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# Venous Pressure as Predictor of Secondary Arterio Venous Fistula Failure in Patients on Hemodialysis

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## Abstract

*Background:* Autologous arteriovenous fistula (AVF) is gold standard to maintain vascular access for hemodialysis. Actually, creating this type of access is considered very vital for haemodialysis patients. It enables them to avoid serious complication of long use of haemodialysis catheters e.g. local and systemic infections as well as unachieved required dialysis adequacy.

*Aim of Study:* The aim of this study was to assess venous pressure as predictor of secondary arterio venous fistula malfunction in hemodialysis patients clinically.

*Patients and Methods:* This study was designed to assess venous pressure as predictor of secondary arteriovenous fistula malfunction in hemodialysis patients clinically. The study has been conducted on a total of 83 patients with end stage renal disease (ESRD) maintained on regular hemodialysis four hours thrice weekly through AVF. They were dialyzed through a native AVF by Freseinus 4008S Machine, using bicarbonate dialysis solution at the Dialysis Unit at Al-Hussein University Hospital, From Sep. 2020-April 2021.

*Results:* There was statistically significant difference between the two groups (*p*-value <0.05) as regard 2nd and 3rd D.V.P. There was highly statistically significant difference between 1st, 2nd, 3rd D.V.P. measurements in each group (*p*-value >0.001) means with different letters significantly differ (Pairwise comparisons between measurements in each group, *p*<0.05 Significance values have been adjusted by the Bonferroni correction for multiple tests). There was no statistical significant difference between the two group (*p*-value >0.05) as regard 1st D.V.P. There was statistically significant difference between the two groups (*p*-value <0.05) as regard venous ratio and intra-access pressure (PIA). There was no statistical significant difference between the two group (*p*-value >0.05) as regard M.A.P and Normalizes venous pressure.

*Conclusion:* Our study demonstrated that in absence of clinical signs of AVF out-flow stenosis, static and dynamic venous pressure may be used to predict fistula flow in hemodialysis patients. This study demonstrated the feasibility of performing well-designed, randomized, controlled clinical trials in the dialysis population. Further, large, multi-center randomized trials are feasible and will be necessary to confirm the outcome.

***Key Words:*** *Hemodialysis – Venous pressure – Secondary arterio venous fistula failure.*

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## Introduction

**ARTERIOVENOUS** fistula it is the preferred type of vascular access (VA) because it has the lowest complication rates for thrombosis and infection. Autologous arteriovenous fistula (AVF) is gold standard to maintain vascular access for hemodialysis (HD). AVFs are constructed using radial artery and cephalic vein in the forearm or brachial artery and cephalic or basilic vein in the upper arm. Anastomosis may be either end-to-side (preferred) or side-to-side from vein to artery. Upper limb fistulas are preferable over lower limb or any other site of the body. In order of preference as given by the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines, the Brescia-Cimino fistula, i.e., radiocephalic (RC) fistulas are the first choice, followed by brachiocephalic and brachiobasilic AVF followed by synthetic graft fistulas, either straight or loop, in upper or lower arm **[1]**.

The most common surgical technique today is the side-to-end anastomosis. A new surgical approach for VA for HD using a latero-lateral AVF in the thigh between the femoral artery and superficial femoral vein transposed to the subcutaneous layer in patients with no other access options is described by Cerri et al., **[2]**.

Arteriovenous fistula (AVF) created with native vessels are the vascular access of choice for hemodialysis: At comparable flow rates, the AVF is associated with a lower incidence of complications and longer survival than prosthetic grafts or central venous catheters **[3]**.

Vascular access-related complications can lead to patient morbidity and reduced patient quality of life. Access clinical monitoring using history and physical exam is the standard of practice for arteriovenous access [4].

According to Rodríguez et al., [5], vein punctures and catheterizations in the upper extremities should be avoided to reduce the incidence of venous occlusions and stenosis. When necessary, a complementary examination by Doppler ultrasound or phlebography to be performed. The complication rate related to permanent hemodialysis vascular access remains high and access related problems are responsible for 50% of the hospitalization of dialysis patients [6].

End-stage renal disease is a chronic disease requiring treatment with dialysis or renal transplantation. Patients require an adequate vascular access for hemodialysis (HD). Autologous arteriovenous fistula (AVF) is gold standard to maintain vascul access for HD [1].

