

Cannulation of Newly Created AVF/AVG

Key Points

- Cannulation of newly created AVF/AVG
- Cannulation Techniques
- Management of Infiltration
- Recommended needle gauge and blood flow rates

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Abbreviations

AVF	Arterio-Venous Fistula
AVG	Arterio-Venous Graft

Summary

Newly created primary AV fistulas shall be allowed to develop for at least 6 weeks prior to cannulation. Initial attempts to perform dialysis via new fistulas shall proceed with caution.

The Frimley Park Hospital Renal Vascular Access team, Nephrologists and Surgeons can advise cannulation of an AVF at two weeks if clinically the AVF is viable for use.

Without exception, fistulas shall not be progressed faster than these guidelines ***without direction from the Renal Vascular Access team***

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Introduction:

To successfully cannulate newly created arteriovenous fistulae (AVF) and to prevent infiltration.

Staff Group

Clinical staff of renal medicine.

Maturation of the Fistula for Needling

Premature needling should be avoided as it often results in early access loss, which may be due to haematoma formation or the application of excessive external pressure to control haemorrhage. (Koo Seen Lin and Burnapp 1996). Daugirdas et al (2014) recommend that fistulas once created should be allowed two months for maturation as cannulation can compromise the long-term survival of the fistula. Therefore, it is recommended that 6-8 weeks should be allowed for maturation before cannulation of fistula.

Choice of needles

Kim et al (2005) advocate the use of smaller gauge needles as their study indicates that the lower gauge needles show a lower incidence of bleeding, with potentially less disruption of the access, improved patient tolerance and lower recirculation rates at higher pump speeds. The needles used in the study ranged from 14 to 17 gauge. Therefore, the haemodialysis unit should adopt the use of needles no larger than 15 gauge.

Cannulation

Many authors quote Gallieni, M. *et al.* (2019) for reference for AV fistula cannulation. Gallieni, M. *et al.* (2019) describes three methods of cannulation:

1. *The Rope Ladder* Uniform needle sites along the length of the vessel causing uniform dilatation of the vein, with little stenotic formation. The nurses in this unit should adopt this method of needling where possible.
2. *Button Hole Puncture* The needles are inserted in the same places and the same sites after removal of the clots. Wang, L.P. *et al.* (2022) states that critics of this technique claim there is an increased risk of infection, thrombosis and aneurysms but that those that have used this method refute this, claiming there is less pain, fewer repeated cannulations and no increase in infections or aneurysms.
3. *Area Puncture*. Concentrated puncture over a small area. Repeated punctures destroy elasticity of the Wall of the vessel leading to the aneurysm formation with a tendency of stenotic folding at the border of the aneurysm Daugirdas et al (2014). This method of needling where possible should be avoided or if used alternative methods of needling should be explored.

Procedure

1. Surgeon to draw diagram of the structure of the newly created fistula in patient's medical notes, with additional instructions regarding cannulation if necessary. This can be gained from Frimley Park Hospital Renal Vascular Access Team. Once all notes have been digitized, it is the cannulating member of staff responsibility to access EPIC to view the fistula diagram.
2. Haemodialysis staff to obtain order from vascular surgeon or Nephrologist to begin cannulation of fistula six weeks after creation. All new fistulas should be **examined** by Renal Vascular Access CNS and Senior Dialysis Nurses before cannulation is initiated.
3. **Only** staff identified as demonstrating the best cannulation practice techniques and assessed as competent should be assigned to cannulate **newly** developing fistulas.
4. Explain procedure to the patients and get verbal consent.
5. **Always use a disposable tourniquet**, even with well-developed fistulas, this helps to engorge and stabilise AVF.
6. Educate patients on:
 - Checking the access daily for a thrill and for signs and symptoms of infection.
 - Performing fistula exercises to promote maturation process.
 - Understanding that haematoma could occur most likely during the first few weeks of using the access.
 - For infiltrations, provide written materials about icing, elevation, and heat application.

Preliminary Considerations

Reduce patient's fear of the initial cannulation.

Words alone can cause or reduce fear, so choose your word wisely (Don't use word like "stick" or "puncture.")

Ensure additional time is allocated to the nurse when initial cannulation is planned.

Week One

- Check anti-coagulation regime against Surgeon / Nephrologist directive following access surgery.
- Consult nephrologists about the dose of anti-coagulant.
- If no other access present, use two 17-gauge needles. **always** stay at least 1.5-2cms away from the anastomosis.
- If catheter present, use 17-gauge needle as the arterial, and use catheter for venous return.

