

For Patients with Hemodialysis as Their Primary Modality

A. CREATION

1. Counsel all patients about vein preservation as part of routine teaching for chronic kidney care.
2. Referrals for AVF creation should be made when the glomerular filtration rate (GFR) is approximately 15 mL/min/1.73m² or the GFR is 15-20 mL/min/1.73m² and the patient is expected to require dialysis within 12-18 months. This timeline assumes that the anticipated surgical wait time for fistula creation is consistent with the BCPRA guideline "Indications & Urgency Criteria for Surgical Hemodialysis Procedures"¹ at www.bcrenalagency.ca/professionals/VascularAccess/ProvGuide.htm.
 - For CKD patients whose anticipated dialysis start is within 3 months, the target wait time from decision date to surgery date is 4 weeks.
 - For CKD patients whose anticipated dialysis start is within 3 to 6 months, the target wait time from decision date to surgery date is 6 weeks.
3. Target the following timeframes for HD access creation/placement (evidence):
 - a. AVFs: >3-4 months prior to the anticipated start of HD
 - b. AVGs: 3-6 weeks prior to the anticipated start of HD
 - c. Catheters: as close as possible to the anticipated start of HD
4. Prior to placement of a permanent HD access, undertake a thorough evaluation:
 - a. History and physical examination; and
 - b. Mapping of vessels using ultrasound.

Venography may be useful to further assess the veins +/- to rule out central vein stenosis on a case-by-case basis (evidence).
5. If the vessels are adequate, use the non-dominant arm for creation/placement of a permanent HD access; if not, use the dominant arm (evidence).
6. The order of preference for HD access for patients requiring chronic hemodialysis is AV fistula, then AV graft, then catheter (evidence).
7. For AV fistulas, the preferred order of creation is (evidence):
 - a. Radio-cephalic fistula (RCF) (wrist, forearm or elbow)
 - b. Brachio-cephalic fistula (BCF) (elbow)

If a RCF or BCF is not possible, second line options include the following, in alphabetical order (evidence):

- a. Radio-basilic with vein transposition
- b. Transposed brachio-basilic fistula (tBBF)

¹ Waiting times in the BCPRA guideline are the same as those listed on the Vascular Surgery Provincial List of Patient Condition, Diagnosis Descriptions & Priority Levels (2010; Surgical Patient Registry).

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8. Tunneled catheters are placed if a hemodialysis catheter is to remain in situ for >1 month.
9. The preferred site for a tunneled catheter is the right internal jugular vein. Tunneled cuffed catheters should **not** be placed on the same side as a maturing AV access, if possible (evidence).
10. Real-time fluoroscopy guided insertion of tunneled catheters is recommended. The catheter tip should be adjusted to the level of the caval atrial junction or into the right atrium to ensure optimal blood flow (evidence).
11. Femoral hemodialysis catheters may be placed when urgent vascular access is required, using long (≥ 20 cm) catheters. Establish a more suitable access (IJ catheter) as soon as possible (within one week).

B. MONITORING

a) Maturation of Created Access:

1. At **2 weeks** after creation: Trained individual (vascular access or kidney clinic nurse +/- nephrologist +/- vascular surgeon) assesses AV fistula/graft:
 - If absent thrill or bruit, refer patient urgently back to the vascular surgeon.
2. At **6 weeks** after creation: Vascular access team assesses AV fistula/graft for maturation failure:
 - If inadequate maturation, initiate appropriate investigations (fistulogram) and interventions.
3. **Q6 months:** Vascular access team assesses preemptive AV fistula/graft for patency until dialysis is initiated.
4. At **4-6 weeks prior** to anticipated initiation of hemodialysis: Vascular access team assesses AV fistula/graft for adequacy to cannulate:
 - If access inadequate for cannulation, initiate appropriate investigations and interventions.

b) Established Vascular Access:

1. Monitor AV fistulas/grafts on a q4-6 weekly schedule by the following methods (preferred order):
 - a. Access flow measurements.
 - b. Dynamic or venous pressure measurement.
 - c. Access recirculation using 2 needle, 3 sample urea method if other technology not available.
2. Monitor catheter function on a q4-6 weekly schedule using recirculation values preferably using dilution method (transonic machine).

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3. Investigation and treatment by venography (fistulogram) is recommended:
 - a. Within **2 weeks** for:
 - i. Absolute access flows of 300-500 mL/min in AVF and 500-650mL/min in AVG.
 - ii. Decrease in access flow of >20% from baseline values.
 - iii. Inability to achieve a blood pump speed on dialysis of \geq 300 mL/min by week 3 of initiating hemodialysis or <350 mL/min for established hemodialysis (on 2 consecutive runs).
 - iv. Difficulty with cannulation and excessive bleeding post-hemodialysis otherwise unexplained.
 - v. Arm swelling; or
 - vi. High machine venous pressures or low machine arterial pressures on hemodialysis.
 - b. Within **48 hours** for:
 - i. Access flows of <300 mL/min.
 - ii. Decrease in access flow of \geq 50 %; or
 - iii. Potential SVC syndrome (acute facial swelling with respiratory compromise)
 - c. Within **24 hours** for:
 - i. Unable to cannulate; or
 - ii. Loss of pulse/thrill in AVG.
4. The use of TPA on >2 occasions in a 2-week period in a patient with a catheter needs to be investigated.
 - Chest x-ray to confirm position.
 - Some centres may do catheter dye study to look for evidence of fibrin sheath.
5. If clinically suspicious and/or evidence of fibrin sheath or ongoing unexplained catheter dysfunction: (1) replace the catheter (preferred) or (2) identify catheter as resistant and administer alteplase on a regular basis (exceptional basis only).
6. Use venography in patients with persistent catheter dysfunction or in patients who develop new facial swelling to rule out central vein stenosis.

C. INTERVENTION

1. Angioplasty is the first option for treatment of stenosis of the AVF/AVG or central veins, unless otherwise directed by the radiologist or vascular surgeon.
2. Guidelines for angioplasty treatment are as follows:
 - a. Usually within 2 weeks
 - b. Within 48 hours if:
 - i. Absolute access flow <300 mL/min or
 - ii. Drop from baseline of >50% or
 - iii. Clinical indication (severe bleeding or unable to properly dialyze patients)
3. Surgical revisions of stenosed fistula/graft should be done on a more urgent basis, as per surgical priority scale.

Approved by the Provincial Vascular Access Services Team (PVASt) and BCPRA Medical Advisory Committee (MAC).