

WatchBP Office ABI explained – Validations

PP.11.04

OSCILLOMETRIC METHOD IDENTIFIES EVEN SUBCLINICAL ATHEROSCLEROSIS WHEN MILD DECREASE OF ANKLE-BRACHIAL INDEX

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brachial index (ABI) ratios (< 0.9) predict higher risk of subjects with an ABI between 0.91 and 1.00 are considered cardiovascular risk and further evaluation is appropriate. To assess the validity of the oscillometric method to scleriosis in those subjects with mild decrease of ABI.

A cross sectional study was conducted among 328 hypertensive (6.6% women). Patients underwent a ultrasound (SonoCalc IMT™) to evaluate carotid intimal-media thickness (IMT) and the first oscillometric method (Microfile Watch BP Office) index (ABI). Subjects were classified according to different groups: low (< 0.9); mid-low (0.9–0.99

detected in 8.5%, mid-low ABI in 30 subject (79.8%) and only 8 were ABI > 1.4 (2.4%) were groups according to waist circumference > 99.5 cms, respectively). There were no differences in weight or BMI. When comparing those mid-low ABI we only found differences on DE pulse pressure (58.68 Vs 65.63 mmHg). R = 0.9 mms (ABI < 0.9); 0.87 mms (ABI 0.9) and 0.73 mms (ABI > 1.4). Distribution (mmHg) were detected in 47% Vs 44% Vs 23%

Accuracy of the Microfile large-extra large-sized cuff (32–62 cm) coupled to an automatic oscillometric device

Serena Masiero, Francesca Saladini, Elisabetta Benetti and Paolo Palatini

To determine the accuracy of the large-extra large-sized cuff (32–62 cm) coupled to an automatic oscillometric device. Similar device-observer differences were observed in patients divided into two subgroups according to whether their arm circumference was above or below the median in the group. These results indicate that the use of the large extra large cuff coupled to the Microfile Office ABI monitor can accurately blood pressure readings in patients with large arms as well as arm circumference. Blood Pressure Med 16:309–310, 2011. Witters Kluwer Health | Lippincott Williams & Wilkins.

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Participants and main measurement: Participants were selected from outpatient clinics and were divided into two groups according to whether their arm circumference was above or below the median. The accuracy of the Microfile Office ABI monitor was evaluated in patients with large arms as well as arm circumference. Blood Pressure Med 16:309–310, 2011. Witters Kluwer Health | Lippincott Williams & Wilkins.

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Devices and technology

Accuracy of Microfile WatchBP Office ABI monitor assessed according to the 2002 European Society of Hypertension protocol and the British Hypertension Society protocol

Francesca Saladini, Elisabetta Benetti, Serena Masiero and Paolo Palatini

Objective: To determine the accuracy of the WatchBP Office ABI monitor for blood pressure measurement developed by the Microfile Company. **Methods:** The device accuracy was tested in 85 subjects with a mean age of 54 ± 19 years. Their systolic and diastolic blood pressure (SBP/DBP) at entry was 141 ± 30/86 ± 19 mmHg, and upper arm circumference was 33.2 ± 1.5 cm.

category (> 160/100 mmHg). Mean blood pressure difference between device and observers in the first 33 subjects was -0.9 ± 5.5 mmHg for SBP and -2.2 ± 4.5 mmHg for DBP and in the 85 participants it was -1.2 ± 6.5 mmHg and -2.3 ± 5.1, respectively. **Conclusion:** These data show that the Microfile WatchBP Office ABI monitor satisfied the recommended ESH/AHA grade of the BHS, the range of BP, Blood Press Monit Witters Kluwer Health | Lippincott

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ORIGINAL ARTICLE

Automated determination of the ankle-brachial index using an oscillometric blood pressure monitor: validation vs. Doppler measurement and cardiovascular risk factor profile

Anastasio Kollias, Apostolos Xilomenos, Athanasios Proterogerou, Evangelos Dimakakos and George S Stergiou

The ankle-brachial index (ABI) is a method used widely for peripheral arterial disease (PAD) diagnosis and cardiovascular risk prediction. This study validated automated ABI measurements taken using an oscillometric blood pressure (BP) monitor allowing simultaneous arm-leg BP measurements. A total of 93 patients (hypertension 83%; dyslipidemia 72%; diabetes 45%; cardiovascular disease 23%; smoking 15%) were submitted to Doppler and automated ABI measurements, performed using a professional oscillometric BP monitor (Microfile WatchBP Office; triplicate simultaneous arm-leg BP measurements), in a randomized order. The mean difference between the Doppler reading (1.08 ± 0.17) and (1) the first oscillometric ABI reading was 0.03 ± 0.11, (2) the average of two oscillometric readings was 0.02 ± 0.10 and (3) the average of three oscillometric readings was 0.02 ± 0.09 ($P < 0.01$ for all). Strong correlations were found between oscillometric and Doppler ABI (r = 0.80, 0.85 and 0.86 for single and average of two and three oscillometric readings, respectively; $P < 0.001$ for all). Agreement between oscillometric and Doppler ABI in diagnosing PAD (Doppler ABI < 0.9) was found in 95% of cases ($n = 0.79$; agreement in diabetics: 94%, $n = 0.79$). A receiver operating characteristic (ROC) curve revealed area under the curve at 0.98, with a 0.97 oscillometric ABI cutoff for optimal sensitivity (92%) and specificity (92%) in diagnosing PAD. Average time for automated ABI measurement was 5.8 vs. 9.3 min for Doppler ($P < 0.001$). Doppler and oscillometric ABI were associated and predicted (multivariate regression analysis) by the same cardiovascular risk factors (pulse pressure, smoking and cardiovascular disease history). Automated ABI measurement using a professional BP monitor allowing simultaneous arm-leg BP measurements appears to be a reliable and faster alternative to Doppler measurement. *Hypertension Research* advance online publication, 19 May 2011; doi:10.1038/hr.2011.53

