Increased Blood Pressure Variability Predicts Poor Short-term Functional Outcome

Karen Appiah [1], Mintu Nath [1], Will Davison [2], Sara Mazzucco [3], John Potter [2], Peter Rothwell [3], Tom Robinson [1, 4]
[1] Department of Cardiovascular Sciences, University of Leicester, Leicester, UK; [2] Faculty of Medicine and Health Sciences, Norwich Medical School, University of East Anglia, Norwich, United Kingdom; [3] Nuffield Department of Clinical Neurosciences, John Radcliffe Hospital, Oxford, United Kingdom; [4] NIHR Leicester Biomedical Research Centre, University of Leicester, Leicester, UK

Background

Hypertension is the most common, yet most treatable stroke risk factor. A transient hypertensive response is present post-acute ischaemic stroke (AIS), and affects approximately 80% of AIS patients. Though the natural history suggests a spontaneous BP decline over the subsequent day's post-stroke, it has recently emerged that increases in the spontaneous erratic fluctuations of blood pressure (BP), termed blood pressure variability (BPV) is associated with increased vascular risk. BPV is the overall variability of BP over a period of time, and increasing BPV following AIS may be of prognostic significance.

Aim: We investigated the effects of increasing BPV, defined from enhanced casual BP readings, on short-term functional outcome.

Method

240 AIS and transient ischaemic attack (TIA) patients from three centres were prospectively studied; enhanced casual BP was measured within 48 hours of symptom onset using OMRON 705-IT (Figure 1). Separated by 10 minute intervals between the two sets of three BP readings, supine BP were recorded in the hemiparetic arm. The OMRON 705-IT provided values for systolic BP (SBP), diastolic BP (DBP), and heart rate (HR); mean arterial pressure (MAP) and pulse pressure (PP) were subsequently derived from the systolic BP and diastolic BP.

BPV was defined as: standard deviation (SD) and coefficient of variation (CoV); functional outcome at one month was assessed as death or disability (modified Rankin scale (mRS) ≥3).

Regression analyses performed used variability indices of SBP, DBP, MAP, PP and HR to predict outcome.

Figure 1
OMRON 705-IT device used to record enhanced casual BP

Results

Median (IQR) age was 70.5 (64-78); 152 (63.33%) participants were male, and 219 (91.25%) were white British. At admission, median (IQR) SBP, DBP and HR were 153mmHg (138-175), 84mmHg (75-98), and 75 bpm (67-85). Predictors of death and disability at 1 month post-AIS were identified as SD of diastolic BP and MAP, and CoV of MAP.

These regression models were adjusted for age, sex and baseline mRS (≥3). Additionally, other BP parameters, including increasing mean diastolic BP and MAP were also predictors of 1 month functional outcome (Table 1).

Predictors of 1 month outcome	Odds Ratio (95% CI), p
SBP (mean)	1.01 (1 - 1.04); 0.168
SBP (SD)	1.02 (0.92-1.13); 0.659
SBP (CoV)	1 (0.86-1.18); 0.966
DBP (mean)	1.05 (1 to 1.09), 0.028*
DBP(SD)	1.23 (1.07 to 1.41), 0.003*
DBP (CoV)	1.02 (0.99-1.05); 0.3
MAP (mean)	1.03 (CI 1 to 1.06), 0.038*
MAP (SD)	1.17 (1.03 to 1.34), 0.018*
MAP (CoV)	1.16 (1 to 1.33), 0.048*
PP (mean)	1 (0.98-1.03); 0.727
PP (SD)	1.08 (0.99-1.18); 0.086
PP (CoV)	1.05 (0.99-1.1); 0.121
HR (mean)	1.02 (0.98-1.05); 0.360
HR (SD)	1.11 (0.92-1.35); 0.273
HR (CoV)	1.09 (0.94-1.26); 0.278

Table 1
Increasing BPV, defined using SD and CoV of DBP and MAP were predictors of functional outcome; death and disability were also predicted by mean DBP and MAP

Conclusions

In this study, we have demonstrated that increasing BPV, particularly in diastolic BP, and MAP, were identified as independent prognostic indicators of the functional outcome at one month post-AIS.

Email
ka306@leicester.ac.uk