Case Report

Tunneled Femoral Vein Catheterization for Long-term Hemodialysis – Experience from a Tertiary Care Center

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Abstract

Introduction: Tunneled femoral vein hemodialysis catheters are used when all other options for permanent vascular access or jugular central vein catheter are exhausted. There is little published literature on the outcome and survival of tunneled femoral vein catheters. **Methods:** Using a retrospective database, we identified all tunneled femoral dialysis catheters placed in the Nephrology department of our institute over a one-and-half year period. The outcomes, complications, and patency of these procedures was retrospectively evaluated. **Results:** Out of total 21 patients, 14 were female and 7 males with a mean age of 45 (range 17–73 years) and about one-fourth had diabetes mellitus (26%). Right-sided femoral catheter insertion was performed in 18 patients (85.7%) and 3 patients underwent left-sided insertion. Technical success of placement was 100% with no immediate complications. Median follow up period was 24 days. Primary catheter patency at 30, 60, 90, and 180 days were 81, 29, 18, and 12.5%, respectively. Three patients (15.7%) developed catheter-related deep venous thrombosis. Three catheters (14.2%) were removed for catheter-related infection and seven (33.3%) were removed because of absent blood flow. **Conclusion:** Our experience with tunneled femoral catheters revealed low catheter survival and significant complications (deep venous thrombosis and malfunction/occlusion).

Keywords: *Femoral, hemodialysis, tunneled catheter*

Introduction

Vascular access in the form of arteriovenous fistula, grafts, and central vein catheterization are an essential prerequisite in patients with end-stage renal disease (ESRD) on hemodialysis. Unfortunately, in some patients, fistula/graft gets exhausted with no chances of repair. Also, some patients develop internal jugular vein/superior vena cava thrombosis or stenosis from the previous catheterization endangering patient's survival. In such patients, tunneled femoral vein catheter (TFC) insertion remains the only viable option for hemodialysis. Femoral vein cannulation comes next to jugular in order of preference for insertion of tunneled hemodialysis catheter followed by subclavian and lumbar in that order.[1] The other situation where TFC plays an important role especially in a country like ours is as a bridge to creation of AV-fistula in a patient with central vein stenosis/thrombosis. However, the published literature on TFC as a vascular access is scant, and the efficacy, catheter life, and long-term complications have not been extensively studied. We hereby report our center experience using the common femoral vein as a vascular access for tunneled hemodialysis catheters.

Materials and Methods

This is a retrospective review of all consecutive tunneled hemodialysis catheters inserted through common femoral vein in our department from January 2020 to April 2021. The primary study outcome was catheter site patency at 30, 60, 90 and 120 days. Each patient's vascular history including previous catheters, failed fistulas, and known central vein stenosis were reviewed. All patients received intravenous vancomycin (1 g) on the day of procedure and the skin preparation was done with 10% povidone iodine. All the catheters were inserted under real-time ultrasonographic guidance under strict septic conditions. After the puncture of femoral vein using 21-gauge micropuncture needle, a guidewire was inserted which was then converted to

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15-F peel away introducer needle. A subcutaneous tunnel was created with a tunneler with exit in the lateral thigh away from the groin. The distance between the puncture site and the catheter exit site had to be approximately 10 cm. The catheter length was chosen so as to position the catheter tip within the inferior vena cava just above the confluence of iliac veins (approximately measured from the exit site to the umbilicus). Post-procedure plain X-ray of the abdomen and pelvis was obtained to check the position of the catheter tip and to exclude kinking [Figure 1]. One hemodialysis session post-catheter insertion was provided in our hemodialysis unit, where blood flow rate (pump speed) was recorded. The patient was then advised to continue hemodialysis at center of convenience with routine standard intradialytic heparin protocol. The patients were followed up telephonically every month and enquired about the blood flow rates, new onset fever, and limb swelling. If any problem was reported, patients were asked to visit physically in our hemodialysis center for evaluation. Primary catheter site patency was defined as the interval from time of placement of the catheter until first intervention, catheter malfunction, completion of therapy, and catheter site abandonment.[2] Patients were advised to ask the respective dialysis units to use heparin in the dose mentioned on catheter hub to be instilled in each catheter port post each dialysis session, and the same instructions were mentioned on the discharge manual.