Keywords: ankle-brachial index; atherosclerosis; blood pressure; oscillometry; peripheral arterial disease

INTRODUCTION

Peripheral arterial disease (PAD) is a frequent manifestation of atherosclerosis, particularly in the elderly, in patients with diabetes and in those with multiple cardiovascular risk factors.^{1,2} Even in its asymptomatic form, the presence of PAD has been shown to be associated with an increased risk for cardiovascular morbidity and mortality.³ The Doppler-measured ankle-brachial index (ABI) is a relatively simple and noninvasive method for the assessment of PAD and the prediction of cardiovascular risk.^{4,6} Current guidelines provided by the European Society of Hypertension-European Society of Cardiology endorse the ABI measurement as a 'recommended' test in hypertensive patients, with values < 0.9 indicating advanced atherosclerosis and increased cardiovascular risk.⁷ However, its clinical application is limited by the reference manual method with Doppler and the time required for measurement, which leads to underdiagnosis of asymptomatic PAD.^{8,9}

Oscillometric determination of blood pressure (BP) has emerged as a simple, accurate and widely available technique for measurement in the doctor's office, at home or with ambulatory monitoring.¹⁰ Recent studies have shown that automated determination of ABI using oscillometric BP monitors appears to be a useful alternative to the conventional manual measurement by Doppler.^{11–14} However, there is evidence that in diabetic patients, who often have undiagnosed PAD, oscillometric ABI does not correlate as closely with Doppler ABI as in non-diabetic.¹² In addition, oscillometric ABI values have not been validated in terms of their clinical relevance.

This study was designed to validate automated ABI measurement using a professional oscillometric BP monitor that allows simultaneous arm-leg BP measurements. We compared these results with those obtained using the reference manual method with Doppler in diabetic and non-diabetic patients. The validation process consisted of two parts: (1) measurement validation, which compared Doppler and

REVIEW

Automated oscillometric determination of the ankle-brachial index: a systematic review and meta-analysis

Willen J Verbeek^{1,2}, Anastasios Kollias³ and George S Stergiou³

Measurement of the ankle-brachial index (ABI) using a Doppler device is widely used to identify subjects with peripheral artery disease (PAD) and to assess cardiovascular risk. This systematic review and meta-analysis of studies assessing the usefulness of automated oscillometric devices for PAD detection compared with the conventional Doppler method. A total of 23 studies including 4186 participants were included in the meta-analysis. A random-effects meta-analysis showed that the average oscillometric ABI was similar to the Doppler ABI (mean difference: -0.020 ± 0.018, $P < 0.3$) but that the absolute differences were significant (0.048 ± 0.009, $P < 0.001$). The average risk ratio for PAD diagnosis was 0.71 ± 0.05. Simultaneous measurements resulted in a smaller difference between the average oscillometric ABI value and the average Doppler ABI value (-0.012 ± 0.022, $P < 0.040$ ± 0.026, respectively, $P < 0.01$). The average risk ratio for PAD diagnosis was 0.69 ± 0.06 and 0.6 ± 0.05, respectively (with 1 taken as the reference). These data suggest that an automated ABI measurement obtained by oscillometric blood pressure monitors is a reliable and practical alternative to the conventional Doppler measurement for the detection of PAD. The sensitivity of the PAD diagnosis based on an oscillometric ABI, a higher threshold of 1.0 might be preferable. *Research advance online publication, 28 June 2012; doi:10.1038/nr2012.83*

ankle-brachial index; blood pressure measurement; Doppler; oscillometric; peripheral arterial disease

CONCLUSION

Peripheral arterial disease (PAD) is a prevalent manifestation of atherosclerosis that can have serious consequences for quality of life.¹ In particular, PAD is a strong independent predictor of cardiovascular morbidity and mortality as a constant coronary artery and cerebrovascular disease.^{2,3} PAD have a threefold higher risk of myocardial infarction and death than those without PAD.⁴ However, the prevalence of PAD is underestimated in many countries. The symptoms of PAD include claudication or rest pain. However, more than 50% of patients are asymptomatic.⁵ Thus, PAD remains largely undiagnosed.^{6,7} PAD is particularly common in patients with hypertension (20%), current smokers (27%) and patients with diabetes (30%).⁸ Diabetes increases the risk of PAD by 2- to 4-fold and is present in 40% of PAD patients.⁹ Based on several epidemiological studies, it is estimated that between 3 and 10% of the general population are affected by PAD.¹⁰

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Received 21 November 2010; revised 7 January 2011; accepted 2 February 2011

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1. Kollias A, Xilomenos A, Proterogerou G, Dimakakos E, Stergiou GS. Automated determination of the ankle-brachial index using an oscillometric blood pressure monitor: validation vs. Doppler measurement and cardiovascular risk factor profile. *Hypertens Res* 2011; **34**(7): 825–830.