

Dialysis Catheter Placement in Patients With Exhausted Access



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Patients with end-stage renal disease undergo renal transplant, peritoneal dialysis, or intermittent hemodialysis for renal replacement therapy. For hemodialysis, native fistulas or grafts are preferred but hemodialysis catheters are often necessary. Per KDOQI, the right jugular vein is the preferred vessel of access for these catheters. However, in patients with long-standing end-stage renal disease vein thrombosis, stenosis and occlusion occurs. In these patients with end-stage vascular access, unconventional routes of placement of dialysis catheters are needed. These methods include placing them by means of sharp recanalization, via a translumbar route directly into the inferior vena cava, and via transhepatic and transrenal routes. These difficult, but potentially lifesaving methods of gaining vascular access are reviewed in this article.

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Introduction

Arteriovenous fistulas and grafts are the first line of dialysis access, the management of which is discussed elsewhere. However, for various reasons, including thrombosis, surgical ineligibility, need for urgent dialysis, and maturation failure or delay, 80% of patients with end-stage renal disease will at some point require catheter-based access for dialysis.¹ Central venous dialysis catheters may malfunction, become infected, and cause central venous obstruction, stenosis, or occlusion. Therefore, in patients with long-term dependency on catheter-based dialysis, unconventional approaches are necessary for catheter placement.

Clinical Evaluation

When faced with a patient with exhausted access who needs placement of an unconventional dialysis catheter, a thorough history and physical examination is necessary. A

detailed history of patient's venous anatomy and prior access sites is crucial to understand potential options. Physical examination of the extremities, neck, and chest will aid in determining the presence of collaterals and provide clues about sites of stenosis. Before performing unconventional (and therefore more risky) techniques, all efforts should be made to ensure any prior access sites cannot be salvaged, including changing the tunnel tract for tract infections. Ultrasound evaluation or diagnostic venography or both can aid in determining if traditional catheter access sites can be salvaged.

All patients require preprocedure laboratories, including international normalized ratio and platelets. Administration of antibiotics before central venous access procedures is controversial. Although of uncertain clinical usage for routine dialysis catheter placement,² it is reasonable to administer preprocedure antibiotics (eg, 1-2 g cefazoline IV).

Conventional Access

Short-term, nontunneled catheters are used for short-term dialysis and should either be removed or converted to a long-term catheter within 7 days or as soon reasonably possible. Long-term catheters may also be used; but ideally with a plan for subsequent permanent access (graft or fistula). The order of preference for site of placement of dialysis catheters is right internal jugular vein, left internal jugular vein, external jugular

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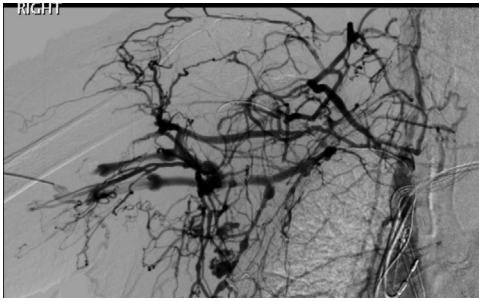


Figure 1 DSA showing chronically occluded right subclavian vein. The existing left permcath needed to be removed due to infection. DSA, digital subtraction arteriography.

veins, subclavian veins, and femoral veins.³ Attempts should be made to preserve traditional access sites even if chronically occluded. Often hydrophilic guidewires can be navigated through occluded or stenosis segments with adjunctive angioplasty or stent placement used to preserve these preferred access sites (Figs. 1-3). If patency of conventional access sites cannot be re-established, unconventional dialysis access techniques are needed.

Unconventional Access

Translumbar approach

Translumbar venous access was first described in 1995 by Lund et al.⁴ In this approach, the infrarenal inferior vena cava (IVC) is accessed along the lumbar vertebrae via a direct percutaneous puncture.⁵ Using a point above the right iliac crest as a skin entry landmark, the IVC is targeted at the L3 level. Longer catheters (27 or 33 cm tip to cuff) are often needed.⁶

Technique

- (1) Review available computed tomography (CT) ensuring patent IVC CT measuring length from skin to IVC along the planned trajectory.



Figure 2 Chronic total occlusion of the right subclavian vein crossed with aid of hydrophilic wire and angled catheter.



Figure 3 DSA showing restored patency of right subclavian vein after stent placement. A permcath was then placed (not shown). DSA, digital subtraction arteriography.

- (2) Mark belt line so it can be avoided (have patient help).
- (3) Palpate the right iliac crest.
- (4) Mark a point approximately 5 cm above the iliac crest and 10 cm right of midline.
- (5) Advance a needle 45° medial and cephalad. Usually, a 21-gauge needle of appropriate length based on preprocedure measurements
 - (a) If the iliofemoral system is patent, obtaining femoral or popliteal venous access and advancing a catheter or wire into the IVC will provide a target for percutaneous IVC access (Fig. 4).⁷
 - (b) If the iliofemoral system is not patent and a wire cannot be passed centrally, the IVC can be delineated by intermittent contrast injections from collateral networks (Fig. 5).
- (6) Approach the anterolateral margin of the L3 vertebra as a landmark.
 - (a) Access to the IVC can also be obtained via CT assistance. However, fluoroscopic targeting of the IVC results in better catheter trajectory compared with CT.
- (7) When the needle has passed a line parallel to the lateral margin of the vertebral pedicle, check for luminal entry by aspirating through the needle.

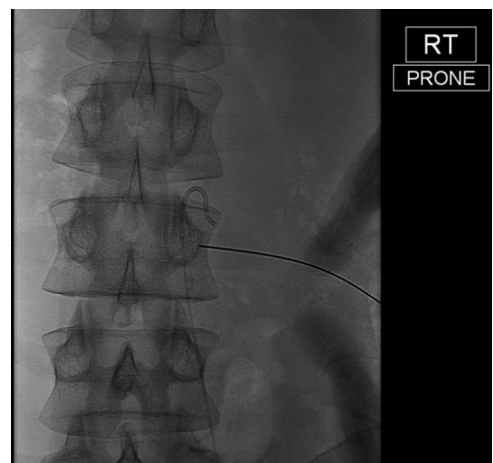


Figure 4 Percutaneous needle targeting flush catheter in the IVC placed via popliteal approach (Image courtesy: Keith Quencer).

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