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## **Ambulatory blood pressure monitoring in stroke survivors: What do we add to the care of our patients?**

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### **Why is it necessary to know about the circadian blood pressure rhythm in acute stroke patients?**

Hypertension is a major reversible risk factor for stroke in all age groups. The biphasic circadian blood pressure (BP) pattern with physiological nocturnal decrease of 10-15 % in the BP is referred to as "Dipping". This rhythm is lost in chronic hypertension and stroke.

Absence of normal dipping results in a higher 24 hour blood pressure load and may lead to more target organ damage like left ventricular hypertrophy or recurrent stroke. Moreover, sleep systolic and early morning systolic BP (SBP) are more predictive for stroke events than daytime SBP, especially in the elderly.

Conventional BP recordings may therefore be inadequate to delineate these changes in physiology. Ambulatory blood pressure monitoring (ABPM) has been introduced as a reliable method of obtaining an accurate clinical assessment especially in hypertensive stroke patients.

### **What do we know about the circadian rhythm of BP in stroke patients?**

Limited data is available addressing the circadian rhythm in acute stroke patients. Luis et al evaluated the long term changes of BP in Spanish stroke survivors using ABPM and compared them with the conventional clinic measurements. They studied 101 consecutive patients (62 males and 39 females; mean age: 71 years; 88 ischaemic and 13 haemorrhagic strokes) coming to their hospital within 24 hours of acute stroke. The BP was automatically recorded for 24 hours for every 15 minutes during the daytime (7.00 am-11 pm) and every 30 min at night (11 pm to 7 am). Patients were classified according to the percentage fall in mean SBP at night compared to during the day as: dippers (fall 10-20%); extreme dippers (>20%); non-dipper (<10%); and reverse dippers i.e. a rise in mean nocturnal SBP compared to mean daytime SBP. These patients were followed up for the changes in the BP circadian rhythm through outpatient visits with ABPM at 6 and 12 months after discharge. Manual BP was measured

with a standard manual sphygmomanometer at the time that 24-hour ABPM was performed according to the current recommendations. For manual BP, each value was taken as the average of three readings taken 1 minute apart. Interestingly, the percentages of abnormal circadian rhythm of SBP after stroke were similar in both hypertensive and non-hypertensive patients. There were significant differences in the mean systolic and diastolic BP by the conventional sphygmomanometer versus ABPM. The reading was higher for the former. There were more non dipping as well as reverse dipping pattern observed in the stroke survivors.

The West Birmingham Stroke Project also investigated the clinical use of a 24-hour oscillometric ABPM device in patients after acute stroke within 12 hours of onset. A total of 86 patients (48 men; mean age 64 years) with either Transient Ischaemic Attacks (TIA) or stroke were included. BP was measured using both conventional method and by ABPM. The first reading obtained with the ABPM device was compared with simultaneous manual BP measurements. Mean daytime and nighttime pressures were also analysed to determine the frequency of dipping. Higher systolic BP was recorded by ABPM (but not manually) in patients with Intracerebral Haemorrhage (ICH) as compared to cerebral infarcts. A similar trend of higher SBP was seen in blacks. Patients with stroke demonstrated a loss of diurnal BP rhythm. In addition to this, a trend toward reverse dipping was seen in patients with ICH.

### **What is the effect of circadian rhythm on functional outcome in stroke?**

Another group assessed the influence of 24 hour BP levels on functional recovery a week after stroke and the effect of antihypertensive therapy on 24 hour BP levels. Out of 160 stroke admissions, 72 patients admitted to hospital within 24 hours of stroke onset

were investigated.

Casual supine BP was measured in the hemiparetic arm on three occasions with a standard mercury sphygmomanometer to obtain a mean BP reading. A 24 hour BP measurement were performed immediately thereafter using Dyna Pulse 5000 A recorder, programmed to record BP at 30- min intervals during the day (7 am-10pm) and during the night (10 pm -7 am). The mean difference between mean casual and 24 hour ABPM for SBP and Diastolic Blood Pressure (DBP) was 4.7 mmHg and 5 mmHg respectively. Blacks had a higher mean 24 hour, day and night DBP than whites. The mean drop in day-night DBP that is dipping was lower in non-lacunar strokes. For each 10 mmHg difference between day and night time DBP within 24 hour of stroke onset, the odds for complete functional recovery were fourfold. A lack of nocturnal dipping was associated with poor outcome.

### **What are these studies teaching us?**

Survivors of stroke, both hypertensive and non-hypertensive patients, present a chronic disruption of circadian rhythm of BP which can vary with the stroke type. Modest promotion of nocturnal BP dipping and preservation of the physiological circadian pattern of BP may induce a protective effect on cerebral circulation among patients with ischaemic stroke. However, the value of tentative lowering of BP to maintain the physiological dipping phenomena after acute stroke has yet to be addressed in large randomized controlled trials.

### **Suggested Reading**

1. Guerra LC, Moreno MCF, Montoro AE, Chozas JML. Ambulatory blood pressure monitoring in stroke survivors: Do we really control our patients? *Eur J Intern Med* 2009; 20: 760-3.
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