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COMMENT

Can we accurately measure the ankle-brachial index in patients with atrial fibrillation?

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Peripheral artery disease (PAD) is frequent in the elderly [3, 4]. It can be easily detected by measurement of the ankle-brachial index (ABI), which is often proposed as the first-line diagnostic tool to detect this condition [5]. A cut-off of 0.90 is proposed to define PAD when the ABI is under this threshold [6].

Since atrial fibrillation (AF) is also increasingly prevalent with older age [5], the frequent coexistence of both conditions is expected. However, this association seems more than random, and several population studies have demonstrated an increased risk of incident AF, independent of age, in patients who have clinical or subclinical PAD detected by the ABI [6, 7]. In turn, AF is associated with increased risk of incident PAD and its complications [8, 9].

Currently, the thromboembolic risk of AF is most often addressed using the CHADS2VASc score [10], where the presence of PAD contributes one point, increasing the odds for arterial thromboembolic events in patients with AF. Some authors have even proposed to measure the ABI in patients with AF to identify subclinical PAD, detected in 21% of patients hospitalized for AF by a systematic measurement of the ABI [11].

In this context, one important question is the reliability of the ABI measurement during AF, with variable beat-to-beat heart rate and systolic pressure. In 2012, the AHA statements on the measurement, calculation and interpretation of the ABI did not address the issue of arrhythmia and its effect on the ABI results due to the lack of evidence at that moment [4]. The study performed by Dabrowski et al. [12], reported in this issue of the journal, sheds light on and brings an important piece of evidence for the reliability of the ABI measurement during AF.

Indeed, the authors proposed a very elegant approach by comparing the ABI measured during AF and sinus rhythm (SR) on the same patients, taking the opportunity of planned electrical cardioversion to measure ABI before and after this intervention. The authors reported a lower ABI during AF than during SR but considered that the upper 95% confidence interval margins for the median difference (~0.04) were not clinically significant and that the ABI could be considered accurate for the diagnosis of PAD during AF [12].

The prevalence of PAD (ABI < 0.90) was low in this series (0.3%) compared with what is usually reported, but this difference might be related to the relatively young age of these patients (mean age 66 years), which can be explained by the fact that most of these patients had recently had AF and been referred for cardioversion; therefore, older patients with permanent AF were excluded. Indeed, the data suggested more progressed atherosclerosis in patients with persistent/permanent AF [13]. However, it is noteworthy that five other patients had borderline ABI (0.90–0.99) on SR and would plausibly be classified as PAD if the ABI on AF was considered. However, one lesson from this study is that the prevalence of PAD in patients with AF may be overestimated when ABI is measured during AF rhythm, especially for those with an ABI close to the 0.90 threshold. Guidelines [4] suggest other tests when the ABI is borderline, which would not have consequences for the clinical management but is noteworthy in epidemiological/clinical studies where the prevalence of PAD in patients with AF is estimated using the ABI alone.

Upon further analysis, the authors found that heart rate may affect the reliability of the ABI measured during AF [12]. While the difference in ABI measured in SR was trivial in patients with heart rates below 100, the ABI values measured in those with faster heart rates were significantly

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different, reaching an average of more than 0.07 in the right leg. This finding highlights the fact that rather than arrhythmia, heart rate may significantly affect the ABI. Previous studies in SR demonstrated an inverse relationship between the ABI and heart rate in healthy individuals [14, 15]. In a study using cardiac pacing to change the heart rate, the brachial-to-central pressure ratio rose by 0.012 units for every 10 bpm, which can alter the ABI because of the greater distance of the ankles than the arms to the heart [15].

The study reported by Dabrowski et al. [12] in this issue provides important information regarding the measurement of ABI during AF: at an individual level, a normal ABI can accurately rule out PAD in a patient with AF, while in borderline cases, the ABI may overdiagnose PAD, especially when the heart rate is above 100. In this case, and if the patient remains in AF, further diagnostic tests are necessary.

Of note, this study has been performed using the Doppler method, which is the reference method [4]. The conclusions drawn should not be extrapolated for other methods, especially the oscillometric method, which is expanding. Specific studies using the latter are mandated.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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