M O N D O: MONitoring Dialysis Outcomes

Patient-level Factors Associated with Cerebrovascular Events in Maintenance Hemodialysis

Albert Power, Neill Duncan, Charles Pusey, Len Usvyat, Daniele Marcelli, Cristina Marelli, Peter Kotanko, MONDO Consortium

Background

Stroke remains a major cause of disability and mortality in hemodialysis [HD] patients with studies deriving predominantly from US & Japanese cohorts. By contrast the worldwide variability in stroke epidemiology is poorly characterized and associations with treatment parameters remain relatively unexplored.

Methods

The MONDO consortium consists of HD databases from Renal Research Institute [RRI] clinics in the US, Fresenius Medical Care [FMC] clinics in Europe, Asia Pacific [AP], Latin America [LA], KfH clinics in Germany, Imperial College in UK, Hadassah Medical Center in Israel, and University of Maastricht, Netherlands [Usvyat et al, Blood Purif 2013].

Databases from RRI, FMC Europe & FMC Latin America [FMC LA] identified all patients with in-center treatments [1/2000-12/2012] who survived ≥12 months on HD. Only those with ≥1 all-cause hospitalizations were included [assuring proper recording] and hospitalizations for stroke were studied. The mean of clinical & laboratory parameters were computed for the whole patient exposure time.

Results

We studied 27,252 patients. Overall 2% of the cohort [n=575] experienced stroke events [Table 1; p-values shown if ≤0.1].

Older age, cerebrovascular comorbidity, higher mean pre-dialysis systolic blood pressure [SBP] and variability in SBP, and lower serum creatinine levels were associated with stroke across all databases. Diabetes was associated with stroke in LA & RRI but not in Europe. Lower IDWG was associated with stroke in Europe & LA but not in the US. Albumin and nPCR appeared to be lower in the patients with stroke events although not always reaching statistical significance.

Conclusion

Higher pre-dialysis SBP variability is associated with stroke on HD populations suggesting a potential role for cerebral perfusion instability. We confirm known associations between age, diabetes, pre-existent cerebrovascular disease and hypertension.

In contrast to studies in non-dialysis patients we do not find an association between EPO dose and stroke.

Interventional trials of blood pressure management on stroke are urgently required.

Table 1. Cohort characteristics [mean ± stdev]

	FMC Europe [17 countries]			FMC LA [5 countries]			RRI		
	No stroke	Stroke	p	No stroke	Stroke	p	No stroke	Stroke	p
N	14498	244		6710	180		5469	151	
Stroke events per pt yrs	0	0.34		0	0.37		0	0.36	
Age [yrs]	60.3 ± 16.0	66.3 ± 12.2	<0.001	59.0 ± 16.1	64.1 ± 12.8	<0.001	61.5 ± 15.3	64.8 ± 13.5	0.004
Male	58%	52%	0.09	57%	59%	NS	55%	46%	0.02
Diabetic	26%	27%	NS	27%	39%	0.002	57%	67%	0.01
Arrhythmia Comorbidity	13%	13%	NS	7%	6%	NS	8%	12%	0.1
Cerebrovascular Comorbidity	9%	30%	<0.001	4%	18%	<0.001	6%	23%	<0.001
BMI [kg/m^2]	N/A	N/A	NS	25.03 ± 11.15	25.29 ± 4.06	NS	28.21 ± 17.32	26.82 ± 5.3	0.005
Pre-dialysis SBP [mmHg]	134.7 ±18.2	137.8 ± 17.9	0.008	135.4 ± 18.1	138.5 ± 18.3	0.03	150.3 ± 17.0	152.3 ± 15.3	0.1
Corrected variance of pre-dialysis SBP	0.13 ± 0.03	0.13 ± 0.03	0.08	0.12 ± 0.03	0.13 ± 0.03	0.06	0.14 ± 0.03	0.15 ± 0.03	0.001
Interdialytic weight gain [% of post-weight]	3.05 ± 1.01	2.92 ± 0.99	0.06	3.37 ± 1.17	3.20 ± 1.09	0.04	3.54 ± 0.93	3.51 ± 0.80	NS
EPO dose per treatment [IU]	N/A	N/A		N/A	N/A		7438 ± 4859	6927 ± 4682	NS
Albumin [g/dL]	3.85 ± 0.40	3.78 ± 0.42	0.01	3.75 ± 0.43	3.71 ± 0.40	NS	3.80 ± 0.34	3.75 ± 0.33	0.06
Dialysate Sodium [mmol/L]	N/A	N/A		136.4 ± 2.4	135.6 ± 9.2	NS	139.9 ± 1.7	140.2 ± 1.7	0.04
Creatinine [mg/dL]	7.74 ± 2.15	7.3 ± 1.85	<0.001	7.79 ± 2.71	7.38 ± 2.36	0.07	8.04 ± 2.63	7.45 ± 2.22	0.002
nPCR [g/kg/day]	1.05 ± 0.10	1.05 ± 0.11	NS	1.01 ± 0.12	0.97 ± 0.10	0.002	0.88 ± 0.17	0.84 ± 0.14	0.001
Hemoglobin [g/dL]	11.4 ± 1.1	11.2 ± 1.2	0.01	10.5 ± 1.6	10.7 ± 1.4	NS	11.8 ± 0.69	11.9 ± 0.8	NS

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