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Dialysis Cannulation: Direction of Bevel and Blood Flow

Discussing tips and tricks to optimize cannulation.

WITH MATTEO TOZZI, MD

What are your tips for successful cannulation of a vascular graft?

Success in the cannulation process is achieved through close collaboration between nephrologists, nurses, and vascular surgeons. Convening on the discussion of complex cases is a necessity to make a step forward in immediate cannulation. The careful application of simple rules should reduce major complications such as infection, pseudoaneurysm, and hematoma.

What is the required training for a dialysis nurse or technician to perform duplex ultrasound cannulation?

In 2017, compact duplex ultrasound in the hemodialysis unit is essential for nurses and nephrologists. Training starts with a basic course that teaches how to evaluate the vascular access. Ultrasound cannulation is learned in a few hours of frontal teaching and some practice during hemodialysis sessions. Within 1 month of ultrasound evaluation of vascular accesses and cannulations, the nurses and nephrologists typically possess all the necessary skills.

Is it standard practice to use local anesthesia prior to vascular graft cannulation?

No, in our center, we currently do not have an extensive use of anesthesia. In cases of accentuated pain or special sensitivity, a patient may need a small dose of anesthetic gel on the skin before antiseptic preparation and cannulation.

What are the antiseptic options used to cleanse the patients' site prior to cannulation?

In our center, all patients' upper arms are cleansed with surgical soap before their dialysis session. The nurse disinfects the cannulation area with chlorhexidine 2% for 30 seconds.

Do nurses usually wear sterile gloves for vascular graft cannulations?

Yes. We prefer to use sterile gloves for all prosthetic vascular accesses because bacteria contamination from the skin to the needle increases the risk of subcutaneous tissue infection, hematoma, or infection of the graft. This is a crucial point, and we use sterile gloves for every cannulation for the life of the graft.

In what time frame is a non-early cannulation vascular graft typically needled for hemodialysis? What about for early cannulation?

The time to first cannulation of a standard arteriovenous graft is an average of 14 days. An early cannulation graft, such as the GORE® ACUSEAL Vascular Graft, has completely changed this. We can use the graft within 24 hours of surgery. In the case of the GORE ACUSEAL Vascular Graft, it is possible to perform immediate cannulation within a few hours after the surgery. However, with immediate cannulation, if the needle exit site is not held for 10 to 15 minutes to achieve hemostasis, there can be a higher percentage of periprosthetic hematoma.

Periprosthetic hematoma may complicate subsequent cannulations. Today, in centers that use early cannulation grafts, the percentage of periprosthetic hematoma is very low. In our center, the number of hematomas after immediate cannulation is greatly reduced by the experience of the nurses.

If cannulating within the early postoperative period, what needle gauge and blood flow rates are preferred?

With an early cannulation graft, we prefer using a 17 gauge needle for 2 weeks with a 200 mL/min blood flow rate.

Why do you prefer the small-gauge and low blood flow rates?

We prefer a smaller needle for first-time use of the graft because of the possibility of larger needles to cause hematoma, and this is problematic for subsequent cannulations of the graft. It is important to perform the first hemodialysis with a low blood flow rate (200 mL/min) to reduce complications in the vein near the anastomosis with the graft.

If the patient starts with a small-gauge needle and low blood flow rates, how do you increase to larger-gauge needles and higher blood flow rates?

It is possible to increase the flow and the needle size if necessary after 2 weeks. After 2 weeks, the needle can be increased from 17 to 16 gauge, and then after another 2 weeks, from 16 to 15 gauge. We also increase the flow from 200 to 300 mL/min after 2 weeks. The increase of the flow is mandatory with respect to the venous pressure. If the venous pressure is high, we maintain either low-flow hemodialysis or treat any areas of stenosis.

