Midterm Results of Tunneled Catheter Placement in Hemodialysis Patients with Central Venous Stenosis or Occlusion

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Background: Patients who suffers from central venous occlusion (CVO) or central venous stenosis (CVS) with no options for vascular access (VA) need urgent HD.

Purpose: To evaluate CVO or CVS endovascular veinoplasty through an occluded access site to insert tunnelled catheter for HD.

Patients and methods: Patients included had no options for VA and had CVO or CVS.

Results: 124 patients on HD had endovascular veinoplasty. Technical success was 100% and 79% for CVS and CVO. Mean follow-up period was 36.16±12.6 months. Primary catheter site patency was 70%, 40%, 20%, and 5% after one, two, three, and four years. Assisted primary catheter site patency was 77%, 45%, 27%, and 12% and access vein survival was 100%, 80%, 40%, and 15% respectively at one, two, three, and four years, respectively.

Conclusion: Recanalizing occluded veins for catheter insertion is simple, cost-effective, and safe.

Key words: Tunnelled catheter, central venous occlusion, veinoplasty.

Introduction

Hemodialysis (HD) is the most widely used kind of renal replacement treatment in Egypt, and the number of people undergoing HD is rising. In other words, the number of Egyptians receiving HD treatment went from 23500 in 2016 to 26000 in 2017.[1]

Few patients had permanent vascular access (VA) before beginning dialysis because many patients only discovered they had a kidney problem after starting dialysis.[2] While efforts are made to promote a "fistula-first" approach, the majority of kidney loss patients who require renal replacement treatment begin using HD catheters as their first treatment.[3-5] Because of this, patients will need tunnelled HD catheters for dialysis until the arteriovenous fistula (AVF) can be properly created and get mature.[6]

HD complications include central venous occlusion (CVO) and central venous stenosis (CVS). CVO disease is often caused by the insertion of a central venous catheter (CVC). Subclavian vein (SCV) insertion had the greatest prevalence of central venous problems associated with previous catheter implantation.[7] Various etiologies, however, have been documented. This is most likely due to intimal damage produced by the high pressure and volume flow created by upper limb AVF. Thoracic outlet syndrome, fibrosing mediastinitis, and postradiation treatment are all rare causes of CVS and CVO.[8,9]

For patients who are unable to obtain upper extremity VA due to a CVS or CVO, aggressive treatment is necessary to maintain HD and also to alleviate associated symptoms such as dilated veins in the upper arm, neck, and chest area, facial oedema, and dyspnea in severe cases, especially if the patient has a functional AVF.[10] Thus, the solution is to either identify innovative sites for tunnelled dialysis catheter insertion or unblock obstructed veins.

CVC insertion into a patent superior vena cava (SVC) through direct transthoracic puncture is considered an alternative location, but its patency is just a few months.[11] Another unusual site is the percutaneous inferior vena cava (IVC) catheter insertion via either a translumbar or transhepatic approach, but both have limited patency and serious complications.[12-14]

When CVO occurs, getting dialysis access may become a matter of urgency or emergency.[9] Percutaneous angioplasty of narrowed or occluded central veins is an alternative to surgical revascularization.[15] Percutaneous endovascular therapy, which has essentially supplanted surgical treatment in recent years, offers a less invasive management approach associated with decreased morbidity and mortality.[16-18]

To effectuate dialysis, urgent, rapid, reliable, and safe access is needed in the event of a patient on regular dialysis with CVO or CVS who has exhausted

all vascular options, which is considered a life-threatening situation.

So, the aim of this study was to find out whether endovascular therapy for CVO or CVS veinoplasty through an occluded access site followed by tunnelled catheter insertion in HD patients was effective, reliable, and safe.

Patients and methods

This study was intended as a prospective, non-randomized observational study.

It included patients who had exhausted all peripheral VA sites and had limited access sites for CVC placement (Occluded femoral veins, IVC, IJV and SCV, and a history of multiple femoral catheter dysfunctions due to repeated femoral catheterization). Patients with low cardiac output or hypercoagulable diseases who were unable to establish VA and suffers CVO or CVS were also included in the study. To keep their HD, they must have a cuffed dialysis catheter. The patient's selection depended upon clinical examination and duplex ultrasound (DUS) of both upper and lower limbs. They all had bilateral CVO or severe CVS, which was confirmed using a CT venogram of the neck and chest central veins to confirm the diagnosis of central venous issues, as well as to determine their location, severity (Stenosis vs. occlusion), length, and status of surrounding collateral. They were presented to both the Vascular Surgery Unit, Faculty of Medicine, Alexandria University, Egypt and the Vascular Surgery Department, Faculty of Medicine, Helwan University, Egypt from July 2016 to July 2021. Patients' conditions were thoroughly discussed with other vascular surgeons to see if there was any chance for VA for them. The patient was deemed eligible for inclusion in the research if there was no realistic alternative for AVF, arteriovenous graft (AVG), or lower limb VA choices.