Fistula failure is frequent cause of increased mortality, morbidity, psychological and financial burden in end stage renal disease (ESRD) patients who are on hemodialysis (HD) for survival in developing countries where renal transplants is not affordable by common people. There are multiple factors leading to failure of arteriovenous fistula (AVF) in these patients like diabetes, atherosclerosis and out of these technical errors, hypotension, site of insertion and infection are the common preventable causes of failure. Access clinical monitoring using history and physical exam is the standard of practice for arteriovenous access [4].

Native arteriovenous (AV) fistulas, which are the most commonly used access line, enable sufficient and repeated hemodialysis applications and improves the rate of survival and quality of life in patients with end-stage renal disease (ESRD) [7].

The goal of clinical monitoring and access surveillance is to identify early access dysfunction and correct it with preemptive angioplasty or surgery prior to access thrombosis or loss. Access surveillance and management is an interdisciplinary team function. The patient, nephrologist, nephrology nurse, technician, interventional radiologist /nephrologist, surgeon, and primary care physician should all be participants of the team [4].

The aim of this study was to assess venous pressure as predictor of secondary arterio venous fistula malfunction in hemodialysis patients clinically.

## Patients and Methods

The study has been conducted on a total of 83 patients with end stage renal disease (ESRD) maintained on regular hemodialysis four hours thrice weekly through AVF. They were dialyzed through a native AVF by Freseinus 4008S Machine, using bicarbonate dialysis solution at the Dialysis Unit at Al-Hussein University Hospital.

*Inclusion criteria:* Patients under dialysis for at least 6 months 3 session per weak four hours, and Patients age from 15 to 60 years.

*Exclusion criteria:* Patients dialyzed via catheters, patients dialyzed via graft, and patients with rheumatic heart disease or cor pulmonale.

*Methods:*

Written informed consent was obtained from the patients. The study was approved by the Ethical Committee of Al-Azhar University. All patients included in this study underwent the following:

*1- History and clinical examination stressing on:*

(a) Personal history including age, sex, weight, height and body mass index (BMI), history of diabetes mellitus, history of hypertension, history of smoking, smoking habits, and associated comorbidity particularly diabetes mellitus, hypertension and calculating mean arterial blood pressure by the following equation: MAP=1/3 (SBP-DBP) + DBP (Smeltzer et al., 2010). (b) Underlying etiology of CRF. (c) Access location of AVF [brachial or radial] and its duration.

*2- Physical examination of AV fistula:*

Physical examination and clinical monitoring of the arteriovenous access should include an assessment at each dialysis treatment and include LOOK, LISTEN for bruit, and FEEL for thrill, Clinical findings that have been associated with arteriovenous access dysfunction include physical findings of persistent swelling of the arm, presence of collateral veins, prolonged bleeding after needle withdrawal, or altered characteristics of pulse or thrill in outflow vein or graft [4].

Physical examination (PE) of the AVF implies the use of inspection, palpation and auscultation. Thrill and pulse abnormalities felt throughout the entire fistula tract are used as the main PE tools for the diagnosis of AVF dysfunction [8].

*3- Static Venous Pressure (SVP):*

Measurements were performed during two consecutive dialysis sessions each month using a method modified from that of Besarab et al., [9]. Venous drip chamber pressure and systemic blood pressure were obtained 20 to 30 seconds after turning off the dialysis blood pump (VP0), assessed with zero pump flow, using the dialysis machine digital pressure display. The intra-access venous pressure was calculated as follows: PIA= PDC+dH, where PIA (mmHg) is intra-access pressure, PDC (mmHg) is venous drip chamber pressure, and dH (cm) is the difference in height between the venous drip chamber pressure transducer and the venous needle in the access [10].

*4- Dynamic Venous Pressure (DVP):*

It was first advocated by Schwab et al., [11]. DVP consists of recording at each dialysis treatment the venous pressure in the dialysis circuit under standardized conditions (usually 200ml/min pump speed and zero ultrafiltration). The value obtained varies, not only with the blood pump speed, but also dialysis needle gauge and placement as well as the type of dialysis machine and tubing. The threshold for angioplasty referral is set at a DVP greater than 125mmHg on three consecutive treatments. However, it is not possible to establish uniform thresholds for detecting stenosis in all dialysis patients [12]. Threshold for dynamic VP was 150mm Hg [13].

