

Stroke in Hemodialysis Patients and Mortality

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Abstract: ***Introduction:** End Stage Renal Disease ESRD is associated with an increases risk of cerebrovascular accidents with significant morbidity and mortality. Stroke is the third most common cause of cardiovascular disease death in hemodialysis patients. Chronic renal disease is an independent risk factor for stroke in the general population. The American Heart Association and American Stroke Association have redefined a stroke as brain spinal or retinal cell death attributable taischemia, based on pathological, imaging, other objective evidence, and /or clinical evidence. Furthermore the new definition include the concept of "silent infarction/ hemorrhage "to take into account. Lesions were discovered on neuroimaging on neuro-pathological examination without a history of acute neurological dysfunction attributed to the lesion. **Objective:** To highlight the risk factors for stroke in our dialysis population, to see the prevalence of stroke in this population, and evident mortality rate among dialysis patient with stroke. **Methods:** We conducted a retrospective, qualitative and descriptive study which involved 1732 patients from 5 different centers in the Amerikan Hospital starting November 2008 to December 2019. We evidenced 70 different case of cerebrovascular accidents. Also we took a control group of 70 dialysis patients to compare, (those we did not select it preferentially but we selected according to the ordinal registrations in to the centers) **Results:** A total number of 1732 patients were observed during November 2008 till December 2019. Of these 70 patients were diagnosed with cerebrovascular accidents. The mean age was 57.6 years. 33patients were females (47%) and 37 patients were males (53%). 23 patients were younger than 55 years old and 47 patients (68%) were older than 55 years. The mean age of the control group is 53.69 years. The vascular access in 22 patients was AVF (fistula 30.4 %) and 48 had a central venous catheter (69.6%). In the control group there were 52 AVF(74.3%), 1 GAV, and 17 CVC (24.3%). The average hemoglobin levels in the stroke group were 9.3 g/dl compared to 11.4 g/dl of the control group. Between the hemorrhagic group, 18 patients (25.7%) in total, mortality was 94.44%, only one patient survived. There were 52 patients with ischemic stroke (74.28%) and the mortality was 40.3% (21 patients). In the control group 14 patients died during the study (20%) and 2 patients had renal transplantation. **Conclusions:** The prevalence of stroke among hemodialysis patients in our center resulted 4.01%. The patients with stroke tended to be older, with lower hemoglobin values and thecentral venous catheter represented the vascular access in the majority of the patients (69.6%). Vascular access may increase stroke risk by affecting cerebral hemodynamics. Mortality was very high in patients with hemorrhagic stroke. Different factors were present.*

Keywords: stroke, mortality, hemodialysis

1. Introduction

Cardiovascular disease is the leading cause of death in hemodialysis patients (1-2-3). Several study have reported that dialysis patients have much higher incidence of stroke than the general population (4-5)..Chronic Renal Disease is an independent risk factor for stroke in the general populations (5) Patients in hemodialysis are associated with an increased risk of cerebrovascular accidents with significant morbidity and mortality (6). The incidence of both, ischemic and hemorrhagic stroke, in hemodialysis is 10 times greater than in general population (5). This increased stroke risk in dialysis patients is related with the increased prevalence of traditional stroke risk factors such as age, hypertension, diabetes mellitus and dyslipidemia, but there are also risk factors due to the uremic syndrome and to the vascular access witch may predispose patients on dialysis to either ischemic or hemorrhagic strokes (4-5-6) The American Heart Association and American Stroke Association have redefined a stroke as " brain spinal cord or retinal cell death attributable to ischemia, based on pathological, imaging, other objective evidence, and/or clinical evidence. The three main stroke subtypes, cerebral infarction or ischemic stroke, intracerebral hemorrhage and sub-arachnoid hemorrhage have also redefined based on these principles. Furthermore, the new definitions include the concept of "silent infarction/ hemorrhage" to take into account lesions discovered on neuroimaging on neuro-pathological examination without a history of acute neurological dysfunction attributed to the lesion.

For every 10 ml/min/1.73 m² reduction in glomerular filtration rate (GFR), the risk of stroke increases by 7% (9). For this reason Chronic Kidney Disease (CKD) staging may also be a useful clinical tool for identifying people who may benefit most form interventions to reduce cardiovascular risk. (9) Patients on hemodialysis carries up a risk for stroke 10 time higher than those with normal function.(4). The risk factor for stroke in hemodialysis may differ when compared to the general population. Patients on dialysis and End stage Renal Disease, (ESRD) are at 5-10 fold higher risk for developing cardiovascular disease (CVD) than age matched controls (13).