This study employed the newly announced reporting criteria for thoracic CVO. 19 Stenosis was defined as a vein that had been narrowed enough to prohibit catheter passage for dialysis but had not yet attained 100% occlusion as compared to patent neighbouring arteries such as the SVC or brachiocephalic vein (BCV).

A written consent was signed by the patient after explaining, in simple language, the procedure and its expected drawbacks. A local anaesthetic was used for all angioplasty operations, along with sedation and analgesia if necessary, and patients were monitored for changes in their ECG, pulse oximeter, and blood pressure during the procedure.

One or more of the upcoming locations might be used as an access point. Under ultrasound guidance, puncture site overlying occluded AVF or AVG was done if the patient had any **(Fig. 1)**. Also, access through an occluded IJV or SCV, a previously occluded CVC, or right femoral access could be used.

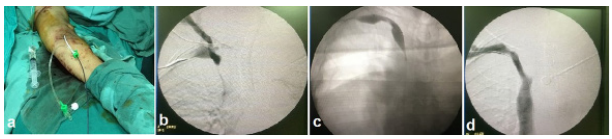

Fig 1: A case of SVC occlusion a, access via right-occluded AVG. b, Venogram demonstrating type 4 central venous occlusion. d, dilatation by a 6 mm balloon centred at the lesion with waist indentation.c, right BCV and SVC revascularization.

A 6–8F short vascular sheath was inserted. Consecutive venograms were used to determine the site and severity of the lesion. A 0.035-inch hydrophilic regular guidewire (Terumo) was used to explore the stenosis/occlusion of the patients' central veins with the help of a guiding angiographic catheter. A 0.035-inch hydrophilic stiff guidewire (Terumo) was sometimes required to traverse the lesion.

If the lesion could not be handled effectively, a double puncture approach was employed (A right femoral puncture under ultrasound guidance in addition to a proximal puncture). Wires and catheters had to be guided through the lesion. This might be accomplished from above, below, or both (Rendez-vous technique) until the obstruction was crossed. 20 After passing through the occlusion, the catheter is removed and over-the-wire balloon dilation with a proper length and size was conducted along the tract, with the balloon centred over the stenotic or occluded segments to be dilated. Inflation could be repeated several times for 60–90 seconds each until the balloon's indentation was gone or the manufacturer's maximum rated balloon pressure was attained.

Following the reopening of the central veins, a cuffed catheter was inserted, preferably into the right internal jugular vein, with tunnelling of the cuffed catheter to an infraclavicular position to allow for maximum patient mobility, following the conventional approach. If the right IJV was deemed unsuitable, any other veins would be considered. In the event of failure to cross the lesion, the patient's peritoneal dialysis or any other CVC salvage insertion technique were used as a last resort should be reevaluated.

For the first three months after the intervention, each patient was clinically monitored for endovascular access site problems and catheter patency. At each HD session, nursing personnel were instructed to check for symptoms and signs of catheter exit site

and tract infection, facial or arm oedema, dialysis adequacy, pressure suction, clot aspiration, and blood flow monitoring. When an issue arose, they were instructed to transfer the patient to our unit. A chest X-ray was requested to rule out mechanical reasons such as kinks in the catheter or catheter tip misalignment. If a mechanical fault was detected, the catheter was repositioned or exchanged. If there was no mechanical concern, an overnight declotting effort was made using the available thrombolytic solution infused in both catheter lumens.

If all the previous measures failed, DUS was used to rule out IJV or SCV thrombosis, and then a CT venogram was scheduled. If the central vein reoccluded, the catheter was retained in position and a guide wire was inserted and navigated through the catheter into the occluded vein, even using the sharp back end of the wire to pass through the difficult site of occlusion. The wire was then advanced by its floppy end to the inferior vena cava, then to the right atrium, and finally to the IVC to provide support. With the insertion of the new catheter, the old catheter was withdrawn. A 6 F vascular sheath was incorporated in case the catheter encounters resistance during passage and vein dilatation was accomplished using a 5 or 6 mm balloon, followed by the advancement of a new catheter over the wire.

If the SVC was narrow or could not be entirely dilated, a longer catheter was utilised and its tip advanced through the right atrium to the patent IVC above the renal veins in order to avoid catheter insufficiency in the future if the catheter had been in the stenosed SVC.