*5- Laboratory investigations:*

They included complete blood count (CBC), fasting blood glucose levels (mg/dl), serum creatinine (mg/dl), blood urea (mg/dl), serum calcium (Ca) (mg/dl), serum phosphorus (PO4) (mg/dl), intact parathyroid hormone (IPTH) (pg/ml) and lipid profile.

*6- Adequacy of dialysis:*

It was assessed by the kt/v formula [14]. Kt/V is defined as the dialyzer clearance of urea (K, obtained from the manufacturer in mL/min) multiplied by the duration of the dialysis treatment (t, in minutes) divided by the volume of distribution of urea in the body (V, in mL), which is approximately equal to the total body water.

$$TBW = 2.447 - (0.09156 * Age) + (0.1074 * Height) + (0.3362 * Weight)$$

*Statistical analysis:*

Data were analyzed using the Statistical Package of Social Science (SPSS) program for Windows (Standard version 26). The normality of data was first tested with one-sample Kolmogorov-Smirnov test. Qualitative data were described using number and percent. Association between categorical variables was tested using Chi-square test while Fischer exact test was used when expected cell count less than 5. Continuous variables were presented as mean ± SD (standard deviation) for parametric data and median (min-max, IQR) for non-parametric data. The two groups were compared with Student *t*-test for parametric data and Mann Whitney test for non-parametric data. The Friedman test was used to compare DVP at three different times Pairwise comparisons between measurements in each group, the significance level is $p<0.05$ Significance values have been adjusted by the Bonferroni correction for multiple tests. For all above mentioned statistical tests, $p$-values $\leq 0.05$, was considered to be statistically.

## Results

There was statistically significant difference between the two groups ($p$-value <0.05) as regard sex. There was no statistical significant difference between the two groups ($p$-value >0.05) as regard Age (Table 1).

There was no statistical significant difference between the two group ($p$-value >0.05) as regard weight, height and BMI (Table 2).

There was no statistical significant difference between the two group ($p$-value >0.05) as regard Duration of dialysis (Table 3).

There was statistically significant difference between the two groups ($p$-value <0.05) as regard Cardiovascular disease. There was no statistical significant difference between the two group ( $p$-value >0.05) as regard DM, HTN, smoking, Cerebrovascular disease (Table 4).

There was statistically significant difference between the two groups ($p$-value <0.05) as regard S.V.P (Table 5).

There was statistically significant difference between the two groups ($p$-value <0.05) as regard 2nd and 3rd D.V.P. There was highly statistically significant difference between 1st, 2nd, 3rd D.V.P. measurements in each group ( $p$-value >0.001) means with different letters significantly differ (Pairwise comparisons between measurements in each group, $p<0.05$ Significance values have been adjusted by the Bonferroni correction for multiple tests). There was no statistical significant difference between the two group ($p$-value >0.05) as regard 1st D.V.P (Table 6).

There was statistically significant difference between the two groups ($p$-value <0.05) as regard venous ratio and PIA. There was no statistical significant difference between the two group ( $p$-value >0.05) as regard M.A.P and Normalizes venous pressure (Table 7).

There was no statistical significant difference between the two group ($p$-value >0.05) as regard Site of fistula (Table 8).

There was statistically significant difference between the two groups ($p$-value <0.05) as regard Ionized Ca and IpTH. There was no statistical significant difference between the two group ( $p$-value >0.05) as regard total Ca and phosphorus, urea and creatinine (Table 9).

Table (1): Relation between history of malfunction and demographic data.

| Demographic data | Past history of malfunction | | Test of significance | $p$-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| *Age / years:* | | | | |
| Mean ± SD | 45.93±8.52 | 45.96±9.92 | $t$=0.01 | 0.989 |
| Min-Max | 27-59 | 19-60 | | |
| *Sex:* | | | | |
| Male | 14 (46.67%) | 39 (73.6%) | FET | 0.018 |
| Female | 16 (53.33%) | 14 (26.4%) | | |

$t$: Student $t$-test.
FET: Fischer exact test.

