

Research Article

Effect of Arteriovenous fistula patency on blood pressure in patients of renal transplantation



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Abstract

Background: Hemodialysis and peritoneal dialysis have evolved into bridging therapies that individual undergo while they await a suitable kidney donor, thanks to the rapid expansion of numerous national and international transplantation programs. **Aim and objectives:** Assessment of the impact of arteriovenous fistula patency on blood pressure in patients of kidney transplantation.

Patients and methods: This trial was performed on 98 kidney transplant recipients who were divided into 2 groups: the closed AVF group (N= 46), the patent AVF group (N = 52). This study was conducted at El Minia University outpatient nephrology clinic and ensurance hospital nephrology clinic in Minia governorate. **Results:** There was statistically significant variance among two studied groups regarding Systolic blood pressure was significantly higher in patent AVF group than closed AVF group but there was no difference in diastolic blood pressure in the two studied groups.

Conclusion: In this study we found that systolic BP higher in patient with patent AVF than patients with closed AVF also we found that patients patent AVF have significant increase in LVH and diastolic dysfunction more than patients with closed so it is advisable to close AVF in patients of renal transplantation will protect them from hypertension and destructive changes in the heart as LVH and Lt vent diastolic dysfunction.

Key words: Arteriovenous fistula, blood pressure, renal transplantation.

Introduction

AV fistulas reduce the supply of oxygen to the heart significantly but only slightly affect the demand for oxygen in the left ventricle.^[1]

AVFs can arise from a variety of sources, including surgical procedures, genetic abnormalities, or iatrogenic trauma or injury.^[2,3] These are quite unusual, especially when compared to fistulas that are medically made. These can have serious pathologic effects on the body as a result of the pressure gradient between the arterial & venous systems; the severity of these effects is proportional to the location of the fistula.^[4]

Shunting of oxygenated blood back to the right heart occurs in patients with severe, chronic, or

high flow fistulas, who may present with high output cardiac failure.^[5] There is less peripheral resistance because arterial blood travels a shorter route through the veins. Increasing the total volume of blood in circulation to keep blood pressure constant causes heart failure. Compression of the fistula owing to increased afterload & reflex bradycardia is known as the Nicoladoni-Israel-Branham sign.^[6]

Swelling of the afflicted limb, which may worsen with time & restrict movement, is a symptom of venous hypertension. Skin stasis pigmentation, varicosities, & ulcerations are symptoms of insufficiency. This issue arises when the one-way valves in the veins fail & the blood pressure pushes against the thinner vein walls.^[7]

Patients and methods

This trial was carried out on 98 kidney transplant recipients, who were divided into 2 groups: the closed AVF group flow < 650ml/min (N= 46), the patent AVF group (N = 52) flow 650-1500ml/min. It was conducted at Minia University outpatient nephrology clinic & insurance hospital nephrology clinic at Minia governorate.

Inclusion criteria: Receiver of a kidney transplant as an outpatient (Living unrelated and related patients), PRA (panel reactive antibody) negative by Luminex bead assay.(must be eighteen years old or older), no evidence of rejection (antibody or cellular) and willingness to participate in the survey.

Exclusion criteria Infection, rapid deterioration of kidney function, cognitive impairment, and HF in the NYHA class IV and impaired cardiac function patients

Methods

All patients were subjected to a full history, including: Present history, past history, family history, and history of smoking, drug use, diabetes mellitus, and hypertension.

Full clinical examination: vital signs (blood pressure mmHg, pulse beat/min), general examination, weight (kg), and height (meter).

Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 25.0 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp). Qualitative data were described using number and percent. The Kolmogorov–Smirnov test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum), mean, standard deviation, median and interquartile range (IQR). Significance of the obtained results was judged at the 5% level.

Results

This study was conducted on 98 kidney transplant recipients who referred to Insurance hospital at Minia governorate and nephrology outpatient clinic El Minia university hospital. They divided into two groups; closed AVF group (N=46), and patent AVF group (N=52).

Table (1): Demographic characteristics among the studied groups.