Early complications were defined as those that occurred during the procedure, those that happened at the access site, and those that occurred one week after the procedure. Complications that arose later were referred to as late complications.

Infections associated with catheters were classified as exit site infections or tunnel infections. Exit site infections occur between the Dacron cuff and the skin, while tunnel infections occur proximal to the cuff.

In the case of catheter removal due to infection, catheters may be exchanged over a guide wire to maintain their vein access patent; however, a new tunnel and exit site must be established. The contaminated catheter was divided near the site of its entry into the jugular vein. After removing the subcutaneous catheter and cuff, the new catheter was tunnelled via an uninfected field and advanced into the vein over a guide wire that was introduced through the lumen of the original catheter that could now be withdrawn. If the infection was severe, a temporary catheter rather than a cuffed one was implanted to keep the vein access patent until a permanent catheter could be installed after the infection had cleared.

Any difficulties that occurred during the procedure were documented for further statistical analysis.

The following definitions of patency were used: 21

Primary catheter site patency. This is the time interval between catheter installation and the first intervention, catheter malfunction, or treatment completion.

Assisted primary catheter site patency: This is the time interval between catheter placement and catheter malfunction, or therapy completion, including intervening manipulations (endovascular or surgical interventions) aimed at restoring catheter functionality without the need for replacement.

Access vein survival is the time it takes for an access vein (internal jugular, femoral, etc.) to stop functioning as an access vein.

To analyse the data, we utilised SPSS (version 25.0, IBM SPSS Statistics for Windows, IBM Corp., Released 2017). The frequency (%) for categorical variables, the mean ± standard deviation (SD), and the median for normally distributed continuous variables. The Kaplan–Meier (K-M) methodology was used to examine the survival of access veins and the patency of catheter sites (primary and assisted). The log-rank and Mann-Whitney tests were used to compare patency curves. To be statistically significant, the P-value has to be less than 0.05.

Results

A total of 124 patients, ranging in age from 48 to 91 years, who were currently on HD and were running out of VA were included in this research. The mean time after dialysis initiation was 10±3.4 years ranging from 3–19 years. CVS was found in 43 patients (34.6%), whereas CVO was identified in the remaining 81 individuals. Only 13 individuals were classified as having type 4 occlusions (SVC obstruction that blocks or impedes direct right atrial venous flow with any combination of BCV, IJV, or SCV obstruction) and 63 patients were classified as having a type 3 occlusion (both BCVs are blocked, but flow to the right atrium still passes through the SVC), as recommended by the Society of Interventional Radiology.[19] **(Table 1)** shows the demographics of individuals with various forms of central venous lesions. There was no significant difference in the gender, age, co-morbidities, and smoking status of individuals presented by CVS and CVO (P >0.5). Six patients has a previous intervention with prior stenting of central veins.

Only 7 patients (16.3%) with CVS were symptomatic

Table 1: The demographic patients with stenosis and occlusion (n=124)

	CVO 81 (65.3)		CVS
	Type 3	Type 4	
Number	68 (54.8%)	13 (10.5%)	43 (34.7%)
Males (%)	40 (58.8%)	8 (61.5%)	25 (58.1%)
Age at dialysis initiation Mean ± SD	40 ± 6.8	36± 11.8	48 ± 3.8
Diabetes mellitus (%)	45 (65%)	9 (69.2%)	30 (69.8%)
Arterial hypertension (%)	48 (70.6%)	10 (76.9%)	33 (76.7%)
Dyslipidemia (%)	30 (44.1%)	7 (53.8%)	22 (51.2%)
Smoking (%)	38 (55.9%)	6 (46.2%)	28 (65.1%)
HD duration (y)	10 ± 2.8	12 ± 4.7	8 ± 3.2

(%); Percent. (y); Year.

Patients who had a prolonged duration of HD, those who had repeated CVCs, had catheters for long periods of time, and had more SCV catheters had a significantly worse lesion than those who did not (P< 0.05). Central vein lesions were greater in those who had a left- sided catheter (RR, 2.6; 95% CI, 1.2 to 4.4) **(Table 2).**

Table 2: CVC criteria and distribution between stenotic and occlusive lesions.

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	CVO	CVS	P
Number of catheters Mean ± SD	9 ± 3.2	5± 1.2	P<0.001
Left: Right side	3:1	2:1	P=0.3
Duration of catheter(y)	2.5± 0.9	1.5± 0.6	P =0.3
SCV: IJV CVC	3:1	1:2	P<0.001

(y); Year.