Catheters with absent/poor blood flow rates were removed. Catheter-directed thrombolysis was not attempted. Patients with probable catheter-related blood stream infections were started on intravenous vancomycin and piperacillin tazobactam that was later modified as per the blood culture sensitivity report. Patients who presented with limb edema after catheterization, a duplex ultrasonography was done for deep venous thrombosis and were anticoagulated with warfarin after catheter removal.

Figure 1: Abdominal radiograph showing a tunneled hemodialysis catheter placed using the left common femoral vein with a tunnel created in the thigh. The tip is positioned in the inferior vena cava at the level of L3 lumbar vertebrae

Results

Baseline characteristics

We analyzed retrospective data of 21 consecutive patients who underwent femoral tunneled hemodialysis catheter insertion in our department between January 2020 and April 2021. A total of 227 tunneled catheters were inserted during this period and femoral catheters constituted 9.2% of all the tunneled catheters placed in our department. Out of total 21 patients, 14 were female and 7 males with a mean age of 45 (range 17–73 years) and about one-fourth had diabetes mellitus (26%). Right-sided femoral catheter insertion was performed in 18 patients (85.7%) and 3 patients underwent left-sided insertion. The patients with femoral catheter insertion were on hemodialysis for a median duration of 24 months (range 2–144 months). Two types of tunneled hemodialysis catheters were used: palindrome (Covidien Medtronic) and bard (Hemosplit) with lengths varying from 27 to 35 cm (Tip to cuff). Indication of insertion of femoral tunneled hemodialysis catheter was bilateral central vein/superior vena cava stenosis in 14 patients and unilateral central vein stenosis who were to receive fistula in the contralateral arm in six patients. One patient had developed iatrogenic mediastinal rupture and subclavian arterial tear during right internal jugular catheterization for which he underwent exploratory thoracotomy and repair.

Catheter survival

All the procedures were technically successful and uneventful. In five catheters, blood flow rate was less than 300 mL/min during the first hemodialysis. The remaining 16 catheters had an acceptable blood flow rates of more than 300 mL/min. Follow-up data was calculated for 21 catheters. The median follow-up period was 24 days (IQR 51.5 days). Primary catheter patencies at 30, 60, 90, and 180 days were 81, 29, 18, and 12.5%, respectively. Three catheters (14.2%) were removed for catheter-related infection; seven (33.3%) were removed because of absent blood flow. Ten catheters (47.6%) were removed when they were no longer needed (one patient with peritoneal dialysis, eight patients with functional AV fistula, and one patient became dialysis independent after 4 weeks). One patient died with the functioning catheter due to unrelated cardiac issue.

Catheter-related deep vein thrombosis (DVT)

There were no procedural-related immediate complications. Three patients (15.7%) developed catheter-related deep venous thrombosis. One patient developed proximal common femoral and iliac deep venous thrombosis on day 8 of catheter insertion for which he was started on therapeutic anticoagulation after catheter removal, but he had sudden cardiac arrest the same day (Likely massive pulmonary thromboembolism). The remaining two patients with the right-sided femoral catheter developed iliac and

femoral vein thrombosis extending into IVC at 1 month for which catheter was removed and anticoagulation was commenced. Among the 21 patients who underwent femoral catheter insertion, six patients (31.5%) died during study follow-up.

