



Vascular access complications and risk factors in hemodialysis patients: A single center study



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KEYWORDS

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Abstract *Background:* Morbidity related to vascular access is the leading cause of hospitalization for chronic hemodialysis patients and is associated with high cost. Since data on vascular access complications are scarce, this study was designed to focus on vascular access complications in hemodialysis patients.

Methods: 119 patients with End Stage Renal Disease (ESRD) on regular hemodialysis were recruited for the study, They were subjected to the following Laboratory blood tests: Kidney function tests, CBC, KT/V, serum albumin, fasting blood sugar, swab culture and sensitivity from the skin over the vascular access and blood culture and sensitivity from both central and peripheral samples, In addition, radiological Doppler ultrasound was done for all patients to evaluate the vascular access.

Results: 27 out of 119 patients (22%) have positive blood culture, 64 (53.7%) patients have positive swab culture, 68 (57%) patients have stenosis, 25 patients (21%) have athermanous plaques and 44 (36.9%) patients have aneurysmal dilatation. There was a significant low Kt/V in patients with stenosis and aneurysmal dilatation ($p < 0.001$). Low Kt/V, low serum albumin level and low BMI were significant in patients with central blood infection ($p < 0.008$, < 0.008 and < 0.001 respectively). There was significant increase in the risk of infection in male patients, patients with low BMI, increased BUN and increased duration of HD session ($p < 0.046$, < 0.008 , < 0.002 and < 0.009 respectively). Stenosis was the most common risk factor for vascular failure as it

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occurred in (29%) of patients. Diabetes was the second common risk factor for vascular failure as it occurred in (17%) of patients.

Conclusion: Stenosis and infection are the most common complications of the vascular access. DM is an important risk factor for the incidence of infection. Other risk factors for dialysis CRBSI include older age, low serum albumin, high BUN and decreasing the duration of dialysis.

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1. Introduction

Hemodialysis has become an increasingly safe and well-tolerated therapy for patients with end-stage renal disease (ESRD). Nevertheless, life expectancy of dialysis patients remains significantly shorter than that of the general population with similar demographics.¹ Arterio-venous fistula (AVF) is the preferred access for patients who require regular Hemodialysis (HD) and the preferred site is the wrist, preferably in the non-dependant arm.² A standard Arteriovenous fistula (AVF) is created from anastomosis of cephalic vein with radial artery at the wrist. Tunneled dialysis catheters are used for temporary vascular access in patients awaiting placement or maturation of a permanent vascular access (AVF or AV graft). They are also required for long-term access in patients who have exhausted all options for placement of a permanent access in all four extremities. They are usually placed in a central vein in the chest, most commonly in the internal jugular vein, and less commonly in the subclavian vein. However, they can be used also in femoral veins whenever indicated and due to their proximity to the groin; one would anticipate they would be more prone to problems with low dialysis blood flows, loss of patency, and catheter-related bacteremia.⁴ Vascular access complications are of great burden in the chronic hemodialysis population. Morbidity related to vascular access is the leading cause of frequent hospitalization among chronic hemodialysis patients and is associated with huge financial problem. The Clinical Practice Guidelines for Vascular Access of the National Kidney Foundation's Dialysis Outcomes Quality Initiative (KDOQI) recommend use of arteriovenous (AV) accesses (native fistulae or synthetic grafts) for hemodialysis over using the venous catheter as they provide higher blood flow rates than do venous catheters and are associated with lower rates of infection, thrombosis, septicemia, and central venous stenosis which are common complications of the venous catheters. KDOQI Guidelines further recommend fistulae over grafts, as most studies have found fistulae to have fewer complications.⁵ Other complications of AVF include thrombosis, infection, bleeding, increased venous pressure, arterial insufficiency, aneurysm, carpal tunnel syndrome, distal ischemia and even heart failure.⁶ Since data on vascular access complications are scarce in Egypt, this study was designed to focus on vascular access complications and their common risk factors in Egyptian hemodialysis patients.

2. Subjects and methods

This cross sectional study has been carried out in the nephrology unit, and clinical biochemistry departments, Zagazig

University Hospitals, Egypt in the period between May 2012 and April 2014. One hundred and nineteen patients with ESRD on regular HD were recruited for the study.

They were receiving bicarbonate base dialysis using a high flux polysulphonesynthetic dialyzer with an average blood flow of 300–350 mL/min, 3 times/week with target 4 h duration for each dialysis session, 79 out of them were males and 40 were females. Their ages ranged from 25 to 76 years with mean of $46.47.78 \pm 09.85$ years. The duration of haemodialysis ranged from 1 to 12 years with mean of 7.84 ± 3.54 years. 46 (38.7%) patients were diabetics and 77 (64.7%) patients were hypertensive.

2.1. Vascular accesses

One hundred and seven patients were dialyzed through AVF, ten patients were dialyzed through permanent tunneled catheters and two patients were dialyzed through AV graft. All patients of the unit on HD were candidates for the study except patients with obvious infection, malignancy, recently created AVF and patients with temporary non-tunneled catheters were excluded from the study. All subjects of the study were subjected to the following: thorough full history taking and clinical examination, laboratory blood tests which included: kidney function tests, Complete Blood Count (CBC), single pool Kt/V, serum albumin by colorimetric method, fasting blood sugar, swab culture and sensitivity from the skin over the vascular access and blood culture and sensitivity from both central and peripheral samples. Blood samples for blood culture were taken before dialysis session. Under complete aseptic condition, 10 mL of blood was taken through the catheter and a peripheral vein puncture and injected into two "blood bottles" with specific media for aerobic and anaerobic organisms and fungal infection. Also all patients underwent radiological Doppler ultrasound examination to evaluate the vascular access by high-resolution real-time B mode ultrasonography with a 7.5-MHz linear transducer (SSH 140A Toshiba, Japan). The examination involved 2D and Doppler vascular access examination, with the former allowing evaluation and detection of any abnormalities in the vascular access such as stenosis, atheromatous plaque, aneurysm, pattern of blood flow and distal ischemia.

3. Statistical methods

Statistical analyses were performed with Statistical Package for Social Sciences version 17.0 for Windows (SPSS Inc., Chicago, IL). Continuous variables are presented as mean \pm SD or median and range. Chi-square test was used for qualitative data (frequency and proportion), student *t*-test was used to

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