(Headachesorfacial/armedoema),comparedto63/81 (77.8%) with CVO (P<0.001). During the planning phases of VA surgeries, asymptomatic individuals were identified on routine DUS before inserting CVC. The patients handled all symptoms well and reacted either partially or totally to conservative palliative therapy. All cases off stenoses had more than 90% reduction of the reference diameter compared to nearby patent vein as appeared by CT venogram **(Fig. 2)**.

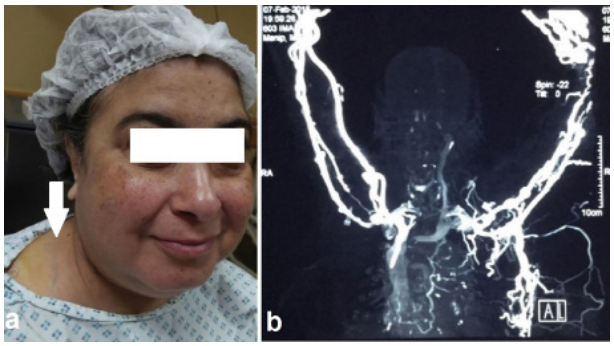

Fig 2: a, Female patient with facial oedema and dilated neck veins (white arrow). b, CT venogram demonstrating bilateral BCV and SVC occlusion.

All patients with CVS had an intervention via a single proximal access site, but in 20/81 patients with occlusion (24.7%), a second right femoral access was required. **(Figs. 3,4)**. Technical success was 100% for stenotic lesions and 79% for occlusion (64 patients). Technical success was 80.8% for Type 3 (55 patients) and 69.2% for Type 4 (9 patients) **(Fig. 4).** All patients who had previously undergone stenting were presented with occlusion. Four of them were effectively dilated, while for the remaining two, we failed to cross the occlusion **(Fig. 5)**. The balloons used had a diameter ranged from 4–12 mm. CVCs were implanted into 107 individuals after successful veinoplasty. Failed patients were sent to peritoneal dialysis, if possible, or to an interventional radiologist for CVC insertion in other unusual locations.

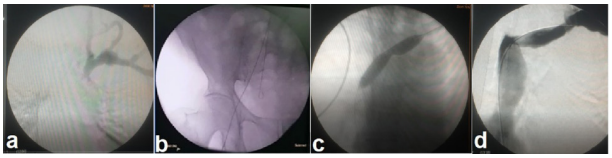

Fig 4: A case of SVC occlusion. a, CT venogram shows SVC occlusion. b, a second access point from the right femoral vein was required. c, dilatation by a 8 mm balloon. d, completion venogram shows successful dilatation of the lesion.

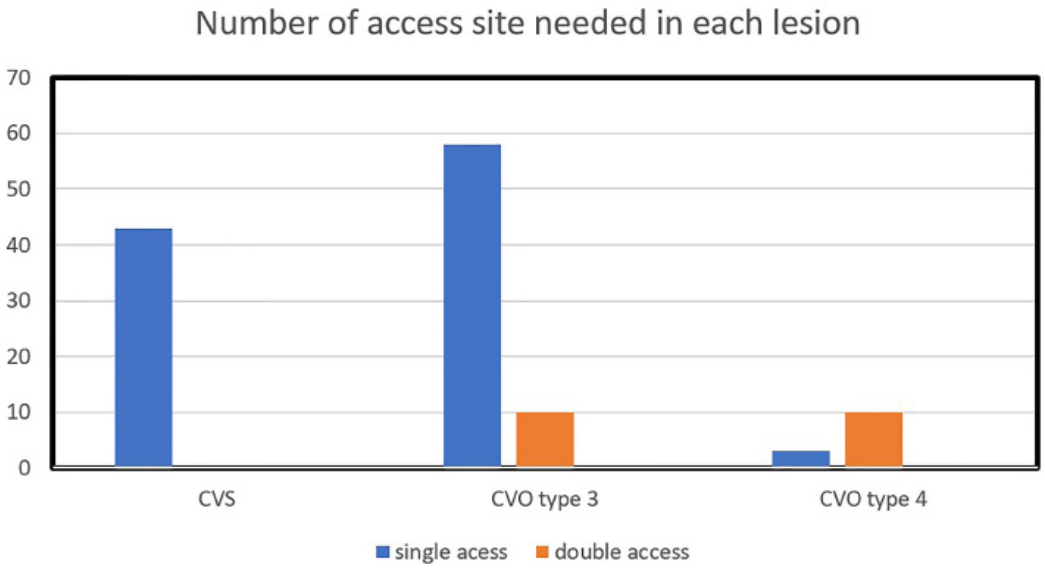

Fig 3: Represent different lesion and the number of access site needed.

