

Factors Affecting the Development of Acute Renal Failure after Intracerebral Hemorrhage

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It has been known that patients with intracerebral hemorrhage (ICH) have a higher rate of acute renal failure (ARF), which is associated with poor outcomes including increased mortality.

The factors such as medications for blood pressure control, blood pressure (BP) variations and use of contrast for imaging within the first 48 hours of admission, could be associated to the development of ARF in ICH patients with or without history of previous kidney disease.

OBJECTIVES

1. To identify possible factors affecting the development of acute renal failure after intracerebral hemorrhage.
2. To evaluate the relevance of the level of kidney damage according to RIFLE classification for the development of acute renal failure.

METHODS

- We analyzed records of 604 ICH patients admitted to a single academic Neuro ICU center between 2008 and 2012.
- Patients were divided into the following groups using RIFLE classification for acute renal failure (ARF); not qualified as ARF, risk of ARF and confirmed ARF as injury or failure (Table 1).
- We evaluated for association between antihypertensive therapy, variability in blood pressure within the first 48 hours of admission and the use of IV contrast for imaging with ARF (Table 2).

Table 1. Risk, Injury, Failure, Loss of Kidney Function and End-Stage Kidney Disease (RIFLE) Classification

Classification	Glomerular Filtration Rate	Urine Output
Risk	↑ SCr x 1.5 or ↓ GFR > 25%	< 0.5 mL/kg/h x 6 h
Injury	↑ SCr x 2 or ↓ GFR > 50%	< 0.5 mL/kg/h x 12 h
Failure	↑ SCr x 3 or ↓ GFR > 75% or if baseline SCr ≥ 353.6 μmol/L (≥ 4 mg/dL) ↑ SCr > 44.2 μmol/L (> 0.5 mg/dL)	< 0.3 mL/kg/h x 24 h or anuria x 12 h
Loss of kidney function	Complete loss of kidney function > 4 weeks	
End-stage kidney disease	Complete loss of kidney function > 3 months	

GFR: Glomerular Filtration Rate; SCr: Serum Creatinine.

Table 2. Distribution of Renal Risk, Injury and Failure by RIFLE Classification w/ Antihypertensive Use in ICH Patients ^

Antihypertensive Therapy within First 48 Hours	RIFLE Classification		
	Risk	Injury	Failure
B-Blockers	•	•	•
CCB	•	•	•
ACE inhibitors	•	•	•
Hydralazine	•	•	•
Mannitol	•	•	
Clonidine	•		
Isosorbide		•	
Furosemide		•	
Digoxin	•	•	

[^] n = 22; CCB: Calcium Channel Blockers; ACE: Angiotensin-converting-enzyme.

RESULTS

86 patients were reported to have renal failure by the medical records. Of this cohort:

- 22 (25.5%) demonstrated risk of kidney failure, had developed injury or fully developed ARF, using RIFLE criteria. 12 (54.5%) were catalogued as risk and 7 patients (31.8%) were confirmed injury and 3 (13.6%) as failure.
- Antihypertensive therapy used within the first 48 hours of admission was a variable combination of ACEI, ARBs and B-blockers, and other agents. Patients showed a wide variability in blood pressure (max-min within a day) which showed no clear association to the type of antihypertensive therapy (Table 3).
- Majority of patients were evaluated with non-contrast CT scans and hence influence of contrast on ARF could not be evaluated.

Table 5. Δ Systolic Blood Pressure Variability Distribution by RIFLE Classification (n = 22)

Δ SBP Variability within 48 Hours of Admission and its Distribution of RIFLE Degree of Renal Insufficiency (n = 22)				
Δ mmHg	Risk	Injury	Failure	n (%)
0 - 50	1 (4.5%)	4 (18.2%)	1 (4.5%)	6 (27.3%)
51 - 100	3 (13.6%)	1 (4.5%)	2 (9.1%)	6 (27.3%)
> 100	8 (36.4%)	3 (13.6%)	0	12 (54.5%)

Table 3. Δ Systolic Blood Pressure Variability within a Day for All Patients with ARF (n = 22)

Mean Δ Systolic Blood within a Day (mmHg)	Day					
	1	2	3	4	5	6
209	183	145	164	164	123	

Table 4. Δ Systolic Blood Pressure Variability Range and Distribution by RIFLE Classification (n = 22)

Δ Systolic Blood Pressure Variability within 48 Hours of Admission (mmHg)	RIFLE Classification		
	Risk	Injury	Failure
50-144		16-154	26-60

CONCLUSION

- We observed lower incidence of ARF as compared to other published literature.
- Our observations did not show an association in between BP variability, type of antihypertensive therapy or use of iodinated contrast within the first 48 hours of admission to acute renal failure in ICH patients either with or without history of renal disease (Table 4).
- The degree of renal injury did not show to impact the development of an acute renal failure episode (Table 5).
- Small sample size may limit our observations.
- A larger study may be required to support this statement.



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