Discussion

A subset of hemodialysis patients requires insertion of tunneled femoral catheter insertion because central vein occlusion precludes placement of catheter in internal jugular vein. Our study shows that 9.2% of total newly placed tunneled catheters at our institute are placed in femoral veins. This is greater than the 2% proportion reported by Maya and Allon.[3] Our patients were on hemodialysis for a long period of time (average 38 months) prior to receiving a tunneled femoral catheter and have had multiple failed permanent vascular access. There is limited data available on the use of femoral veins as permanent dialysis vascular access with no published experience from our country.[3-8] Preferably right-side femoral vein is chosen for catheter insertion because the anatomical course through the right iliac veins into the inferior vena cava is straighter and shorter than through left iliac veins. Moreover, left iliac vein can get compressed by the overlying iliac artery and thus predispose to iliac vein thrombosis. In our study, being a retrospective design, we did not evaluate the difference in the outcomes between right- and left-sided catheters.

We had a primary catheter patency of 81% at 1 month and 29% at 2 months (with 16 out of 21 catheters removed by the second month). Inadequate or improper heparin locking of the catheter ports could be one reason for low primary patency at 2 months. As the patients underwent dialysis at the center of convenience, we could not ensure the proper heparin catheter lock post each dialysis session. Our primary catheter patency rate at 1 month was higher than those previously reported. We did not perform imaging/thrombolysis/catheter salvage in patients with poor flow. As all our patients were receiving hemodialysis at respective local centers, blood flow could not be documented/monitored. Hence, catheters were removed when they had absent flow in one/both ports with no intervention done for poor blood flow. Had we routinely removed or intervened for catheters with poor blood flow, the primary patency would have been much lower. Falk[4] in a retrospective review of 86 TFC revealed a low primary patency rate of 44% at 1 month and poor blood flow requiring 1–13 interventions. They managed all catheters with a blood flow rate of <200 mL/min with instillation of thrombolytic agents followed by radiological imaging for the detection of fibrin sheath/thrombus if thrombolysis failed. Catheters with a blood flow rate of <200 ml/min were removed. Burton *et al*.[5] showed that factors such as advanced age, diabetes and left side femoral vein catheter insertion were associated with a higher catheter failure rate. Similarly, Zaleski *et al*.[6] reported 30, 60, and 180-day femoral catheter primary patency rates of 78, 71, and 55%, respectively. Our technical success rate of 100% for successful catheter insertion is comparable to that described by Falk.[4]

Risk of deep venous thrombosis after TFC in our study was 15.7% that was somewhat higher than 14% rate reported by Zaleski *et al*.[6] in a retrospective study. Maya and Allon[3] reported a DVT rate of 26% in their prospective cohort of 27 patients. However, in our study, we evaluated patients with a duplex ultrasound only in symptomatic patients with a clinical suspicion of DVT. It is possible that many additional patients may be diagnosed with subclinical DVT if routine ultrasonography is performed. Possibly the local trauma to the vein by the long length of the catheter and poor catheter blood flow contributes to the increased rates of thrombosis. Recently, Herrington *et al*.[9] in a retrospective review showed no benefit of routinely adding prophylactic anticoagulation in patients with TFC to reduce the rates of catheter-related deep venous thrombosis. A randomized trial with appropriate blinding is required before a universal policy of prophylactic anticoagulation can be adopted.

Our study is limited by the small sample size and the retrospective design. We did not compare the outcome of tunneled femoral catheters with other alternative vascular access site. Also, since the patients did not follow-up at our center after the first dialysis, the calculated primary patency rates and the complication rates may be overestimated and underestimated, respectively. The long-term risks of stenosis, thrombosis, and infection may not have been adequately determined by the short follow-up period and retrospective nature of our study. We could not compare the patency and complication rates between palindrome and hemosplit catheters as this data was not captured.

Conclusion

To conclude, our experience with tunneled femoral catheters revealed low catheter survival and significant complications; deep venous thrombosis and malfunction/occlusion. However, despite this bleak picture, TFC might be the only option available in patients with exhausted vascular access or as a bridge to transplant.

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Conflicts of interest

There are no conflicts of interest.

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