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The Discrepancy of ABI and CAVI Values for Arterial Stiffness Evaluation

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Abstract

The current case is a 57-year-old male who had no history of cardiovascular, hypertensive, renal, diabetic, or lipid problems, with a BMI of 24.7 kg/m^2. He underwent pulse wave velocity (PWV) measurement, with results showing a cardio–ankle vascular index (CAVI) of 11.1/10.7 and an ankle–brachial index (ABI) of 0.98/1.31 (right/left), respectively. The inter-limb difference of 0.33 in ABI exceeded the standard threshold for clinically significant asymmetry. The case remained asymptomatic and showed no clinical signs of peripheral arterial disease (PAD). Because of the discrepancy between ABI and CAVI values, further interpretation of the vascular indices was considered necessary to determine their potential clinical significance.

Keywords

Pulse Wave Velocity, Cardio–Ankle Vascular Index, Ankle–Brachial Index, Arterial Stiffness, Peripheral Arterial Disease

Abbreviations

PWV: Pulse Wave Velocity; CAVI: Cardio–Ankle Vascular Index; ABI: Ankle–Brachial Index; AS: Arterial Stiffness; PAD: Peripheral Arterial Disease

Introduction

Cardiovascular disease and/or arteriosclerosis remain the leading causes of morbidity and mortality worldwide, and early identification of subclinical vascular abnormalities is important for preventive medicine [1]. For these indices, the cardio–ankle vascular index (CAVI) and the ankle–brachial index (ABI) are widely recognized as useful tools for evaluating vascular health [2]. In this report, we describe a male who did not have a past medical history or cardiovascular symptoms or signs. He showed elevated CAVI values with minimal inter-limb difference, but marked asymmetry in ABI measurements [3]. The current case highlights the potential clinical implications of discordant CAVI and ABI and underscores the importance of integrated interpretation of these indices.

Case Presentation

The current case was a 57-year-old male who

underwent pulse wave velocity (PWV) as part of a routine health check-up [4]. He did not have any history of cardiovascular disease, hypertension, diabetes, or dyslipidemia. He had no symptoms or signs of peripheral arterial disease (PAD), such as limb pain, intermittent claudication, or exercise intolerance. He had no history of smoking or alcohol consumption. Physical examination was unremarkable for the heart, lungs, abdomen, or neurological system, with a body mass index (BMI) of 24.7 kg/m^2. Routine biochemical markers were within normal ranges.

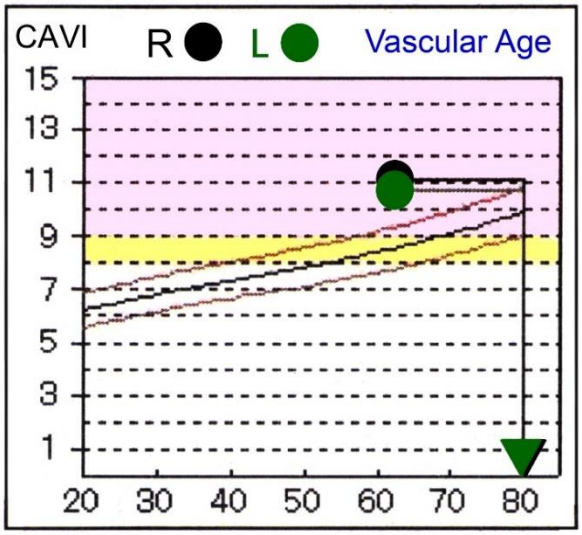

Fig-1: CAVI values indicating arterial stiffness

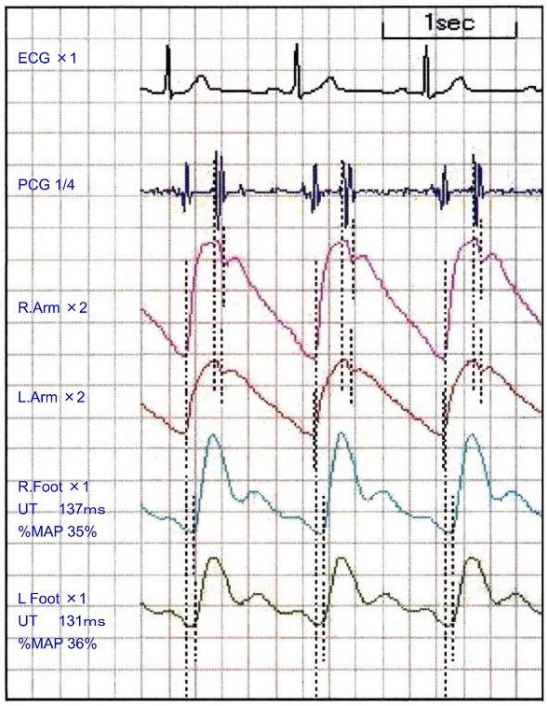

Fig-2: The exam of Pulse Wave Velocity (PWV)

PWV is a non-invasive vascular assessment for measuring CAVI and ABI. CAVI values were 11.1/10.7 (right/left), and both values exceeded the age-adjusted reference value (approximately 8.6 ± 0.8), suggesting increased arterial stiffness (AS) (**Fig-1**). However, the difference between the two values was relatively small (0.4). On the other hand, ABI measurements revealed significant asymmetry in the lower limbs as 0.98/1.31 (right/left). While both values were within the generally accepted reference range, the difference of 0.33 exceeded the commonly reported threshold for clinically significant asymmetry (**Fig-2**).