Risk appears to be proportionally increased for both ischemic and hemorrhagic strokes (5).Causes of hemorrhagic stroke may differ from ischemic stroke in patients in long term dialysis therapy and thus acquired risk factors could account for this later hemorrhagic stroke risk (5). Reason could include excess vascular calcification and stiffness, (16-17) leading to worsening hypertension. This combined with the use of anticoagulation on dialysis therapy, could increase hemorrhagic stroke (9)

Cardio-embolic strokes account for a relatively large proportion of ischemic strokes within the dialysis population (5), perhaps because of the increased prevalence of atrial fibrillation (13). Cardio-embolic risk factors, in the CHOICE study, such as arrhythmias, left ventricular hypertrophy, valvular disease, and congestive heart failure, were not significantly different between individuals who experienced

a cerebrovascular event versus those who did not, suggesting that these aspects may not be correctly identified in dialysis patients (5). Measurement of cardiac function by echocardiography, chest radiography and physical examination is suggested for all patients before initiating hemodialysis therapy.

Having CKD/ESRD is associated with an increased prevalence of AF and vice versa (18). The prevalence of AF in patients with advanced CKD has been reported 4-21% and in dialysis patients 7-27 % (18). The presence of AF confers a high risk of stroke in patients with CKD and ESRD. (18).

2. Methods/ Results

We conducted a retrospective, qualitative and descriptive study which involved 1732 patients treated frequently 3 times a week in 5 hemodialysis centers in American Hospital during November 2008 to December 2019. From the analysed data 70 patients experienced a cerebro-vascular accident during this period of time. We compared the data with a control group of 70 patients, from this population, without a stroke event.

The diagnosis of stroke was made on the basis of history, physical examination computed axial tomography or CT-scan of the head and brain. Stroke was defined according to standard clinical and imaging criteria. The causes of stroke were further subdivided into ischemic or hemorrhagic categories depending on the radiological appearance.

Clinical details were recorded including primary renal diagnosis, the presence of DM, hypertension, atrial fibrillation AF. We also extracted Ultrafiltration volume (UF), Kt/V, pre-dialysis urea, urea reduction, potassium, calcium, phosphoremi, hemoglobine, albumin, total protein, cholesterol and LDL-cholesterol levels.

18 patients had hemorrhagic stroke (25.7%) and the mortality was 94.4%. The median time of the event was 22.1 months from the beginning of hemodialysis (1 month-72 months). 52 patients (74.28%) experienced ischemic stroke and mortality was 40.38 %. The median time of the event was 24.77 months.

3. Discussion

Cardiovascular diseases are the leading cause of death in dialysis patients (15). It is demonstrated that the increased risk of cardiovascular disease is attributable to advanced atherosclerotic vascular changes

Previous investigators have examined stroke epidemiology questions (5, 6, 1, 14). Overall stroke incidence rate reported by Power *et al.* was 14.9-1000 patients-years (75) and Iseki *et al.* 24-1000 constituting the lower end and Sozio *et al.* 49-1000 (5) the higher. We found 74.28% of the total stroke events to be ischemic, similar to the 75% (6) and 76% (5) reported in other cohorts.

Compared with the general population, in turn, a recent review by Feigin *et al.* (19) showed that in high-income

countries, 30-day case fatality rates were about 13%–23% for ischemic strokes and about 25%–35% for hemorrhagic strokes. This suggests that, compared with the general population, 30-day ischemic stroke mortality in dialysis patients is similar, while hemorrhagic stroke was substantially greater. The chronically anticoagulated state of hemodialysis patients in particular might partially explain the worse outcome in hemorrhagic stroke.

The manner in which stroke might affect mortality remains uncertain. Stroke is probably part of an epiphenomenon involving inflammation, nutrition, and frailty.

In conclusion, strokes in patients receiving dialysis are associated with a substantially increased risk for death in these patients and are associated with substantial years of life lost. Long-term stroke survivors have slightly lower hazard ratios than do individuals who recently had strokes after having spent several years on dialysis.

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