Cannulation for the *Skilled* Cannulator Self-Learning Package

Please review the PowerPoint presentation "**Cannulation for the Skilled Cannulator**" and then answer the questions below. Once you have completed the questions, please check your responses using the answer key. Submit completed answer sheets to your VA Nurse or Renal Educator for their review with you.

In addition to completing the PowerPoint presentation and the quiz, it is suggested you complete the following to fulfill the criteria for a **Skilled Cannulator**:

- Under the observation of an advanced cannulator, successfully cannulate 3 established AVFs and 3 established AVGs designated as "moderately complicated."
- Under the observation of an advanced cannulator, successfully cannulate 3 new AVFs and 3 new AVGs designated as "easy."
- Under the observation of an advanced cannulator, successfully demonstrate the use of ultrasound to support the cannulation of at least one AVF or AVG.

Skilled Cannulators may cannulate established AVFs and AVGs categorized as "moderately complicated" (i.e., one cannulation complication) OR new accesses with no complications. If AVF has a buttonhole, track is well established.

Refer to Cannulation Learning Plan: www.bcrenalagency.ca ▶ Health Professionals ▶ Clinical Resources ▶ Vascular Access ▶ Cannulation Teaching Tools

Direct link: www.bcrenalagency.ca/resource-gallery/Documents/Cannulation%20Learning%20Plan.pdf

Questions

1. What types of accesses may an *skilled cannulator* cannulate?
2. Describe a "moderately complicated" AVF and AVG.
3. True or false - It is appropriate to use the Allen's test in the preoperative assessment of a patient undergoing an AVF or AVG creation/insertion.
4. How is the Allen's test done?
5. What does a positive Allen's test infer?
6. What is the usual minimum time required before cannulating an AVF or AVG?
7. What causes an AVF to develop and mature?
8. What are the signs of a mature AVF?
9. Why does an AVG need a minimum time prior to cannulating?
10. Who determines when a new AVF or AVG is ready to be cannulated?
11. Prior to cannulating any access, what steps should be completed?
12. Should ultrasound be used to map a site prior to cannulating?
13. What are the causes of early AVF failure?
14. Describe the needle and pump speed progression when initiating a new AVF.
15. Describe the desired needle and pump speed once cannulation has been established.
16. What potential problem could occur if the blood flow is too fast for the size of an AVF needle?
17. If an AVF is cannulated too early, there is a risk of AVF failure. What are some of the problems that can lead to AVF failure?

18. Which sign is indicative of a Juxta-anastomotic venous (outflow) stenosis?
    a) Thrill only felt in systole.
    b) Strong pulse felt at anastomosis only.
    c) Often felt as severed dip in vein or shelf in vein
    d) Above area of stenosis, pulse is weak and vein may be small or difficult to palpate.
    e) All of the above
19. True or false - When an AVF is stenotic, a pulse not a thrill may be detected at the arterial anastomosis.
20. Which sign is indicative of an eminent aneurysmal rupture?
    a) Thinning of skin over AVF, often white and shiny, skin is pulsatileUlceration or non-healing needle sites; e.g. presence of black eschar
    b) Evidence of bleeding or difficulty with prolonged bleeding from a particular needle site
    c) All of the above
21. What causes an aneurysm?
22. What is the difference between a *true aneurysm* and a *false* or *pseudoaneurysm*? Which type of accesses does each occur in?
23. An infection in a mature AVF may present as which of the following?
    a) Perivascular cellulitis with localized erythema
    b) Swelling or tenderness, or as infected aneurysms
    c) Abscesses from infected needle sites
    d) All of the above
24. Both arterial steal syndrome and ischemic monomelic neuropathy are very painful. What are the two primary differences between them?
25. Which of the following are important assessment cues when determining the presence of ischemia?
    a) Skin temperature
    b) Skin colour
    c) Gross sensation
    d) Signs of skin breakdown, tissue necrosis or infection
    e) Range of motion
    f) Presence and quality of radial and ulnar pulses
    g) Numbness/tingling
    h) All of the above
26. What is the most common site for stenosis to develop in an (a) AVF; and (b) AVG?
27. What is meant by the term “intimal hyperplasia?”
28. BC Renal Agency PVAST guidelines recommend referral for a fistulogram when the access flow rate is:
    a) < 300 mL/min
    b) < 500 mL/min for AVF
    c) < 650 mL/min for AVG
    d) Or decreased from baseline > 20% from baseline values
    e) a, b, and c
    f) b, c, and d
29. True or false - According to the BC Renal Agency PVAST guidelines, q 4-6 weekly monitoring of AVFs and AVGs is recommended using an online total access flow measurement, if available.