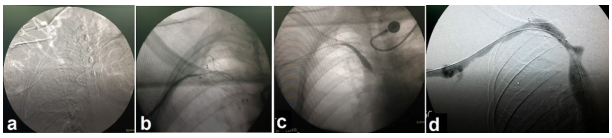

Fig 5: A case of an occluded right SCV stent. a, CT venogram with bilateral BCV and SVC occlusion and a stent occlusion. b, passing the occluded stent with a hydrophilic wire supported by a catheter. c, occluded stent balloon dilatation. d, re-establishment of flow into the IVC.

During CVO operations, the median operative time was 60 minutes (Range 35–80 minutes), while the median fluoroscopy time was 15 minutes (Range 12–20 minutes). The median dose of contrast agent was 30 millilitres (mL) and ranged from 25 to 90 mL. For individuals with CVS, the median procedural time was 20 minutes (Within a range of 10–25 minutes), the median fluoroscopy time was as low as 5 minutes (Within a range of 4–12 minutes), and the median dose of contrast agent used was 10 mL (Within a range of 6–12 ml). For all the previously mentioned parameters, the P value was <0.05.

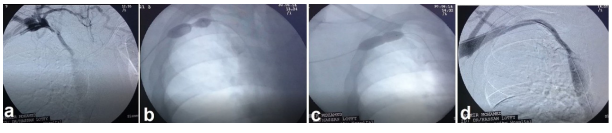

Fig 6: A case of right SCV stenosis a, CT venogram shows right SCV severe stenosis. b, dilatation by a 6 mm balloon centred at the lesion with waist indentation. c, complete balloon inflation causes the balloon indentation to vanish. d, completion venogram shows successful dilatation of the lesion.

Patients were followed up on a three-monthly basis or if an incident associated with HD occurred. At times, telephone consultations with the dialysis team were employed for follow-up. Patients were observed for a mean of 36.16±12.6 months, ranging from 3-56 months. By the end of the study, 15 patients (14 %) had died of causes unrelated to the catheter, 7 patients (605 %) had lost in follow-up, 4 patients (3.7%) had undergone transplantation, and the remaining 81 patients (75.7 %) had complied with follow-up.

Early complications in all intent to treat patients were minor and did not need lengthy hospitalisation or additional surgical procedures. Among them were access site haematoma (11.3%), accidental arterial puncture (3.2%), arrhythmias (16.1 %), and small vein perforation in three cases of CVO (2.4%). The perforation was sealed without serious consequences by prolonged small-diameter balloon 4 mm inflation followed by insertion of a cuffed catheter.

Infection was the most often seen late complication, occurring in 31% of patients. In 13 % of the instances, the infections developed at the exit site, and the 80% of these cases were effectively treated with broad-spectrum antibiotics and local therapy. Tunnel infection hampered 18% of the patients and had more catastrophic outcomes. Because the infection progressed throughout the tract, catheter extraction with systemic antibiotics was required, as was the preservation of the access site by exchanging the infected catheter with a clean one via a different tract.

Thrombosis, on the other hand, was the second most prevalent problem impacting the catheter, with 12% experiencing at least one episode of thrombosis. 90 % of the thrombosed catheters were saved after local injection with heparin solution and/ or a thrombolytic agent remained in the catheter overnight.

Symptomatic venous stasis was observed in 11.5% of cases that had some kind of venous congestion, including dyspenea and facial oedema. Most of the time, the symptoms were modest and responded well to head elevation at night and anti-inflammatory therapies and did not need further treatment. The catheter was functioning in all of these instances. A CT venogram was only ordered in situations of significant symptoms or catheter dysfunction, and the patient needed re intervention. Patients with venous stasis were only required to have re-intervention in 4.5% of the cases. In these circumstances, CVC was used as an access.

Mechanical catheter malfunction complicated 35% of instances, either as a result of the catheter being displaced from its intended location during insertion or as a result of venous re-occlusion. 15% were due to catheter displacement, which happened more often in females (80% of cases), necessitating catheter extraction and replacement. The majority of these patients had tract site infections that were successfully treated with antibiotics.

In one-third of cases of re-occlusion, catheter removal was followed by successful new catheter placement without venoplasty. The remaining two-thirds, central veins were dilated using a small-diameter balloon (less than 6 mm in diameter) followed by reinsertion of another catheter. In three cases, the SVC was not completely dilated with immediate elastic recoil, necessitating the insertion of a longer catheter with its tip advanced down to the patent IVC above the renal veins to avoid future obstruction by SVC **(Fig. 7)**.

