nature publishing group

Detection of Atrial Fibrillation Using a Modified Microlife Blood Pressure Monitor

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BACKGROUND

Hypertension is a major risk factor for the development of atrial fibrillation (AF) and for stroke due to AF. Asymptomatic AF can result in a stroke, in patients with risk factors, if it is not detected and treated appropriately. This study evaluated the sensitivity and specificity of an automatic oscillometric sphygmomanometer designed to detect AF.

METHODS

The sphygmomanometer incorporates an algorithm for detecting AF while reducing false positive readings due to premature beats. A total of 405 unselected outpatients seen in two cardiology offices were evaluated by taking three sequential device readings and one electrocardiogram (EKG) on each patient.

RESULTS

For detecting AF, the sensitivity was 95% and the specificity 86% with a positive predictive value of 68% and a negative predictive value of 98% for single device readings. For the three sequential device readings grouped together, the sensitivity was 97% and the specificity was 89%. The device correctly categorized most of the non-AF, abnormal rhythms. The specificity for those in sinus rhythm was 97%.

CONCLUSIONS

This device is able to detect AF with high sensitivity and specificity. Use of this device by patients who monitor their blood pressure at home may help detect asymptomatic AF and allow for treatment prior to the development of a stroke.

Am J Hypertens 2009; **22**:848-852 © 2009 American Journal of Hypertension, Ltd.

A stroke may be the first manifestation of atrial fibrillation (AF).[1] The percentage of patients who develop a stroke due to AF without a previous diagnosis of AF depends on the method used to screen for it. From the Framingham study, 4% of stroke patients were found to have newly diagnosed AF on hospital admission.[2] A review of published studies evaluating Holter monitoring following a stroke found new AF in 3.8–6.1% of patients. Event loop recorders used for up to a week found AF in 5.7–7.7% of patients.[3] Assuming that 4% of stroke patients were found to have AF on hospital admission as in the Framingham study, then the additional 5.7–7.7% of patients found to have AF in the studies using event loop records makes the total percentage of patients with newly diagnosed AF following a stroke to be 9.7–11.7%. This may still be an underestimation of the total stroke risk due to AF because AF may not recur for over 3 months in some patients with intermittent AF.[4] This suggests that >10% of all strokes are due to asymptomatic AF.

Screening for asymptomatic AF and treating newly diagnosed AF patients with warfarin should help prevent most of these strokes.[5] A recent study suggested that episodes of AF that last less than a few hours do not carry the same risk of stroke as longer episodes.[6] This suggests that intermittent screening for AF may be adequate to identify the patients who are at high risk of developing a stroke due to AF. Home screening for asymptomatic AF by self-assessment of the pulse irregularity has been recommended by the National Stroke Association (http://www.strokeheart.org/CYPA/basics.html). However, application of this approach in the community has shown only limited success, with a sensitivity and specificity of ~70% in the elderly.[7] Another method of screening for AF uses an automatic blood pressure monitor to detect the pulse irregularity.[8] Because hypertension is the most common risk factor associated with AF, using an automatic blood pressure monitor to detect AF would benefit the large number of hypertensive patients who monitor their blood pressure at home,[9] The first blood pressure monitor modified to detect AF was shown to have a very high sensitivity but a relatively lower specificity. The specificity was limited mostly by the effects of premature beats on the pulse irregularity.[8] This device was given to outpatients who had a previous episode of AF to monitor their heart rhythm at home on a daily basis.[10] Out of the 19 subjects in the study, the device detected seven episodes of recurrent AF with three false positive readings. A new algorithm was developed for this device to improve the specificity by reducing the effect of premature beats. This study was a two center trial designed to assess the sensitivity and specificity of an automated oscillometric device using a new AF algorithm. A secondary aim of the study was to evaluate the effect of specific rhythm abnormalities on the specificity for AF.

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Received 25 January 2009; first decision 8 March 2009; accepted 5 May 2009; advance online publication 28 May 2009. doi:10.1038/ajh.2009.98

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