Vascular access for hemodialysis in Nepal Medical College and Teaching Hospital

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ABSTRACT

Good vascular access is an essential component for hemodialysis (HD). Studies in patterns of vascular accesses used for HD are very few. Eighty two (male 55, female 27) patients attending HD unit of Nepal Medical College and Teaching Hospital (NMCTH) over a period of one year were enrolled for the study. Average age was 46.12 years. Seventy four patients (90.0%) were suffering from chronic kidney disease (CKD) 5 and 8 (10.0%) patients had acute renal failure. Initial vascular access used was temporary vascular access in 76 (93.0%) and arteriovenous (AV) fistula in 6 (7.0%) patients. As a first temporary vascular access femoral catheterization was used in 54 (66.0%) patients followed by subclavian and internal jugular vein catheterization in 18 (22.0%) and 4 (5.0%) respectively. Fever was observed in 9 (11.0%) patients with first temporary access. There was no complication in 65 (79.0%) cases. Other complications were poor flow, malposition, infection, thrombosis, aneurysm and self removal of catheter. Only 47 patients were analyzed for the second vascular access. Trends towards use of second vascular access was subclavian and internal jugular vein cannulation in 20 (42.5%) and 10 (21.3%) respectively, AV fistula in 13 (27.7%), and femoral catheterization in 4 (8.5%). Second vascular access was associated with fever in 7 (14.9%) and limb swelling in 1 (2.1%). Temporary vascular access was the most common access to initiate HD in CKD 5. Only 7.0% of the patient had AV fistula to start HD. Femoral vein catheterization was the most commonly used first temporary vascular access. Complications with the vascular accesses were negligible.

Keywords: Vascular access, hemodialysis patients, complications, NMCTH, Nepal.

INTRODUCTION

Good vascular access is an essential component for hemodialysis (HD). The well being of patient with end stage kidney disease depends on durable vascular access. Vascular access for HD should provide blood flow of more than 350ml/min and the permanent vascular access should able to be punctured repeatedly. Scribner *et al* carried out pioneer work by constructing first successful vascular access in 1960.[1] In the initial days, vascular access was created by nephrologists but now it has become the domain of surgeons. Thus the vascular access remains the Achilles' heel of hemodialysis.[2] This study was conducted to evaluate the pattern of initial as well as subsequent vascular accesses used in our unit in Nepal Medical College and Teaching Hospital (NMCTH) and to observe any complications associated with the use of catheters.

MATERIALS AND METHODS

Eighty two patients attending HD unit for hemodialysis over a period of one year (July 2008 to June 2009) were retrospectively analyzed. HD charts of individual patients were reviewed and types of vascular accesses used and their complications were noted down. Out of 82 patients 24 patients discontinued the treatment and 8 cases of acute renal failure (ARF) improved with the treatment. Out of these 50 patients three had arteriovenous (AV) fistula (a permanent vascular access) as a first vascular access so we could analyze second vascular accesses of 47 patients only.

Femoral vein was catheterized with a 14GAX13.3cm straight single lumen femoral catheter by house officers in the HD unit under aseptic precautions and local anesthesia. We used Scheldinger's technique to catheterize femoral vein. Femoral catheters were removed after each dialysis. Femoral sites were properly pressed manually and by sand bag to prevent bleeding and hematoma. After removing the femoral catheter it was kept in cidex, labeled and was reused for the same patient. Temporary internal jugular and subclavian catheters were inserted in the intensive care unit by anesthetist under full aseptic technique under local anesthesia. We used 12frX15cm double lumen catheter with curved kit for internal jugular vein catheterization and 12frX15cm double lumen catheter with straight kit for subclavian vein catheterization. After each dialysis, central venous catheter was aseptically dressed and locked with adequate dose of heparin (3000 units

Table-1: Types of first and second vascular accesses for hemodialysis and outcomes.

Access	Ist access	Discontinued	Improved	No. of patietns requiring 2nd access	2nd access used (n=47)			
					FV	*SCV*	*IJV*	*AVF*
FV	54 (66.0%)	16	8	30	-	19	10	1
SCV	18 (22.0%)	5	-	13	4	1	-	8
IJV	4 (5.0%)	-	-	4	-	-	-	4
AVF	6 (7.0%)	3	-	NA	-	-	-	-
Total	82 (100.0%)	24	8	47	4 (8.5%)	20 (42.5%)	10 (21.3%)	13 (27.7%)

FV: Femoral vein catheterization; SCV: Subclavian vein catheterization; IJV: Internal Jugular vein catheterization; AVF: Arteriovenous fistula; NA: not applicable

unfractionated heparin was diluted in 2ml of 0.9% normal saline and 1ml of diluted heparin was injected in each lumen). Catheters associated with poor blood flow and infections were removed.

All the patients of chronic kidney disease (CKD) 5 were counseled for construction of AV fistula. AV fistula as a permanent vascular access was constructed by a surgeon in operation theater by joining end of cephalic vein to side of radial artery in wrist mostly on nondominant side. In some cases proximal fistula by joining cephalic or basilic vein to brachial artery were constructed.

