament. Accumulated blood in the cavity can result in pressure on the femoral nerve that can result in a palsy that affects the leg or foot.

b. Nursing Action:

   i. Know signs and symptoms that include moderate – severe pain in the back, flank, leg, lower abdominal quadrant or groin along with tachycardia and hypotension.

   ii. Notify catheterizing physician immediately.

6. **Pseudo Aneurysm, Arterio/Venous Fistula**

   a. Possible Cause

   Continued anticoagulation after sheath removal, large (10 French) sheaths and hematoma are risk factors for pseudo aneurysm development. Inadequate hemostasis after a femoral artery puncture allows blood to enter the wall of the femoral artery and create a false lumen or “pseudo aneurysm”. The thinner wall of this pseudo aneurysm may rupture and must be repaired surgically or by echo Doppler guided compression. Most pseudo aneurysms can be detected within 24-72 hours after femoral cannulation.

   ![Diagram of pseudo aneurysm and arteriovenous fistula]

   **FIGURE 2**

   An arteriovenous fistula may be caused when the Sledinger or front wall needle, used during arterial cannulation, inadvertently enters both artery and vein and allows a tract or fistulous communication between the two. An arteriovenous fistula may also occur if venous and arterial sites are close together and both sheaths are removed simultaneously. An arteriovenous fistula must be corrected surgically.

   b. Nursing Action:

      i. Pseudo Aneurysm
a. Assess for pseudo aneurysm by palpating for a pulsatile mass and auscultating for bruits routinely until discharge. Femoral pseudo aneurysm may become prominent (mature) more than 24 hours after sheath removal.

b. Know signs and symptoms which include pulsatile, usually painful mass over the artery at the puncture site and possible nerve compression by the mass resulting in sharp, stabbing or shooting pain in the groin which may radiate down the thigh.

c. Determine type of pain and auscultate femoral artery to assess for a bruit.

d. Notify physician to assess need for ultrasound and compression.

ii. Arteriovenous Fistula:

a. Know signs and symptoms that include a continuous bruit over the puncture site. Pain and/or swelling may or may not be present at the puncture site.

b. Determine type of pain and auscultate femoral artery for bruit.

c. Notify physician to assess need for corrective surgery.

7. Arterial Occlusion

a. Possible Causes

Rarely seen today with the increased use of stents, anticoagulants and antiplatelet drugs before, during and following PCI. However, if a thrombus should develop at the puncture site, this could still occur.

b. Nursing Action:

i. Prior to compressing the artery, allow a small amount of blood to escape immediately following the removal of the sheath. This will expel any clot(s) that may have been forming at the end of the sheath.

ii. Know the signs and symptoms of an arterial occlusion that may include sudden onset of severe pain or numbness, pallor, cyanosis or absence of distal pulses in the affected limb.

iii. Notify the interventional cardiologist of suspicion and prepare patient for surgery.

8. Infection

a. Possible Causes
Femoral catheterization can result in phlebitis, bacteremia and infection. Infection may not be apparent until a few days following the procedure. Although the use of sterile technique has greatly reduced the incidence, infection may still occur with repeated use of the same groin site. Switching to the opposite leg for the second procedure would help reduce this risk. Patients who have undergone a procedure in which the catheter has been passed through a femoral graft are also at higher risk (but still low risk) for infection.

b. Nursing Action

i. Know the signs and symptoms of infection that may include swelling, redness, warm skin and purulent drainage at the insertion site.

ii. Educate patient on the signs and symptoms of infection, the precautions to take to prevent infection and the appropriate action to take if discovered.

9. Neuropathy

a. Possible Causes

Neuropathy is a rare complication that may occur immediately after a large hemorrhage or pseudo aneurysm or may be a late complication from the chronic accumulation of fluid around the nerve that causes pressure and irritability. Permanent damage such as foot drop, paresthesia, chronic pain or other neurological sequelae can occur. Additional risk factors include excessive anticoagulation, the use of a C clamp to compress the groin after sheath removal and sheath size greater than 8 French. Symptoms resolve eventually once pressure is relieved.

b. Nursing Action

i. Know signs and symptoms of neuropathy that may include pain, tingling at groin site, numbness at site or down leg, motor difficulty with affected leg, possible decreased patellar tendon reflex and possible weakness of knee extension. Symptoms may occur as long as three months after the procedure.

ii. Check vital signs, groin site and pulses as per protocol and continue to check q2h until symptoms of neuropathy has resolved.
REFERENCES


QEII Health Sciences Centre On-line IV Drug Therapy Manual.

Self Test

1. Describe the anatomy of the inguinal region.

2. Why are patients nursed in the supine 20° semi-Fowler’s position?

3. How long must the arterial sheath be left in place?

4. What are the nursing implications for patients receiving anticoagulant therapy prior to sheath removal?

5. What medications may be indicated prior to sheath removal? Indicate reason, dosage and method of administration.

6. Indicate five potential complications of arterial sheath removal and the nursing actions of each.

7. What are the causes of a vasovagal episode?
ANSWERS TO TEST QUESTIONS:

1. The anatomy of the inguinal region consists of the:
   a. femoral nerve
   b. femoral artery
   c. femoral vein
   d. empty space with lymphatics moving lateral to medial.

   Remember **NAVEL**

2. With some brands of arterial and venous sheaths, a position greater than 20° semi-Fowler’s could lead to flexing and kinking of the femoral sheath resulting in clot formation and possible thrombus.