		Closed AVF group (No.= 46)	Patent AVF group (No.= 52)	Test value	P-value
Age (years)	Mean± SD	37.07± 6.77	39.37± 6.75	z _{MWU} = 1.816	0.069 (NS)
	Median (IQR)	37 (32-40)	38 (36-42.5)		
	Range	27- 56	28- 59		
Sex	Male	28 (60.9%)	30 (57.7%)	X ² = 0.102	0.749 (NS)
	Female	18 (39.1%)	22 (42.3%)		
Weight (Kg)	Mean± SD	71.43± 8.26	73.44± 9.72	T= 1.094	0.277 (NS)
	Median (IQR)	70.5 (65-77)	72 (66.5-79.5)		
	Range	57- 89	57- 93		

p>0.05 is non-significant (NS), p≤0.05 is significant (S), p≤0.01 is highly significant (HS),

SD: standard deviation, IQR: Interquartile range

Z_{MWU}: Mann-Whitney U Test, X²: Chi-Square test, T: Student T Test

The mean age in closed AVF group was 37.07± 6.77 years, 60.9% of cases were males, and they had a mean weight of 71.43± 8.26 kg. While in patent AVF group, the mean age was 39.37± 6.75 years respectively 57.7% of cases were males, and they had a mean weight of 73.44±9.72 kg. There was no statistically significant difference between the two groups regarding age, sex and weight (p>0.05) as shown in **table (1)**

Table (2): Comparison between the studied groups regarding clinical history.

		Closed AVF group (No.= 46)	Patent AVF group (No.= 52)	Test value	P-value
SBP (mm/Hg)	Mean± SD	129.35± 14.05	137.88± 9.62	$Z_{MWU}=3.084$	0.002 (HS)
	Median (IQR)	130 (120-140)	140 (130-145)		
	Range	110- 150	110- 150		
DBP (mm/Hg)	Mean± SD	82.39± 8.87	85.96± 5.86	$Z_{MWU}=1.907$	0.057 (NS)
	Median (IQR)	82.5 (70-90)	85 (85-90)		
	Range	70- 100	70- 95		

p>0.05 is non-significant (NS), p≤0.05 is significant (S), p≤0.01 is highly significant (HS),

SD: standard deviation, IQR: Interquartile range

Z_{MWU} : Mann-Whitney U Test, X^2 : Chi-Square test

There was statistically significant difference between closed AVF and patent AVF groups regarding systolic blood pressure (p=0.002) as systolic blood pressure were significantly higher in patent AVF group compared to closed AVF group. No significant difference was noticed between closed AVF group and patent AVF group regarding diastolic blood pressure as shown in **table (2)**

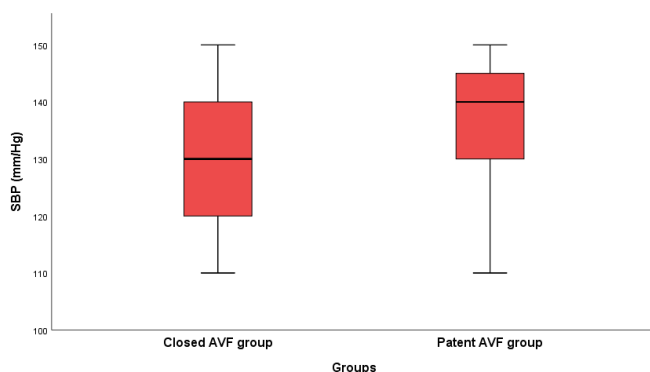


Figure (1): Comparison between the study groups regarding systolic blood pressure.

Discussion

One of the most important things that hemodialyzed patients can do to keep their AVF open and make hemodialysis an available option is to learn how to properly maintain it. Patients' attitudes and reluctances regarding vascular access creation and already-created AVFs have been the subject of various research studies. There is a conflict between renal transplant patients about patency of AVF [8]

The main results of our study were as following: In our study we found that the mean age in closed AVF group was 37.07± 6.77 years, 60.9% of cases were males, and they had a mean weight of 71.43± 8.26 kg. While in patent AVF group, the mean age was 39.37± 6.75 years respectively 57.7% of cases were males, and they had a mean weight of 73.44± 9.72 kg.

There was no statistically significant difference between the two groups regarding age, sex and weight (p>0.05). These results can be explained by selection of the patients was fixed age group.

In a study that sought to examine the clinical, laboratory, & echocardiographic results in patients with renal transplants and AVF, Gorgulu N et al., provided support for the current investigation. A total of 130 renal transplant recipients were included in the study. Of these, sixty had functional fistulas, forty-nine had fistulas that spontaneously stopped or closed, & twenty-one had never had fistulas created; all of these patients were on hemodialysis. They reported that the mean age in closed AVF group, functional AVF group and no AVF group was 37±11 years, 39±12 years and 37±13 years with no statistically significant

variance among the three groups ($p>0.05$). Male cases were predominantly higher in the three groups. There was no statistically significant variance among the three groups regarding age & gender ($p>0.05$). The mean BMI (kg/m²) in closed AVF group, functional AVF group and no AVF group was 24.8 ± 4.5 , 24.4 ± 4.7 and 24.2 ± 3.8 with no statistically significant difference between the three groups ($p>0.05$).