Table (2): Relation between history of malfunction and anthropometric measurements.

| Variables | Past history of malfunction | | $t$-test | $p$-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| *Weight (Kg):* | | | | |
| Mean ± SD | 71.91±16.9 | 71.55±14.84 | 0.1 | 0.924 |
| *Height (m):* | | | | |
| Mean ± SD | 1.62±0.9 | 1.65±0.1 | 1.38 | 0.171 |
| *BMI (kg/m$^2$):* | | | | |
| Mean ± SD | 26.85±4.66 | 25.88±5.61 | 0.80 | 0.425 |

$t$: Student $t$-test.

Table (3): Relation between history of malfunction and duration of dialysis.

| Duration of dialysis | Past history of malfunction | | M.W. test | $p$-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| Median (Min-max, IQR) | 6 (0.5-20, 6.25) | 4.0 (0.3-23, 6.25) | W-Value =2041.5 | 0.08 |

M.W = Mann Whitney test.

Table (4): Relation between history of malfunction and medical history.

| Medical history | Past history of malfunction | | $\chi^2$ | $p$-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| *DM:* | | | | |
| Yes | 4 (13.3%) | 8 (15.1%) | 0.0.048 | 0.827 |
| No | 26 (86.7%) | 45 (84.9%) | | |
| *HTN:* | | | | |
| Yes | 16 (53.3%) | 38 (71.7%) | 2.84 | 0.09 |
| No | 14 (46.7%) | 15 (28.3%) | | |
| *Smokers:* | | | | |
| Yes | 4 (13.3%) | 8 (15.1%) | 0.048 | 0.827 |
| No | 26 (86.7%) | 45 (84.9%) | | |
| *Cerebrovascular disease:* | | | | |
| Yes | 0 (0%) | 5 (9.4%) | FET | 0.153 |
| No | 30 (100%) | 48 (90.6%) | | |
| *Cardiovascular disease:* | | | | |
| Yes | 3 (10%) | 27 (50.9%) | FET | <0.001 |
| No | 27 (90%) | 26 (49.1 %) | | |

$\chi^2$ : Chi-square test. FET: Fischer exact test.

Table (5): Relation between history of malfunction and SVP.

| | Past history of malfunction | | MW-test | $p$-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| S.V.P. (Mean ± SD) | 44±21.06 | 57.98±22.62 | W= 2538.5 | 0.003 |
| Median (Min-max, IQR) | 40 (15-100, 16.25) | 50 (20-100, 40) | | |

M.W = Mann Whitney test.

Table (6): Relation between history of malfunction and DVP.

| Variables | Past history of malfunction | | MW-test | $p$-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| 1st (Mean ± SD)<br>Median (Min-max, IQR) | 85.1±32.19**c**<br>80 (30-160, 32.5) | 98.21±30.24**c**<br>90 (50-150, 62.5) | W = 2389.5 | 0.120 |
| 2nd (Mean ± SD)<br>(Min-max, IQR) | 91.50±31.52**b**<br>90 (40-165,31.25) | 107.26±29.57**b**<br>100 (55-160, 50) | W = 2448 | 0.035* |
| 3rd (Mean ± SD)<br>(Min-max, IQR) | 97.17±31.06**a**<br>100 (45-170, 31.25) | 113.21±30.62**a**<br>105 (60-170, 31.25) | W = 2455 | 0.029* |
| Friedman test | Chi-square = 52.26<br>$p$-value = <0.001 | Chi-square = 82.23<br>$p$-value = <0.001 | | |

M.W = Mann Whitney test.

Table (7): Relation between history of malfunction and M.A.P., Venous ratio and PIA and normalizes venous pressure.

| Variables | Past history of malfunction | | MW-test | *p*-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| M.A.P (Mean ± SD)<br>Median (Min-max, IQR) | 105.75±17.97<br>110 (83.3-133.3, 35.1) | 113.05±15.43<br>120 (83.3-133.3, 28.4) | W = 2403 | 0.091 |
| Venous ratio | 0.54±0.17<br>0.54 (0.32-0.96 ,0.24) | 0.65±0.18<br>0.65 (0.34-1.1, 0.27) | W = 2510 | 0.007 |
| PIA | 69.7±19.64<br>65 (40-125, 21.25) | 82.30±22.52<br>75 (45-130, 37.5) | W = 2502 | 0.009 |
| Normalizes venous pressure | 0.53±0.26<br>0.535 (0.12-1.1, 0.38) | 0.60±0.29<br>0.540 (0.17-1.5 ,0.44) | W = 2315 | 0.401 |

M.W = Mann Whitney test.