3. The arterial sheath is left in place for a minimum of 3-4 hours to allow the heparin bolus given just prior to angioplasty to metabolize. Under some circumstances, the arterial sheath may be left in place for 24 hours. This requires a pressurized arterial flush setup to avoid thrombus formation in the sheath. Where Bivalirudin is used to replace Heparin, the sheath can be removed 1 hour post procedure or 2 hours post procedure if Abciximab is added to this regime.

4. Patients on anticoagulant therapy for their cardiac catheterization require a 1-3 hour period for heparin to metabolize before their arterial sheath can be removed. Prior to sheath removal, the RN should:
   a. determine when heparin was stopped
   b. consult physician to determine if measurement of ACT is appropriate
   c. assess need for atropine and fluid bolus as vasovagal episode more common with late sheath removal
   d. recognize that pressure may need to be applied for a longer period of time to control bleeding

5. a. atropine 0.6 mg direct IV to prevent vasovagal episode.
   b. diazepam 2.5 – 10 mg direct IV to sedate and help prevent a vasovagal episode.
   c. Pain medication as ordered to prevent vasovagal episode and possibly reduce the amount of sedation needed.

6. The possible complications of arterial sheath removal and the nursing actions are:

   **Excess Blood Return Around the Sheath:**
   - Notify interventional cardiologist
   - Assist in insertion of larger sheath if necessary
   - Consult physician re stopping heparin, measuring ACT and early sheath removal if appropriate

   **Vasovagal Episode**
- Take steps to prevent vasovagal episode
- Recognize symptoms
- Give IV bolus 250-500 mL normal saline prior to sheath removal
- Give atropine 0.6 mg direct IV prior to sheath removal
- Reapply manual pressure if necessary
- Check vital signs q5 minutes until they return to pre-vasovagal episode level
- If no response, page physician to assess

**Chest Pain**

- Obtain description of pain and record vital signs
- Obtain 12 Lead ECG
- Treat with O$_2$ and nitroglycerin 0.3-0.6 mg q5 minutes x 3
- If no response, notify interventional cardiologist

**Bleeding or Hematoma:**

- Reapply manual pressure to femoral artery x 10-15 minutes
- Apply clamp if manual pressure not effective
- Observe patient for vasovagal episode and treat if necessary
- Contact physician if still unable to control bleeding

**Retroperitoneal Bleeding**

- Recognize signs and symptoms
- Notify physician

**Pseudo Aneurysm/AV Fistula**

- Assess for symptoms
- Auscultate for femoral bruit and notify physician if present

**Arterial Occlusion**

- Allow a small amount of blood to escape prior to compressing the artery to expel any clots
- Know the signs and symptoms
- Notify physician

**Infection**

- Know signs and symptoms and educate patient
- Notify physician

**Neuropathy**

- Know signs and symptoms
- Notify physician
7. A vasovagal episode may occur as a result of:

a. discomfort/pressure caused by the indwelling arterial sheath
b. discomfort from compression during sheath removal
c. hematoma or blood loss
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<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>1.</td>
<td>Checks physician’s order and offers pain medication if appropriate.</td>
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<tr>
<td>2.</td>
<td>Gathers equipment and takes to bedside.</td>
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<td>3.</td>
<td>Explains procedure to patient.</td>
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<td>4.</td>
<td>Boluses patient with 250 mL normal saline over 10-15 minute period</td>
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<tr>
<td>5.</td>
<td>Positions patient.</td>
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<td>6.</td>
<td>Pre-medicates with atropine IV and diazepam IV</td>
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<td>7.</td>
<td>Removes occlusive dressing.</td>
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<tr>
<td>8.</td>
<td>Positions clamp by placing the base of the arterial clamp under the mattress so that the extension arm of the clamp will rest over the skin directly over the puncture site of the artery.</td>
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<td>9.</td>
<td>Removes the extension arm and compression button from the clamp and places it in a nearby location.</td>
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<td>10.</td>
<td>Compresses the artery by applying manual pressure with the index finger and reinforcing with the middle and ring finger.</td>
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<td>11.</td>
<td>Gently removes arterial sheath while maintaining manual pressure. As appropriate, removes venous sheath prior to, or after arterial sheath removal.</td>
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<td>12.</td>
<td>Compresses femoral artery for 3-5 minutes to achieve hemostasis – pedal pulses present but diminished.</td>
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<td>13.</td>
<td>Gradually releases pressure until pedal pulse returns (palpate pedal pulse with noncompressing hand) then continue this pressure for five minutes.</td>
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<td>14.</td>
<td>Continues to gradually remove pressure for 5-10 minutes allowing the pedal pulse to increase in strength.</td>
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<td>15.</td>
<td>Assesses for hematoma with noncompressing hand and increases pressure if bleeding or hematoma becomes evident.</td>
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<td>16.</td>
<td>Applies clamp if there is evidence of ongoing bleeding or hematoma formation after 15-20 minutes of manual pressure.</td>
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<td>17.</td>
<td>Gradually releases pressure of clamp as with manual method.</td>
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<td>18.</td>
<td>Calls interventional cardiologist for assistance if bleeding cannot be controlled manually or by clamp</td>
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<td>19.</td>
<td>Provides patient with post sheath removal instructions.</td>
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<td>20.</td>
<td>Documents procedure in patient’s record</td>
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**Note:** The process for sheath removal using a mechanical groin clamp is very similar to the above.

Please refer to the policy and procedure for step-by-step instructions.