

# Dialysis

## Vascular Access

### 21. Management of catheter occlusion and poor flow

#### CARI Guidelines

- a. Low dose urokinase (5000U/ml) may be tried according to the DOQI protocols. Higher dose urokinase (25-100,000 units as an infusion, or 250,000 units during or before dialysis) have also been used when low dose fails. (level B evidence)
- b. tPA is an alternative using 1-2mg aliquots for low dose treatment, or 20mg as an infusion. (level B evidence)
- c. Catheter stripping and catheter replacement are also useful adjuncts. (level B evidence)

## Practice Tips

- Catheter malfunction is common.
- Early malfunction may reflect inadequate placement of the catheter such that the catheter abuts the vein wall. Re-positioning may be necessary.
- Delayed malfunction usually reflects thrombus either within the catheter, or around the catheter.

## What is the evidence?

Peska DN, DeLanbe B, Gratch JO, Bleicher JN, Pertusi RM, Mueller D. Short term continuous infusion thrombolytic therapy for occluded central venous (sic) venous dialysis catheters. Am J Manag Care 1997; 3: 261-264. Retrospective Case review of 22 patients receiving 100,000U urokinase divided dose infused into each lumen of occluded/dysfunctional catheters with 80% success.

Paulsen D, Reisotheer A, Aasen A, Fauchald P. Use of tissue plasminogen activator for reopening of clotted dialysis catheters. Nephron 1993; 64: 468-470. Small Case series of 2mg tPA for occluded catheters (divided dose), 90% success.

Twardowski ZJ: High dose intradialytic urokinase to restore the patency of permanent central venous hemodialysis catheters. Am J Kidney Dis 1998; 31: 841-847. (Use of 250,000 urokinase during dialysis to increase flow rates, 80% initial success)

Crain MR, Mewissen MW, Ostrowski GJ et al. Fibrin sleeve stripping for salvage of failing hemodialysis catheters: Technique and initial results. Radiology 1996; 98 41-44.">

## What do the other guidelines say?

**DOQI:** Catheter dysfunction is defined as failure to attain and maintain an extracorporeal blood flow sufficient to perform hemodialysis without significantly lengthening the hemodialysis treatment. The Work Group considered sufficient extracorporeal blood flow to be 300 mL/minute. (Opinion)

A dysfunctional catheter should be treated in the hemodialysis unit using the protocol for

intraluminal urokinase administration. (Evidence)

If urokinase treatment fails, a radiographic study using catheter contrast injection should be performed. Further treatment should then be performed based on the radiographic findings. Appropriate treatments include:

1. Fibrin sheath stripping using a snare if a fibrin sheath is present (Evidence)
2. Exchanging the thrombosed catheter over a guidewire if a fibrin sheath is present, or if the catheter is malpositioned, or of inadequate length (Evidence)
3. Intra-catheter urokinase infusion (e.g., 20,000 units/lumen/hour) for 6 hours if a fibrin sheath is present or a luminal thrombosis remains (Evidence)
4. Performing embolectomy on the catheter if the lumens show residual thrombus (Opinion)
5. Repositioning a malpositioned catheter using a snare (Evidence)

NKF ñ DOQI Protocols for Urokinase Administration\*

1. Attempt to aspirate the occluded catheter lumen to remove heparin.
2. Steadily inject urokinase (1 mL or volume sufficient to fill lumen) with 3 mL or other small syringe into the occluded catheter lumen (urokinase 5000u/mL).
3. If needed, fill remainder of the catheter lumen with saline in the same manner (e.g., for a 1.3 mL catheter lumen use 1 mL urokinase and 0.3 mL saline).
4. Add 0.3 mL saline every 10 minutes x 2 to move active urokinase to distal catheter.
5. Aspirate catheter.
6. Repeat procedure if necessary.

Manufacturer's Protocol for Urokinase Administration

1. Attempt to aspirate the occluded catheter lumen to remove heparin.
2. Steadily inject urokinase (1 mL or volume sufficient to fill lumen) with 3 mL or other small syringe into the occluded catheter lumen (urokinase 5000u/mL).
3. Fill entire catheter lumen (urokinase 5000u/mL).
4. After 30 minutes, aspirate catheter. May be repeated as needed.

\*Numerous protocols for urokinase administration are in use. These are two examples.

**BRA:** No guidelines available

**CSN:** Treat a dysfunctional permanent catheter in the hemodialysis unit using the protocol for systemic urokinase administration. Perform any further treatment based on the radiographic findings. If adequate flow is not achieved, repeat systemic urokinase. Patients who require more than one systemic urokinase should be considered for anticoagulation with warfarin, if there is no contraindication.

## Implementation and Audit

Number of catheter malfunctions per patient treatment months

## Suggestions for Future Research

TPA vs urokinase

Thrombolytics vs fibrin stripping