Table (8): Relation between history of malfunction and site of fistula.

| Site of fistula | Past history of malfunction | | Test of significance | *p*-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| Radio cephalic | 15 (50%) | 26 (49.1 %) | $X^2$ = 0.053 | 0.817 |
| Brachio cephalic | 14 (46.7%) | 27 (50.9%) | | |
| Neck | 1 (3.3%) | | | |

Table (9): Relation between history of malfunction and laboratory investigations.

| Laboratory investigations | Past history of malfunction | | Test of significance | *p*-value |
|---|---|---|---|---|
| | Yes (n=30) | No (n=53) | | |
| Total Ca (mg/dl) | 8.65±1.12 | 8.29±1.05 | *t*=1.49 | 0.139 n.s. |
| Ionized Ca (mg/dl) | 1.24±0.29 | 1.12±0.20 | *t*=2.21 | 0.03 |
| Phosphorus (mg/dl) | 5.13±1.62 | 5.37±1.65 | *t*=0.64 | 0.527 n.s. |
| IpTH (pg/ml) | 806.30±466.70 | 411.10±468.90 | W-Value | <0.001 |
| Median (Min-max, IQR) | 957.3 (122-1650, 812.6) | 136 (12.7, 1597, 550.3) | =1741 | |
| Urea | 106.17±26.16 | 106.57±29.04 | *t*=0.06 | 0.950 n.s. |
| Creatinine | 8.68±2.46 | 9.71±3.23 | *t*=1.51 | 0.136 n.s. |

*t*: Student *t*-test. M.W = Mann Whitney test.

## Discussion

Therefore, the aim of this study was to venous pressure as predictor of secondary arteriovenous fistula malfunction in 60 hemodialysis patients clinically. A through history taking, examination and fistula assessment were done as well as data were collected from patients' haemodialysis files regarding the previous haemodialysis sessions. This study analyzed patients with functional AVFs, which had successfully matured and were used for dialysis, to determine risk factors for subsequent loss of primary functional patency after use.

In this study, a through history was taken, examination and fistula assessment were done as well as data were collected from patient haemodialysis files regarding the previous haemodialysis sessions.

In the current study, there were forty two males and eighteen females, mean age was 46.15 ±9.63 years, with a mean body weight of 71.95±16.03 Kg, a mean height of 1.65±0.09m and BMI of 25.94±5.29kg/m$^2$. In contrary to primary fistula failure, all these factors are important determinant of primary success of the AVF as previously reported by Stoumpos et al., [15]. Also, El-Said et al., [16] study included 30 chronic hemodialysis patients with 20 males and 10 females with mean age 47.73±12.72.

Farrag et al., [17] assessed factors responsible for fistula secondary failure in thirty patients with end stage renal disease (ESRD) on regular HD. Their mean age was 38.50±14.21 years old, 17 were males and 13 were females, their body mass index (BMI) was 26.61kg/m$^2$ (±5.77).

In the current study, mean duration of dialysis was 5 years. El-Said et al., [16] found that mean value for HD (hemo-dialysis) duration was 7.13 ± 5.34. Farrag et al., [17] found that the mean hemo-dialysis duration was 33.73 months (±24.58).

These results gave us the impression that these factors lose its significance as pivotal players in maintaining fistula function as long as the fistula passes the first three months. Monroy-cuadros et al., [18] identified age and history of diabetes and smoking as independent risk factors for fistula failure after 6 months of first usage.

Going back to look for risk factors that should have drawn our attention towards fistula malfunction, we found that markers of elevated venous pressure i.e. history of difficult needles cannulation or prolonged bleeding after needles removal, positive arm elevation test and elevated static and dynamic venous pressure measurements were significantly different between both groups which gave us the impression that these patients suffered from venous stenosis which may be either juxta-anastomotic or central one.