RESULTS

Of the 82 patients studied, there were 55 males (67.0%) and 27 females (33.0%). Their mean age was 46.12 yrs (range 15 to 87 yrs). The indication for HD was CKD 5 in 74 (90.0%) and ARF in 8 (10.0%) cases (Fig.1).

Temporary venous catheter was placed for initiation of HD in 76 patients (93.0%). AV fistula was used to start dialysis in only 6 patients (7.0%). (Fig.2) Temporary vascular access in the form of repeated femoral vein puncture was performed in 54 patients (66.0%), subclavian vein puncture in 18 patients (22.0%) and internal jugular vein puncture in 4 patients (5.0%) (Table-1).

Sixty five (79.0%) patients with first temporary vascular access had no complications. Nine (11.0%) patients had fever and 3 (4.0%) patients had poor flow through the catheter. Malposition, infection, thrombosis, aneurysm and self removal of catheter were other complications observed (Table-2).

Table-2: First temporary vascular access related complications

Complications	No. of patients	%
None	65	79.0
Fever	9	11.0
Poor flow	3	4.0
Malposition	1	1.2
Infection	1	1.2
Thrombosis	1	1.2
Aneurysm	1	1.2
Self removal of catheter	1	1.2

Average puncture of femoral vein as a first vascular access was 2.4 times. Subclavian and internal jugular catheters were used as a first vascular access for 7 and 7.5 times respectively.

Eight patients of ARF improved and they were discontinued from the dialysis. Twenty four patients of CKD 5 discontinued the treatment. Out of 50 patients who remained on regular HD, three patients already had AV fistula as a first vascular access. In remaining 47 patients, 4 (8.5%) patients continued their dialysis with repeated femoral vein puncture till their AV fistula matured. These 4 patients had initially subclavian catheters which had to be removed due to complications eg. fever, poor flow and malposition. Twenty (42.5%) patients continued their dialysis with subclavian vein catheter as a second vascular access. Of these 20 patients, 19 were previously dialysed through femoral vein and in remaining one, the side of subclavian catheter was changed due to poor flow. Ten (21.3%) patients of femoral catheter were changed into internal jugular catheter for a second vascular access. In 13 (27.7%) patients AV fistula was used as a second vascular access for long term HD. Out of these 13 patients 8 were initially on subclavian vein, 4 were on internal jugular vein and one was on femoral vein catheterization (Table-1).

Thirty nine (83.0%) patients with second vascular access had no complications. Seven (14.9%) patients had fever and 1 (2.1%) patient of AV fistula had swelling of upper limb as complications observed in subsequent vascular access. (Table-3)

Table-3: Complications with second vascular ac

Complications	No. of patients	%
None	39	83.0
Fever	7	14.9
Limb swelling	1	2.1
Total	47	100.0

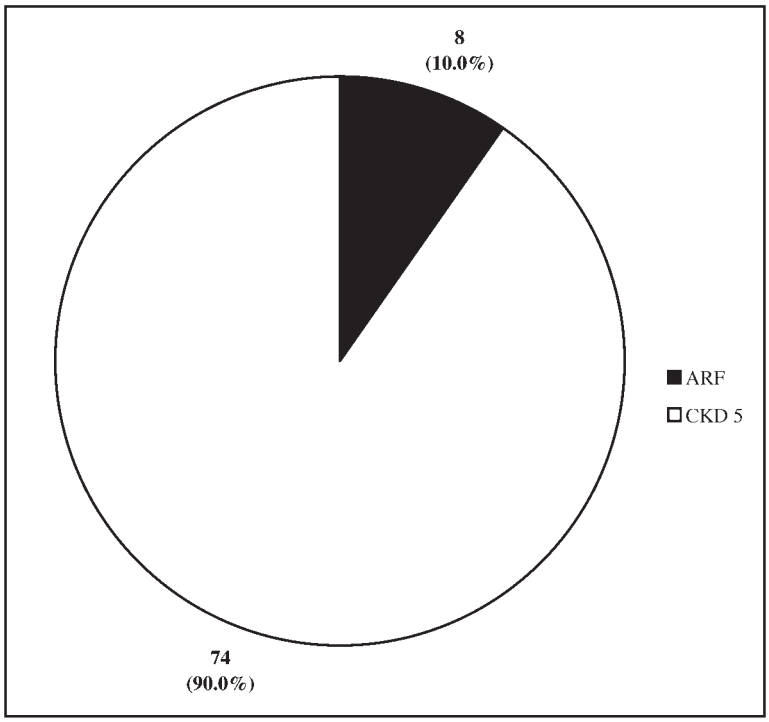

Fig.1. Indications for hemodialysis

DISCUSSION

Proper vascular access is necessary for successful HD. Our study shows that 93.0% started their HD with temporary catheters. Similar report was found in other study from Casablanca Morocco, where the rate of temporary catheter use was quite high (86.3%).[3] The usage of temporary catheter was variable (15.0-60.0%) in the studies published from United States.[4,5] The reason behind high usage of temporary catheter was due to late diagnosis of CKD and late referral to nephrologists and vascular surgeons for timely construction of AV fistula.[6]