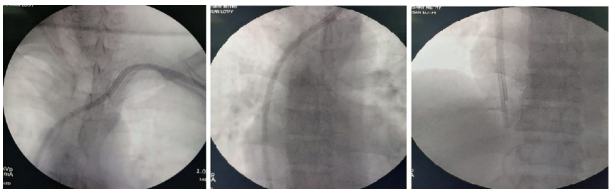

Fig 7: a case of an IVC cuffed catheter inserted above the level of renal veins via the left SCV route through the right atrium in a case of incomplete dilatation of SVC.

The Kaplan–Meier survival curves for all catheters after removing non-catheter-related events that resulted in catheter removal (n = 124; 43 catheters censored; 81 events) were shown in **(Fig. 8)**. the catheter's mean survival period was estimated to be 415±35 days (95% CI), and the median survival time was estimated to be 285 days. Primary catheter site patency was 70%, 40%, 20%, and 5% after one, two, three, and four years. At one, two, three, and four years, assisted primary catheter site patency was 77 %, 45%, 27%, and 12%. At one, two, three, and four years, access vein survival patency was 100%, 80%, 40%, and 15% respectively **(Fig. 9).**

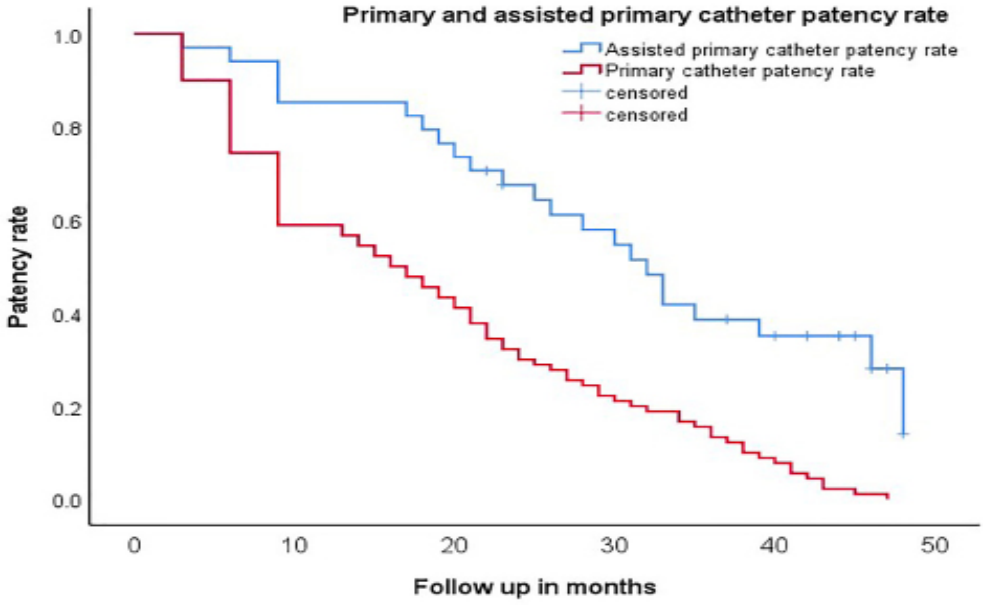

Fig 8: K-M analysis of primary (red line) and assisted primary (blue line) catheter site patency rates during the period of follow-up.