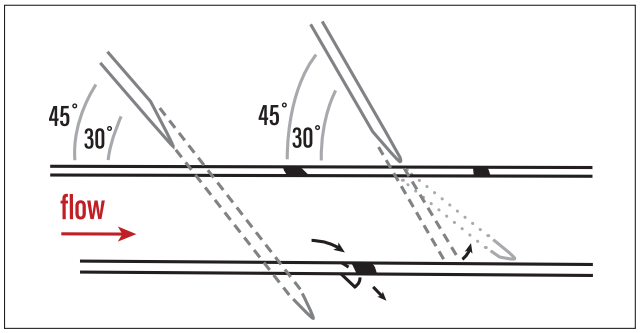

Figure 1.

Which direction is preferred for the bevel of the needle during cannulation?

The posterior wall of the graft is vulnerable to intragraft stenosis and the anterior wall to pseudoaneurysm, so we cannulate with the bevel down. When the needle is bevel up, it is possible to damage the posterior wall with the sharp part of the needle. With the bevel down, it is impossible to create this damage. If we reduce the damage to the posterior wall, we reduce the risk of intragraft stenosis (Figure 1).

After 1 year of utilizing the needle bevel-down technique, the rate of hematoma and pseudoaneurysm formation in our prosthetic vascular access grafts has decreased. The only change we made was the direction of the needle bevel, so this is a most important cannulation technique.

If a back wall puncture occurs during cannulation, what is the course of treatment?

Currently, there is unfortunately no treatment for back wall injury. There is a direct correlation between damage of the posterior wall of the graft and posterior wall stenotic lesions. A graft with posterior wall damage has a very short life span; thrombosis occurs frequently due to the stenotic lesions. This is also why it is so important to cannulate with the needle bevel down.

In what direction is the venous needle placed?

In vascular grafts, we normally prefer the direction of the venous needle to be in the direction of venous flow. This is the same for an arteriovenous fistula. The needle direction is in the same direction as the blood flow in the vein, as this is important to reduce any resistance of the returning blood flow into the venous system.

In what direction is the arterial needle placed?

Needles placed with the flow of blood create a better flap for hemostasis, so the direction of the needle is with the flow in the vein and with the flow in the artery (Figure 2).

Is antibiotic ointment applied on the needle exit site?

No, we do not use a topical antibiotic. We cleanse the cannulation area with chlorhexidine, but we do not use a topical antibiotic after cannulation.

How do you secure the needles during dialysis?

We use medical tape to secure the needles to the skin. It is very important to secure the needles to the skin of the patient's arm to avoid accidental removal of the needle from the graft.

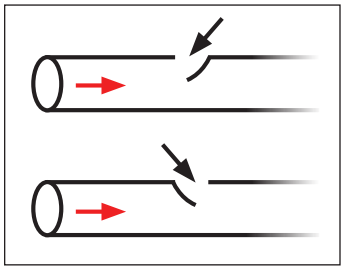

Figure 2.

After the dialysis treatment, which needle is removed first? Why?

We remove the arterial needle first because we continue to use the venous needle for the return of blood to the patient.

Is the pressure to the needle and vascular graft exit site held with fingers or clamps?

We do not use clamps because they may be traumatic to the grafts—in patients with low flow/pressure, it is possible to occlude the graft with the clamp. It is important to instead apply light pressure with the fingers. During the first treatment, the nurse will use a sterile gloved finger to achieve hemostasis. During the second treatment, the patient will be asked to hold the site himself using a sterile glove.

What type of bandage is used to cover the needle exit site?

Slight compression with a sterile 2 x 2 gauze is used to achieve hemostasis. Then, two wound dressings are placed over the needle exit sites.

Do you have any other tips to share?

Always listen with a stethoscope for the bruit in the prosthetic graft or feel the thrill with fingers before needle cannulation. This is important to avoid cannulating a thrombosed graft. I believe that the life of a vascular prosthetic access is preserved with this management, and it is the responsibility of each operator to reduce the complication rate and prolong the life of the graft for as long as possible. It is very important for all technicians, nurses, vascular surgeons, nephrologists, and interventional radiologists. ■

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