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Tunnel Hemodialysis Catheter Placement using the Supra-clavicular Approach to Overcome Stenosis of the Internal Jugular Vein at its Origin

By Magbri A MD, Brandt M CV RT, Mock L RT, Colosimo V RN, Zurawsky R RN & McCartney P BSN, RN

Pine (Partners in Nephrology and Endocrinology), United States

Abstract- A case of ESRD on HD who is referred for placement of tunnel hemodialysis catheter insertion because his arterial-venous fistula is still immature to be used for HD. He had had 3 TDC placed in the right IJ on previous occasions. His angiogram revealed stenosis of the internal jugular vein at its junction with subclavian vein. After 3 failed attempts at right internal jugular vein cannulation the Supraclavicular approach of the SCV cannulation was achieved with ease overcoming the stenosis in the right internal jugular vein.

The case is 68 years Caucasian male with end stage renal disease secondary to renal cell carcinoma and hypertension. He had three tunnel hemodialysis catheters (TDC) placed in the right internal jugular vein and failed radial-cephalic arterial-venous fistula in the left forearm.

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The case is 68 years Caucasian male with end stage renal disease secondary to renal cell carcinoma and hypertension. He had three tunnel hemodialysis catheters (TDC) placed in the right internal jugular vein and failed radial-cephalic arterial-venous fistula in the left forearm. He had recently placed brachial-cephalic AVF in the left arm which was not matured to be used in HD. He was referred to the Dialysis Access Center of Pittsburgh, PA for placement of right internal jugular vein tunneled hemodialysis catheter. Three attempts were made to place TDC in the right IJ vein were without avail due to stenosis in the origin of the right IJ at its junction with the sub-clavian vein as illustrated in the angiogram. A decision was made to place the TDC using the supra-clavicular approach as described below to overcome the stenosis in the right IJ. The procedure was accomplished without difficulty using the ultra-sound- guided cannulation of the subclavian vein and the supra-clavicular approach. Supra-clavicular placement of tunnel dialysis catheter is easy and safe method to overcome stenosis in the internal jugular vein.

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I. Sedation

- Explain the procedure, benefits, risks, and complications, and obtain signed informed consent.
- Sedate the patient using versed and fentanyl injected into the central veins. Vital signs were monitored by the nurse for the entire period of the procedure.

II. Technique

- The skin at the cannulation site is infiltrated with local anesthesia (1% lidocaine), then using real time ultra-sound guidance, the subclavian vein (SCV) was cannulated using a 45° bisection of the approximately 90° angle formed by the superior aspect of the clavicle and the lateral border of the sternocleidomastoid.
- Under continuous aspiration with the syringe the needle is directed parallel to the chest wall in the coronal plane aiming for the contra- lateral nipple or the supra-sternal notch 10-15° to the sagittal plane and 35° posteriorly from the coronal plane (1, 2).
- When blood is freely aspirated the 0.018 inch guide wire was inserted in the needle and then co-axial 3 and 5 Fr dilators were placed. The puncture site to the SCV is achieved easily using the direction explained earlier, 1.5 cm lateral to the heads of the sternocleidomastoid muscle and about 1 cm above the clavicle.
- The 0.018 wire is advance into the vein and the needle is exchanged for the co-axial dilators. A 0.035 inch Bentson (Merit-Medical system Inc Jordan, Utah, USA) guide wire is placed with its distal tip in the inferior vena cava under fluoroscopy.
- A 1 cm incision was made at the venotomy site and the area was bluntly dissected with a pair of hemostat. A tunnel was created following a subcutaneous infiltration with 1% lidocaine along the expected course of the tunnel. The tunnel should be at least 8-10 cm in length. A # 11 blade is used to create a 5 mm incision on the chest wall at the desired entry site on the chest.
- The tunnel was then dilated with a pair of hemostat as well as the catheter-tunnelet combination from the exit site towards the venotomy site.
- The desired catheter length was advanced from the exit site in the anterior chest wall to the venotomy site and the SVC under direct fluoroscopy without the peel-away sheath.
- The tip of the catheter is placed between the junctions of the SCV with the right atrium. Making sure there is no evidence of malposition, kinks of the catheter or complication.
- The catheter ports are then tested by flushing them with 10cc syringe. The ports of the catheter are flushed with heparin and the catheter was sutured in place with 2-0 non-absorbable suture.

Author α σ ρ ω ¥ §: Dialysis Access Center of Pittsburgh, PA.
e-mail: elmagbri@hotmail.com

III. Complications and Advantages of the Supra-clavicular Approach for Tunnel Hemodialysis Catheter Insertion

1. The rate of all procedure- related complications has dropped significantly with image-guided insertion. Arterial puncture (0.8-3.36%), pneumothoraces (0.48-0.56%), and catheter malpositioning are virtually non-existing with image guided insertion (3-12).
2. Venous laceration that often occurs with the traditional method can also happen in this approach. Puncture or laceration of the subclavian artery is theoretical possibility. Also this approach should be avoided in patients who are anticoagulated because the subclavian vein cannot be compressed.
3. The supra-clavicular approach is easy to accomplish and avoids stenosis at the origin of the internal jugular vein as in this case. It is underused procedure for gaining access to the central veins. It offers several advantages over the other methods because the SCV at the insertion site is quite superficial and the right side offer straight path to the SCV. In obese patients this anatomical area is less distorted.
4. Air embolism is caused by the negative intra-thoracic pressure created with the inspiration into an open hub. Placing the patient in Trendelenburg position and making sure the hubs are always occluded would lower this risk.
5. The overall complication rate is significantly less compared to the other methods (4). The success rate is 92% as reported by Czamik et al (6) even in those being mechanically ventilated. The use of the US guidance to locate the vessel prior to cannulation remains an option and lessens the complication rate (7-10).

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