Answers

1. What types of accesses may a skilled cannulator cannulate?
   New accesses (i.e., cannulated for <6 weeks) with no complications, "moderately complicated" accesses (see #2 for definition) and buttonhole accesses with a well established track.

2. Describe a "moderately complicated" AVF and AVG.
   AVF: Fistula with one cannulation complication such as:
   - vein that is not easily palpable (vein deep or rolls when palpated)
   - narrow vein
   - vein with a poorly defined area of straight vein for cannulation
   - visible collateral veins that may interfere with cannulation
   - recent and repeated infiltrations or reduced access flow
   - access limb with signs of edema, bruising, or local infection.

   AVG: Graft with one cannulation complication such as:
   - difficult to palpate and/or not a uniform size (i.e., may bulge in places)
   - deep or inconsistent depth (may be flat and/or mushy to palpate)
   - limited area available for cannulation
   - signs of false aneurysm
   - recent and repeated infiltrations or reduced access flow
   - access limb with signs of edema, bruising, or local infection.

3. True or false - It is appropriate to use the Allen's test in the preoperative assessment of a patient undergoing an AVF or AVG creation/insertion.
   True.

4. How is the Allen's test done?
   a) Ask the patient to elevate his/her hand and make a fist x 30 seconds.
   b) Apply pressure over the ulnar and radial arteries so as to occlude both.
   c) With the hand still elevated, ask the patient to open their hand. The hand should appear blanched (pallor can be observed at the finger nails).
   d) Release pressure over the ulnar artery and the color should return in 7 seconds.
   e) Repeat steps a - d for the radial artery.

5. What does a positive Allen's test infer?
   A positive Allen's test indicates that the ulnar and radial artery blood supply to the hand is sufficient and it is safe to create an AVF.

6. What is the usual minimum time required before cannulating an AVF or AVG?
   AVF: 4 weeks (usually longer)
   AVG: 2 weeks

   All AVFs and AVGs must be assessed by an MD or VA RN as "ready to needle."

7. What causes an AVF to develop and mature?
   An AVF is the joining of a vein and an artery which allows blood to flow from the artery to the vein. This in turn causes the vein to dilate and become stronger and the vein wall to become thicker. This big vein enables large bore hemodialysis needles to be inserted into the AVF.

   Exercising the access arm may facilitate maturation of an AVF.

8. What are the signs of a mature AVF?
   - Palpable vein which is larger and firmer than original vein (not soft or mushy).

- Vein partially collapses when arm is elevated above head (outflow assessment).
- Pulse increases (augments) significantly when mid portion of fistula is manually occluded (inflow assessment)
- Vein depth of <0.6 cm with discernible margins
- Vein diameter of > 0.6 cm (minimum 0.4 cm for initial cannulation)
- Area of straight vein available for cannulation
- No irregular/dilated areas or aneurysm formations
- No collateral veins visible
- Portable ultrasound flow >500 mL/min & biphasic bruit.

9. Why does an AVG need a minimum time prior to cannulating?
   - An AVG is the tunneling of a graft under the skin. After the graft is inserted, time is required to allow granulation tissue to "grow into" the top layer of the graft. The presence of the granulation tissue helps to increase the integrity and reduce compression on the graft as a result of infiltration.
   - Time is also required to allow the edema to subside, thereby minimizing the risk of infiltration and infection.

10. Who determines when a new AVF or AVG is ready to be cannulated?
    f) MD or VA RN.
    g) Cannulation of a new AVF or AVG may be attempted by a skilled or advanced cannulator.

11. Prior to cannulating any access, what steps should be completed?
    h) Complete a thorough physical assessment: Look, Listen & Feel.
    i) Plan and prepare the site for needle insertion.

12. Should ultrasound be used to map a site prior to cannulating?
    j) Yes, once a hemodialysis nurse has been trained in the use of ultrasound and care of the equipment, ultrasound is recommended to assist in cannulation (if available).
    k) Ultrasound is particularly useful for patients with vessels that are difficult to palpate.

13. What are the causes of early AVF failure?
    l) Inadequate vein or artery used for creation
    m) Juxta-anastomotic venous (outflow) stenosis
    n) Accessory veins
    o) Inflow stenosis within arterial system

14. Describe the needle and pump speed progression when initiating a new AVF.
    Start with 17 or 16 g needles and 250 pump speed (200 for children). Increase to 300 pump speed.