In our study, mean values for SVP and DVP were 55.85±22.29 and 87.92±31.64 respectively. El-Said et al., [16] found that mean values for standardized dVP and Qa, were 89.03 ±20.43 and 1128.93±781.21 respectively.

In our study, twenty eight subjects had radio-cephalic AVF, while 32 had bracheocephalic AVF. El-Said et al., [16] found that sixteen subjects had radioceph-alic, while 10 had bracheocephalic, and 4 had bracheobasilic AVFs.

In our study, there was no statistically significant difference between patients with history of rupture or thrombi and patients without history of rupture or thrombi regarding age, sex, weight, height and BMI, as previously reported by Stoumpos et al., [15].

Also, Farrag et al., [17] divided patients into 2 groups: Group (I) included 15 patients on regular hemodialysis with well functioning AVF by physical examination and duplex ultrasound. Group (II) included 15 patients on regular hemodialysis with malfunctioning (secondary failed) AVF by physical examination and duplex ultrasound. There were no statistically significant differences between group I and group II as regards to age, sex, BMI, HD duration and AVF age.

In our study, there was statistically a high significant difference between patients with history of rupture or thrombi and patients without history of rupture or thrombi regarding duration of HD. But, Farrag et al., [17] found that there was no statistically significant difference between group I and group II as regards to duration of HD.

In our study, there was statistically a non-significant difference between patients with history of rupture or thrombi and patients without history of rupture or thrombi as regard to medial history, but there was statistically a significant difference regarding smoking. Our results went in partial agreement with Monroy-Cuadros et al., [18] who identified age and history of diabetes and smoking as independent risk factors for fistula failure after 6 months of first usage.

Farrag et al., [17] found that there was statistically high significant difference between group I and group II as regards mean arterial blood pressure and smoking and there was no statistically significant difference as regards cause of renal failure (HD cause).

In our study, there was statistically a non-significant difference between patients with history of rupture or thrombi and patients without history of rupture or thrombi regarding hypertension. Our result went in disagreement with Culp et al., [19] who specifically described predialysis diastolic pressure as a predictor of risk of thrombosis in AVFs and grafts in the first year after creation. Puskar et al., [20] also reported that a low mean diastolic pressure correlated with poorer AVF survival after exclusion of patients with early fistula failure from the study.

In our study, there was non-significant difference between patients with history of rupture or thrombi and patients without history of rupture or thrombi as regard to SVP and DVP. El-Said et al., [16] demonstrated that there was a significant correlation between standardized dVP and AVF Qa. High flow AV fistulae were associated with standardized dVP >105mmHg. Screening for standardized dVP may prompt definitive fistula flow assessment using color Doppler ultrasound allowing for early detection and management of high flow AVF. They established that standardized dynamic venous pressure could statistically significantly predict AVF blood flow, and dVP accounted for 22.4% of the explained variability in AVF blood flow. They concluded that high flow AV fistulae (Qa >2000ml/min) were associated with standardized dVP > 105mmHg. Screening for standardized dVP may prompt definitive fistula flow assessment using color Doppler ultrasound allowing for early detection and management of high flow AVF. Also, Farrag et al., [17] found that there were statistically a high significant difference between group I and group II as regards SVP and a significant difference as regards DVP.

In our study, there was statistically non-significant difference between patients with history of rupture or thrombi and patients without history of rupture or thrombi as regard to their calcium level, phosphorus, IpTH, urea and creatinine. Farrag et al., [17] found that there was no statistically significant difference between group I and group II as regards serum creatinine, blood urea, S. Ca and iPTH.

In our study, There was statistically non-significant difference between groups as regard to their hemoglobin level and fasting blood glucose. But, Farrag et al., [17] found that there was statistically high significant difference between group I and group II in regard to hemoglobin, concluding that the native AVF is the vascular access of choice for patients who require hemodialysis: It lasts longer and is associated with fewer complications than other types of vascular access; for hemodialysis patients, these benefits translate into better quality of life and longer survival.

A major limitation of our study is sample size. The study would need to be performed in multiple centers with well-coordinated vascular access programs with a larger sample size. We measured static venous pressure but was not correlated with dynamic venous pressure measurements. Another limitation in this study was that we included those patients who did not undergo angiographic study; which is the gold standard for detection of out-flow and central vein stenosis. 17 patients out of 83 have clinical abnormalities during physical examination.