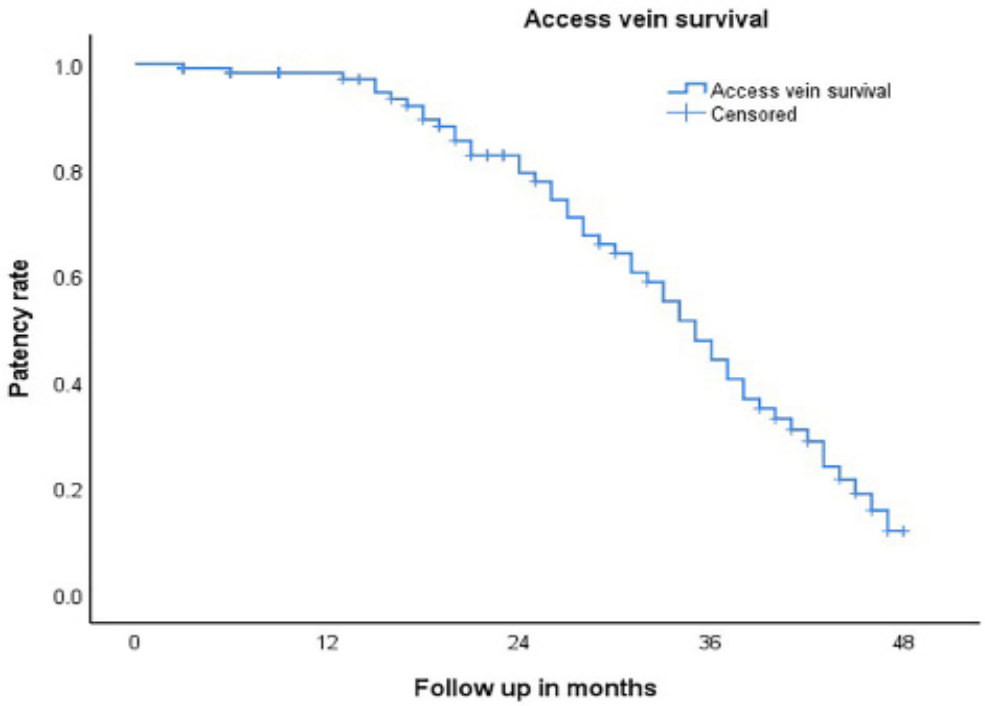

Fig 9: K-M analysis of access vein survival patency at one, two, three, and four years of follow-up.

Discussion

All patients who participated in this research were on HD, had previously attempted VA, and had between six to twelve CVCs in their upper and lower limbs. Patients with a history of CVC insertion had a significant rate of CVO or CVS.[22-28] Adequate VA is a major and urgent concern in these patients.

Two-thirds of the patients had CVO and belonged to type 3 and 4 pattern, which made standard catheter placement in either the SCV or IJV difficult. The severity of the lesions, whether stenosis or occlusion, was not affected by smoking, presence of co-morbidities, age, or sex meanwhile, long duration of HD, repeated CVC insertions, long periods of HD by CVC, left-sided catheters, and SCV catheters had a significant impact on severity of the lesion. This agreed with the findings of Levin,[7] Paxton et al,[29] and Adwaney et al.[30]

Due to a variety of variables, patients on long-term HD are more prone to develop CVO. The symptoms that CVS and CVO induce, in the vast majority of instances, need intervention.[6,10,27,31] In contrast to the previously mentioned researches, over half of our patients exhibited symptoms that were not severe enough to mandate urgent intervention. They responded well to medical therapy. The rationale for this was that all of our patients arrived with an already failed VA, so there was no rise in venous pressure that might be caused by a functioning AVF or AVG, as shown in the earlier investigations.

Furthermore, since the condition has been longstanding, there was time to establish collaterals that might help in symptom relief. It should be noted that the major goal of recanalization in these patients was to gain primary thoracic venous access to the CVC rather than to recanalize central veins for symptoms.

The success rate was 100% in CVS, whereas for those with CVO, the success rate was 79%. This agreed with that achieved by Cui et al.,[32] and Horita et al.,[33] A series of retrospective investigations revealed that angioplasty for CVS and CVO has a technical success rate of 70% to 90%. The fact that we achieved a 100% success rate for CVS was owing to our objective of dilatation of the vein simply to the extent that enabled cuffed catheter passage, rather than setting a target of less than 30% stenosis. Additionally, among individuals who came with CVO and had previously central vein stenting, the success rate was 66.7%, as 4/6 were effectively dilated.

Due to the difficult nature of the lesion, one-quarter of patients need a second femoral access in cases of CVO. Multiple research projects demanded the use of a second entry point for CVO.[33,34]

Percutaneous balloon venoplasty and endovascular stent implantation have evolved into the primary treatment options for CVS and CVO. We employed balloon dilatation only, without stenting. This is because we believe that the ideal therapy

technique for central venous lesions, whether stenosis or occlusion, employing balloon dilatation or stenting, remains unclear at the moment. Although some studies found that stenting did not enhance patency rates when compared to balloon dilatation, others found that angioplasty alone without stenting resulted in increased residual stenosis and a recurrence of venous re-stenosis.[35-41] Another point of concern was the hefty price tag. We were constantly pushed to reduce costs, since the percutaneous endovenous venoplasty technique might have been performed frequently. We felt that simple balloon dilatation would suffice, particularly given our objective of just creating a path for CVC.

The incidence of access site complications was infrequent and minor, which might be explained by the use of DUS guided access, which reduced complications. There were no life-threatening complications after the procedure. Meanwhile, severe problems were reported in other studies.[17,33,34,42] This might be explained by the use of vigorous techniques such as recanalization with a sharp needle, but that was not the case here. There were just a few arrhythmias detected during the passage of the wire that had accidentally entered the heart, and they were instantly identified by changes in ECG continuous monitoring and cured by withdrawing the wire outside the heart without serious effects. In three instances, the catheter was placed into the IVC rather than the SVC through the right atrium, which was not documented in other literature to our knowledge, and those patients were observed and all fared well without any unusual issues.