Despite these findings, the patient remained asymptomatic and demonstrated no clinical signs of PAD. Because of the discrepancy between ABI and CAVI results, further vascular evaluation was considered necessary to determine their potential clinical significance.

Discussion

Clinical assessment of PAD and AS has become increasingly important, and CAVI and ABI have been widely used and are beneficial [5]. ABI primarily reflects the presence of obstructive arterial lesions in the lower extremities. CAVI measures AS from the origin of the aorta to the ankle and is theoretically independent of blood pressure. However, discrepancies between them are occasionally found, and interpretation can be challenging.

This case showed moderate elevation of CAVI values (11.1/10.7), suggesting increased AS compared to the age-adjusted reference (8.6 ± 0.8). In contrast, ABI showed notable asymmetry (0.98/1.31). Although both values are within the standard range (0.90–1.40), inter-limb differences raise important diagnostic considerations [6]. In particular, the left ABI value of 1.31 is near the upper threshold level for non-compressible arteries due to medial arterial calcification. Such arterial incompressibility may be observed in cases of diabetes, chronic kidney disease (CKD), or advanced age.

For ABI interpretation, another crucial issue is the inter-limb difference. Previous studies suggest that an ABI difference >0.15 may indicate asymmetric arterial

disease. In this case, the observed difference was 0.33, which clearly exceeds the threshold. It suggests the possibility of measurement error, unilateral AS, differential vascular calcification, or hemodynamic variation with localized arterial remodeling.

On the other hand, CAVI reflects stiffness from the aortic root to the ankle. Because CAVI uses the stiffness parameter β from PWV and blood pressure, it appears to be less dependent on BP fluctuations than traditional PWV indices [7]. Elevated CAVI values are observed in hypertension, aging, metabolic syndrome, and atherosclerosis, and several studies have demonstrated a relationship between CAVI and future cardiovascular events. The obtained CAVI values in this case indicate elevated AS relative to age-matched reference. However, the right/left difference was relatively small (0.4), suggesting a physiological range. Previous investigations indicate that a CAVI difference >1.0 suggests significant unilateral pathology. Therefore, the asymmetry in this case does not strongly indicate localized obstruction.

An apparent discrepancy was observed between ABI and CAVI values in this case. This may reflect different physiological information represented by these indices. ABI reflects local pressure gradients due to arterial stenosis or vascular incompressibility, whereas CAVI reflects integrated AS over a long arterial segment [8]. Thus, mild or localized vascular changes may affect ABI without significantly influencing CAVI.

Another plausible explanation is mild medial arterial calcification in the left lower extremity, leading to an artificially elevated ABI value. Local medial calcification may increase stiffness locally without significantly altering global arterial stiffness measured by CAVI. Such discordance has been reported, particularly in cases with metabolic disorders or early vascular aging. Although this patient showed no symptoms of PAD, significant ABI asymmetry warrants further evaluation, such as toe–brachial index (TBI), duplex ultrasonography, or exercise ABI testing [9]. These assessments can provide further insight into subclinical pathology.

Non-invasive vascular assessments such as ABI and CAVI provide valuable but distinct information regarding peripheral circulation and systemic AS. Discrepancies between them require careful consideration of physiological and methodological factors, including arterial calcification, localized vascular lesions, and measurement variability [10].

Recently, clinical evaluation of AS and PAD has become essential for cardiovascular risk stratification in middle-aged individuals. Even in asymptomatic cases, elevated AS may indicate early vascular aging and increased long-term cardiovascular risk. Therefore, identifying subtle abnormalities in CAVI or ABI may enable early intervention through lifestyle modification or risk factor management. Furthermore, elevated CAVI has been associated with visceral fat accumulation and cardiovascular risk factors such as insulin resistance, increased oxidative stress, and reduced pre-LPL mass [11].

Conclusion

In conclusion, this case demonstrated discordant vascular findings, with moderate CAVI elevation and minimal inter-limb difference alongside significant ABI asymmetry. While CAVI suggests generalized arterial stiffness and early vascular aging, the ABI pattern suggests unilateral vascular incompressibility or subclinical PAD. Careful interpretation of these findings, along with additional vascular assessments, is essential for accurate evaluation of peripheral circulation and cardiovascular risk in clinical practice.

Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors declare no conflicts of interest.

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