Furthermore, our findings are in line with those of Weekers et al., who sought to determine if KTRs are severely impacted by the closure of a functional AVF. The research involved 285 patients who were divided into three groups: Group 0 (no AVF), Group 1 (closed AVF), & Group 2 (left-open AVF). They found that male cases were predominantly higher in the three groups. There was no statistically significant variance among the three groups regarding gender ($p>0.05$). Their study in contrast with our results in age as was statistically significant variance among the three groups regarding age. ($p=0.01$)

Soleimani et al., sought to assess the natural history of AVFs in kidney transplant recipients & the impact of spontaneous AVF closure following kidney transplantation on cardiac function; our results are consistent with their findings. In their study, 23 patients with a fully functional AVF were compared to seventeen patients whose AVFs had closed on them. They found that mean age in closed AVF group and patent AVF group was 39.2 ± 12.4 years and 49.1 ± 11.8 years with no statistically significant variance among the three groups ($p>0.05$). Male cases were predominantly higher in the three groups. There was no statistically significant variance among the two groups regarding age and gender ($p>0.05$).^[11]

Additionally, De Lima JJ, et al., endeavored to study the effects of long-term AV fistulas on the structure & function of the heart in renal transplant recipients as assessed by echocardiography. The research team examined 61 stable renal transplant patients, thirty-nine of whom had patent AV fistulas & twenty-two of whom had closed ones. Concerning age and body mass index, they discovered no statistically significant variations among the two groups ($p>0.05$).

In our research, we determined that there was a significant difference between closed AVF and patent AVF groups regarding systolic blood pressure ($p=0.002$) as systolic blood pressure were significantly higher in patent AVF group compared to closed AVF group. No significant difference was noticed between closed AVF group and patent AVF group regarding diastolic blood pressure. This can be explained by closing the AVF decrease preload on the heart with subsequent improving COP that improve blood supply of the transplanted kidney and improve renal hypoxia that has the main rule of activation of renine angiotensine aldosterone system which is contributed in elevation of BP. This can explain why patients without AVF have normal blood pressure and blood pressure higher in patent AVF more than closed AVF group.

Based on our findings, De Lima JJ, et al., who indicated that There was significant disparity among the two groups that were evaluated in terms of systolic and diastolic blood pressure. The patent AVF group exhibited significantly greater systolic and diastolic blood pressure compared to the closed AVF group.^[9]

Contrary to our findings, Gorgulu N et al., who indicated that there was no significant distinction found among the three groups involving systolic and diastolic blood pressure.^[10]

Unger P, et al., who indicated that there is a rise in BP, particularly diastolic BP, has previously been reported following AVF closure. Although BP elevation was not observed at 6 months post-AVF ligation in a cohort, our follow-up data demonstrated a significant rise in both systolic and diastolic BPs. This is likely attributed to the long-term consequences of chronic immunosuppressive therapy in transplantation and more specifically, the use of glucocorticoid therapy and calcineurin inhibitors.^[12]

Also we found that there was significant difference between studied groups as reggrade Lt vent hypertrophy and diastolic dysfunction which were more in patent than in closed AVF groups. This can be explained by elevated systolic Bp in patent AVF group more than closed AVF group. in agreement with our results Cridlig et al., sought to evaluate the effects of

arteriovenous fistulas on the heart following kidney transplantation & the connection among access flow & systemic hemodynamics, including cardiac output, cardiac index, central blood volume, & peripheral vascular resistance; our findings were in line with theirs. They found that IVC, PASP, MPAP, left ventricular hypertrophy, & left ventricular DD were significantly different between the two groups based on echocardiographic results. When comparing the two groups, the IVC, PASP, MPAP, left ventricular hypertrophy, & left ventricular DD were all significantly lower in the closed AVF group.^[13]

Also, in contrast with our results, Sheashaa H, et al., who reported that according to echocardiographic findings, there was no statistically significant variance among three studied groups regarding minor right-side diameter, IVC, PASP, MPAP, left ventricular hypertrophy & left ventricular DD.^[14]

Conclusion

In this study we found that systolic BP higher in patient with patent AVF than patients with closed AVF also we found that patients patent AVF have significant increase in LVH and diastolic dysfunction more than patients with closed so it is advisable to close AVF in patients of renal transplantation will protect them from hypertension and destructive changes in the heart as LVH and Lt vent diastolic dysfunction.

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