In our study, use of femoral vein as a first temporary vascular access was very high (66.0%). This may be because it is cheaper, easy to perform in emergency, and can be repeated. Though it's not popular in many developed world, it has become doctor and patient friendly in our set up because of it being relatively cheap and easy procedure. Repeated femoral vein puncture has been shown to be a good vascular access not only for emergency dialysis but also for long term dialysis. Due to use of small sized needle (19 and 18 gauge) and careful insertion of needle by experts, complications like hematoma and local infection rate were negligible.[7] Single lumen femoral catheter (14 gauge) is frequently used as an initial vascular access to start HD. Except for fever in 2 cases and thrombosis and aneurysm in one case, complications were minimal with the use of femoral catheters in our series. Results are comparable with other study.[8] Use of subclavian vein and internal jugular vein as a vascular access is less common in this series. This depends upon the cost, availability of catheters and decision of nephrologist. Even inside the Kathmandu valley, use of different veins for vascular access is variable. In B&B Hospital, Nepal, central vein catheterization is more popular than femoral vein catheterization.[9] Subclavian vein puncture and catheterization is difficult to perform and is associated with complications like venous stenosis, malposition and pneumothorax. So internal jugular vein catheterization has become popular nowadays.[10] In our unit, we prefer

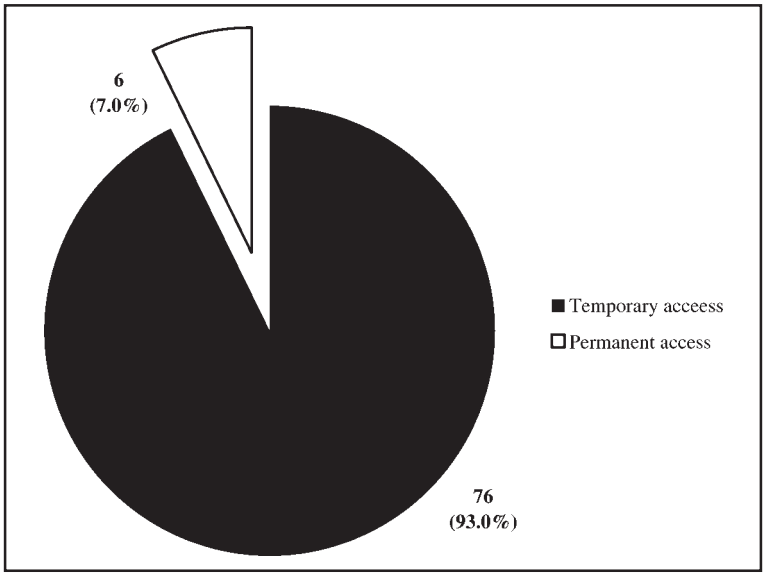

Fig. 2. Types of vascular access used for hemodialysis at the start.

internal jugular catheter insertion more than subclavian in those patients who need long term dialysis and is awaiting construction and maturation of AV fistula. Advantage of using internal jugular and subclavian vein catheter, is that patient remains ambulant.

Out of 47 patients who continued HD, only 13 (27.7%) patients had AV fistula for regular HD as a second vascular access and rest 34 (72.3%) patients were still on temporary catheters. Use of AV fistula as a second vascular access is comparable with the trends followed in United States (32.0%) but the use of temporary catheter as second vascular access is very high in our series (72.3% vs 3%).[11] More than 90.0% patients were referred to the nephrologist at later stage of CKD. Beside this majority of patients cannot decide whether to go for renal replacement therapy or not. So, even after coming to a nephrologist many CKD patients do not comply with the advice of timely construction of AV fistula.

Fever was the commonest complication we encountered with the use of temporary vascular access both in first (11.6%) as well as in second (14.9%) access. Most of these patients (82.0%) were on central venous catheters (subclavian and internal jugular vein). Complication like fever in central catheters is observed and reported in various studies.[12-14] Four percent had problem with blood flow. Other complications associated with vascular access were malposition of catheter, thrombosis, aneurysm and self removal of catheter. In our study, majority of patients had no complications associated with the use of temporary catheter. This could be due to maximum use of single lumen femoral catheter, aseptic technique followed during catheter insertion and appropriate management of catheters.[15] One patient with AV fistula had swelling of hand where fistula was constructed. Doppler study of artery and vein of the affected hand was normal. Swelling was due to soft tissue swelling.

Temporary vascular access was the most common access to initiate HD in CKD 5. Only 7% of the patient had AV fistula to start HD. Femoral vein catheterization was the most commonly used first temporary vascular access. Complications with the vascular accesses either temporary or permanent were negligible. AV fistula as a second vascular access of choice was seen only in 27.7%.

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