In our practice, right IJV access was chosen since it follows a straight path and CVC placed into it has a lower probability of developing different complications, such as venous restenosis and CVC malfunction.[43-45] If it were not suitable, the SCV or left side of the body, might be utilised.

Both surgical and fluoroscopy times were significantly longer for patients with CVO than for those with CVS. CVS patients used a much smaller amount of contrast than those with occlusion.

After CVC insertion, there was a risk of infection, catheter malfunction owing to thrombus or fibrin sheath formation, and venous stenosis. Infection was the most common cause of CVC removal and replacement.[46,47] Local wound treatment with topical antibiotics was effective in half of the instances with exit site infections to eliminate the infection. Meanwhile, tunnel infection necessitates catheter removal. We attempted to save the catheter access site by exchanging the catheter over the guide wire and re-insertion of another new catheter in a different tract with 3 weeks of intravenous antibiotics. This was comparable to the findings of Robinson et al.[48] and Tanriover et al.[49]

At least one incident of thrombosis occurred in 12% of patients while using the catheter, making it the second most prevalent cause of catheter failure. This was comparable to Bhutta et al.[50] and Khouzam et al.[51] the majority of these individuals responded to thrombolysis. If thrombolysis was ineffective, no attempt was made to remove the pericatheter fibrin sheath, and the catheter was replaced with a newer one to save expenses.

In 11.5 percent of patients, venous stasis symptoms were observed. This occurred as a result of the vein being stenosed, or occluded, around the catheter. The majority of patients reported with modest symptoms, necessitating patient assurance, nightly head elevation, and antioedematous medications without intervention as long as the catheter functioned.

Mechanical catheter failure owing to catheter displacement occurred in 15% of cases, with the majority of instances being females (80%). This might be due to the fact that females have a greater amount of soft tissue covering the chest than males do. This tissue has a larger degree of positional mobility and commonly resulted in changes in catheter position after installation, as gravity pulls the soft tissue and catheter down, leading in catheter tip retraction.[52] In ladies with big breasts, we recommended a deeper catheter placement down the right atrium.

Typically, a central venous system angioplasty is complicated by a recurrence of restenosis, necessitating additional repetitive interventions. In prior studies, primary patency rates after percutaneous endovenous venoplasty were 50-70% at 12 months and 20-30 % at two years, respectively, whereas assisted patency rates were 70-95% at 12 months. 33,53 In our study, the primary patency rate at 12 months was 70%, and at 2 years, it was 40%. At 12 and 24 months, assisted patency rates were 77% and 45%, respectively.

The high survival patency of the access vein, which was 100% after one year and 80% after two years, was obtained by frequently reinsertion of the catheter over the wire rather than changing the access site for each CVC reinsertion, which minimised the chance of vein restenosis.

The research design has some strengths as well as a few limitations. The first point of strength was that it was prospective research, which has fewer potential sources of bias and misunderstanding of data than retrospective investigations.

Another factor was that the increased incidence and awareness of renal issues at the national level

enabled us to enroll a comparatively appropriate number of participants in the research, 124 patients, to reinforce the statistical findings.

Furthermore, the research included a lengthy follow-up duration of 36.16±12.6 months. Only 10% of patients lost follow-up, indicating that most patients were followed up thoroughly and consistently.

Finally, the expense of performing this technique was minimal; all that was required was a mobile C arm, a ultrasound machine, wire, and balloon. We believe this is significant in chronic illnesses, which, in most instances, require frequent intervention, increasing the strain on natural resources and exhausting the patient. Furthermore, even if the vein became blocked, the catheter would continue to work without the requirement for catheter exchange or re-intervention of the vein.

However, there were still a few drawbacks. The study was conducted at two institutions, which limited its impact and may make replication difficult. Additionally, since there is no standard practise for catheter care in dialysis centres, the data collected from these centres about the difficulties they face with catheters might be diverse.

This study might well encourage vascular surgeons to continue attempting to tunnel dialysis catheters through occluded IJV and SCV for patients with limited VA rather than using salvage catheter insertion techniques such as translumbar IVC access and transhepatic IVC access, which carry a high patient risk, long radiation time, short patency and cannot be repeatitive.

We need to increase awareness among nursing staff and physicians on the HD unit to keep a closer eye for any occluded catheters and avoid removing them since they would have served as the access point for re-inserting a new one.

Conclusion

It is critical to always bear in mind the potential of recanalizing blocked conventional access channels to provide VA for HD. Along with being a simple, cost-effective operation with a low risk of consequences, angioplasty allows immediate access and may be repeated on demand.

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