How chronic kidney disease and haemodialysis influence stroke outcome.

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Background:

* Stroke patients with underlying chronic kidney disease (CKD) and those on dialysis have complex rehabilitation needs.
comorbidities

- HTN
- DM
- PVD
- Amputations

Common issues

- Unstable BP: extremes of HTN or post dialysis hypotension.
- Sugars: labile: as renal function deteriorates: insulin requirement varies.
Sepsis and other issues

* Prone for infections
* Fistula related problems.

Rehab goals

* Patients on HD: post discharge need to for HD in satellite centres.
* Minimum requirement: sitting tolerance for 4 hours.
* Based on progress: further rehab goals are set.
The number of individuals undergoing dialysis is steadily increasing. Patients undergoing dialysis are susceptible to vascular complications including stroke [1].

The kidney and brain both “require continuous and stable high blood flow in a low vascular resistance system”

These two organs are supplied by “strain arterioles”. Owing the branching nature of these arterioles, they are susceptible to blood pressure changes [2, 3].
Strain arteriole

The arterial endothelium and tunica media are adversely affected in patients with CKD.

These patients are prone to cerebrovascular insults [3, 4].

Further, in patients on haemodialysis (HD), the baroreceptor reflex is altered owing to deranged autonomic function [5].

This results in poor tolerance to fluid and BP changes during dialysis [6].

HD can also result in myocardial stunning, leading to inadequate cerebral perfusion, which may lead to ischaemic brain injury [7].
This study aimed to review the post-stroke survival and functional outcomes following rehabilitation in patients with CKD (stages G3b, G4, G5) and dialysis.

Methods

- retrospective analysis 37 stroke patients
- with underlying CKD (stages G3b, G4, G5; n = 30), and those on dialysis at the time of stroke (n = 7)
- The follow-up period ranged from 20 to 93 months
- Singhealth IRB approval
Patients with CKD stages G3b, G4, G5 (based on the Kidney Disease: Improving Global Outcomes (KDIGO) staging)
- Those on haemodialysis, or peritoneal dialysis at the time of stroke diagnosis

**Inclusion Criteria: Stroke in Patients With**

- Previous known strokes
- Incomplete follow-up records
- Those with normal renal function, acute kidney injury, and CKD stage G1, G2, G3a.

**Exclusion Criteria**
37 patients met the selection criteria. Of which 30 had CKD (stages G3b, G4, G5). 7 were on dialysis at the time of stroke. Follow up duration of 56 months (20-93).

23 had Partial anterior circulation stroke
8 had posterior circulation stroke
6 had total anterior circulation stroke of which 3 had haemorrhagic transformation.

The mean values of eGFR on admission was, 21.3 (5-44), and haemoglobin 11.9 (9-18).

urea 12.1 (3.8-26)
albumin 29.9 (15-39).
The mean age of patients was 64.7 (36-87) years
* 16 (44%) men
* 73% (27) had DM.
* The mean duration of hospitalisation: 28 days (4-77).

A significant decrease was observed from the time of admission [6 (2-19)] to the time post discharge [4 (1-17)] (p<0.001; Wilcoxon signed rank test)
FIM motor score

* increased significantly from the time of admission [31 (13-87)] to the time of discharge [50.5 (13-91)]
  (p<0.001; Wilcoxon signed rank test)

FIM cognition score

* Increased significantly from the time of admission [24.6 (5-35)] to the time of discharge [26.6 (5-35)]
  (p=0.046; Paired t-test).
results

* Median number of recurrent admissions were 6 (1-50)
* Median hospital-stay duration was 48 days (2-291).
* Older age, longer hospital-stay duration and lower eGFR were all significantly related to mortality (p<0.05).
* Lower haemoglobin levels showed borderline significance (p=0.051).

independent predictors of mortality

* Age
* Length of hospital-stay and
* Low haemoglobin: were found to have significant independent relationships with mortality. (multivariable Cox regression).
A cohort of n=37 patients with stroke admission dates ranging from June 2008 to February 2016 were followed up for a minimum period of 20 months (maximum 93 months). During the follow-up period 18 patients died.

Comparisons with the ‘normal’ group (stroke cohort with normal kidney function).
The CKD/ESRF cohort had a significantly higher mortality (p<0.001).
HR=3.5, 95% CI (2.1 to 5.8)
Murray et. al. concluded that the number of stroke events within the first month of initiation of HD increased by a factor of 7 [20].

This could be attributed to the decreased cerebral perfusion and the altered rate of blood flow [20, 21, 22].

Other factors contribute to an increased risk of stroke at dialysis initiation were advancing age, DM, HTN [18],

Patients receiving Erythropoietin [20].

Compared to the general population, patients on dialysis have about 10 times [19] increased risk of stroke.

20 to 30% being haemorrhagic strokes [23, 24])

Increased risk of haemorrhagic transformations and

with more hematoma volume in haemorrhagic stroke [25].
Eldehni et. al. concluded that dialysis performed at 0.5°C below a patient’s core temperature was associated with better hemodynamic stability and led to protection against white matter ischaemic changes [8].

Continuous, instead of intermittent dialysis, has also been suggested to reduce the incidence of brain injury [1].

Conclusion

Despite significant improvements in functional scores, survival remains poor in stroke patients with CKD and in those on HD.

The average hospital-stay duration and recurrent hospitalisations rate is higher compared to stroke patients without CKD.
* Morbidity and mortality in stroke patients with CKD and HD may be a result of the complications associated with the comorbidities rather than stroke itself.

* Community services which focus on preventing or addressing these issues may help reduce the recurrence of hospital admissions and hospital acquired infections.
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References


Thank you