15. Describe the desired needle and pump speed once cannulation has been established.

Needle Gauge	Pump Speed
17 g	<300 mL/min
16 g	300 – 350 mL/min
15 g	350 – 450 mL/min
14 g	> 450 mL/min (AVF only)

16. What potential problem could occur if the blood flow is too fast for the size of an AVF needle?
    Damaged red blood cells (hemolysis).

17. If an AVF is cannulated too early, there is a risk of AVF failure. What are some of the problems that can lead to AVF failure?
    p) Infiltration or hematoma caused by too big a needling hole (perhaps from too shallow an angle of insertion).
    q) Insertion of the needle through the poorly developed AVF and out the back wall (leading

to compression and blockage of the AVF).

18. Which sign is indicative of a Juxta-anastomotic venous (outflow) stenosis?
    a) Thrill only felt in systole.
    b) Strong pulse felt at anastomosis only.
    c) Often felt as severed dip in vein or shelf in vein.
    d) Above area of stenosis, pulse is weak and vein may be small or difficult to palpate.
    e) All of the above

19. True or false - When an AVF is stenotic, a pulse not a thrill may be detected at the arterial anastomosis.
    True

20. Which sign is indicative of an eminent aneurysmal rupture?
    a) Thinning of skin over AVF, often white and shiny, skin is pulsatile
    b) Ulceration or non-healing needle sites; e.g. presence of black eschar
    c) Evidence of bleeding or difficulty with prolonged bleeding from a particular needle site.
    d) All of the above.

21. What causes an aneurysm?
    - Unresolved stenosis above or proximal to the aneurysm (stenosis reduces blood outflow and creates a backflow and increased pressure, resulting in an aneurysm)
    - "One site itis" instead of either rope ladder or buttonhole technique.
    - Cannulation hole is too large (results in scar tissue which stretches and lacks elasticity). Large hole may be due to inserting needles at too shallow an angle.
    - Chronic infection at the access site (results in infiltration in the muscle wall and the muscle wall dies).

22. What is the difference between a *true aneurysm* and a *false or pseudoaneurysm*? Which type of accesses does each occur in?
    True aneurysm: inner layers of the native vessel bulge outward to form a noticeable swelling of the AVF or an area that is markedly bigger in diameter than the rest of the AVF. Occurs with an AVF only.

    False or pseudoaneurysm: collection of blood that leaks out of the vessel but is confined next to the vessel by the surrounding tissue and a layer of fibrin deposition. Most commonly occurs with an AVG but can occasionally occur with an AVF (when blood continues to leak into the tissues from a needle site).

23. An infection in a mature AVF may present as which of the following?
    a) Perivascular cellulitis with localized erythema
    b) Swelling or tenderness, or as infected aneurysms
    c) Abscesses from infected needle sites
    d) All of the above

24. Both arterial steal syndrome and ischemic monomelic neuropathy are very painful. What are the two primary differences between them?
    Ischemic monomelic neuropathy always occurs within the first 24 hours. It is caused by a lack of blood supply to the nerves and is most common post AVG insertion. It does not cause necrosis.

    Arterial steal syndrome can occur within 24 hours or may occur over time. It is caused by a lack of blood flow to the peripheral tissues which ultimately leads to necrosis.

25. Which of the following are important assessment cues when determining the presence of ischemia?
    a) Skin temperature
    b) Skin colour

c) Gross sensation
d) Signs of skin breakdown, tissue necrosis or infection
e) Range of motion
f) Presence and quality of radial and ulnar pulses
g) Numbness/tingling
h) All of the above

26. What is the most common site for stenosis to develop in an (a) AVF; and (b) AVG?
AVFs: arterial anastomosis, junctional stenosis, and puncture segment stenosis.

AVGs: venous anastomosis & arterial anastomosis, and junctional stenosis.

27. What is meant by the term "intimal hyperplasia?"
Thickening of the tunica intima of a blood vessel. It is the universal response of a vessel to injury and is an important reason for late AVG failure. Often presents as increased venous pressure that can be flow limiting

28. BC Renal Agency guidelines recommend referral for a fistulogram when the access flow rate is:
a) < 300 mL/min
b) < 500 mL/min for AVF
c) < 650 mL/min for AVG
d) Or decreased from baseline > 20% from baseline values
e) a, b, and c
f) b, c, and d

29. True or false - According to the BC Renal Agency guideline, q 4-6 weekly monitoring of AVFs and AVGs is recommended using an online total access flow measurement, if available.
True