- Use saline-filled fistula needles with syringes attached.
 - Use dry needles if blood samples are due pre dialysis.
 - Perform hand hygiene.
 - **Closely assess the fistula prior to cannulation** to establish depth and angle at which to insert needle.
 - Determine direction of access flow- look, feel and listen.
 - Locate anastomosis.
 - Palpate access- gently compress access midpoint, arterial inflow will “pulse with flow” and venous outflow will have diminished or no pulse **OR**
 - Auscultate access – gently compress access midpoint, Arterial inflow will have pulsatile sound and venous outflow will have minimal or no sound.
 - **Decide the needle direction**
 - Always cannulate the venous needle with the direction of the blood flow (directed back towards the heart).
 - Always cannulate the arterial needle cannulation toward the blood inflow or with the blood outflow (Arterial needle directed toward the arterial anastomosis – retrograde or toward the heart – antegrade).
 - Clean puncture sites with Chloroprep using a backward and forward motion.
 - Touching a disinfected needle puncture site with unprotected hands, non-sterile instruments, or dialysis equipment should be avoided.
- Cannulate the fistula, using a 20°-35° angle.
 - Stabilize the butterfly with tape using Chevron taping method.
 - Secure dialysis lines by attaching them to the patient using a blue clamp minimize the risk of needle dislodgement.
 - Instruct patients not to move access extremity, in order to prevent infiltration.
 - Instruct the patient not to cover the dialysis access.

For week one: Use 17-gauge needles at a blood flow rate (BFR) of 250 ml/min. If BFR is not tolerated, reduce to 200 ml/min.

Blood flow rates are recommendations and can be modified based on center-specific guidelines.

ONLY INCREASE BFR RATES IF NO EVIDENCE OF INFILTRATION OR OTHER PROBLEMS NOTED.

Report any cannulation or BFR problems to the nurse-in-charge.

Week Two

- If the first week is successful, cannulate with 16-gauge needles, rotating cannulation sites.
- Blood flow rate recommended: 300 ml/min.

Week Three

- Either repeat procedure for Week Two or may attempt to progress to prescribed BFR and needle gauge. When increasing BFR, recommend matching needle gauge to BFR as shown in the chart below.

Infiltration instructions

- If the fistula infiltrates, rest for one week and then go back to smaller gauge needles.
- If the fistula infiltrates a second time, wait another two weeks and then go back to smaller gauge needles.
- If the fistula infiltrates a third time, notify Renal Vascular Access team

Catheter removal instructions

The patient's catheter is not to be removed until the patient has had at least **THREE CONSECUTIVE SUCCESSFUL** arterial/venous needle cannulations at the prescribed BFR and needle gauge.

NOTE: If the catheter becomes infected within the first two weeks of fistula formation, then the catheter should be removed and the patient referred to medics for further clinical assessment.

RECOMMENDED: It is important to match needle gauge to blood flow rate.

BLOOD FLOW RATE	NEEDLE GAUGE
< 300 ml/min	17-gauge
300 – 350 ml/min	16-gauge
> 350 - 450 ml/min	15-gauge

Note: These are minimum recommended gauges for the stated BFR settings. Larger needles, when feasible, will reduce (make less negative) pre-pump arterial pressure and increase delivered blood flow.

Choice of Needles Gauge

17- gauge needle is strongly recommended for initial cannulation.

A fistula may appear and feel ready to cannulate, but the vessel wall may still be fragile and unable to tolerate the needle puncture.

The smaller needle gauge helps to decrease injury to the vessel and prevents a large infiltration, haematoma, compression of the vessel, and possibly clotting of the AVF should any cannulation complication occur (ie, infiltration).

References:

Daugirdas, J.T., Blake, P.G. and Ing, T.S. (eds) (2014) *Handbook of dialysis*. 5th edn. Philadelphia: Lippincott Williams & Wilkins.

Koo Seen Lin, L.C. and Burnapp, L. (1996) 'Contemporary vascular access surgery for chronic haemodialysis', *Journal of the Royal College of Surgeons Edinburgh*, 41(3), pp. 164-169.

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Wang, L.P. *et al.* (2022) 'Effect of buttonhole cannulation versus rope-ladder cannulation in hemodialysis patients with vascular access: a systematic review and meta-analysis of randomized/clinical controlled trials', *Medicine (Baltimore)*, 101(29), article number e29597. Available at: <https://doi.org/10.1097/md.00000000000029597>

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Full version control record

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Version History

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1	October 2017	Sijo Stephen	Final	Reviewed
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Related Documents

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