*Conclusion:*

The native AVF is the vascular access of choice for patients who required hemodialysis. It lasts longer and is associated with fewer complications than other types of vascular access; for hemodialysis patients. These benefits translate into better quality of life and longer survival.

Our study demonstrated that in absence of clinical signs of AVF out-flow stenosis, static and dynamic venous pressure may be used to predict fistula flow in hemodialysis patients. This study demonstrated the feasibility of performing well-designed, randomized, controlled clinical trials in the dialysis population. Further, large, multi-center randomized trials are feasible and will be necessary to confirm the outcome.

Finally, a multidisciplinary approach (nephrologists, surgeons, radiologists and nurses) should improve the HD outcome by promoting the use of AVF.

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# الضغط الوريدى كمؤشر لكفاءة الناسور الشريانى الوريدى فى مرضى الاستصفاء الكلوى المتكرر

خلفية الدراسة: الناسور الشريانى الوريدى الذاتى هو المعيار الذهبى للحفاظ على وصول الأوعية الد موية من أجل غسيل الكلى. فى الواقع، يعتبر إنشاء هذا النوع من الوصول أمراً حيوياً للغاية لمرضى غسيل الكلى. تمكنهم من تجنب المضاعفات الخطيرة للاستخدام الطويل لقسطرة غسيل الكلى، على سبيل المثال الالتهابات الموضعية والجهازية وكذلك كفاية الغسيل الكلوى غير المنجز.

الهدف من الدراسة: كان الهدف من هذه الدراسة هو تقييم الضغط الوريدى كمؤشر على حدوث خلل فى وظيفة الناسور الشريانى الوريدى الثانوى فى مرضى غسيل الكلى إكلينيكياً.

المرضى وطرق الدراسة: صممت هذه الدراسة لتقييم الضغط الوريدى كمؤشر على حدوث خلل فى وظيفة الناسور الشريانى الوريدى الثانوى فى مرضى غسيل الكلى إكلينيكياً. أجريت الدراسة على ما مجموعة مريضاً يعانون من مرض كلوى فى المرحلة النهائية تم الحفاظ عليهم على غسيل الكلى المنتظم لمدة أربع ساعات ثلاث مرات أسبوعياً من خلال الناسور الشريانى الوريدى الذاتى. تم غسيلهم من خلال ناسور شريانى وريدى ذاتى بواسطة آلة Freseinus 4008S، باستخدام محلول غسيل الكلى البيكربونات فى وحدة غسيل الكلى فى مستشفى الحسين الجامعى.

نتائج الدراسة: يوجد فرق ذو دلالة إحصائية بين المجموعتين، فيما يتعلق بالضغط الوريدى الديناميكى الثانى والثالث. كان هناك فرق ذو دلالة إحصائية عالية بين قياسات الضغط الوريدى الديناميكى الأول والثانى والثالث فى كل مجموعة، تعنى بأحرف مختلفة اختلافاً كبيراً (المقارنات الزوجية بين القياسات فى كل مجموعة، تم تعديل قيم الدلالة بواسطة تصحيح Bonferroni لاختبارات متعددة). لم يكن هناك فروق ذات دلالة إحصائية بين المجموعتين، فيما يتعلق بالضغط الوريدى الدينا ميكى الأول. كان هناك فرق ذو دلالة إحصائية بين المجموعتين، فيما يتعلق بنسبة الوريد والضغط داخل الوصول. لم يكن هناك فرق ذو دلالة إحصائية بين المجموعتين فيما يتعلق بالضغط الوريدى وتطبيع الضغط الوريدى.

الاستنتاج: أظهرت دراستنا أنه فى حالة عدم وجود علا مات سريرية لتضيق تدفق الناسور الشريانى الوريدى الذاتى، يمكن استخدام الضغط الوريدى السا كن والدينا ميكى للتنبؤ بتدفق الناسور فى مرضى غسيل الكلى أظهرت هذه الدراسة جدوى إجراء تجارب سريرية جيدة التصميم وعشوائية ومضبوطة فى مجتمع غسيل الكلى. علاوة على ذلك، فإن التجارب العشوائية الكبيرة متعددة المراكز ممكنة وستكون ضرورية لتأكيد النتيجة.