

Development of a Novel Program to Detect Atrial Fibrillation Using Pulse Wave from Automated Blood Pressure Monitor

Tetsuo Minamino¹⁾, Makoto Ishizawa¹⁾, Kazuhrio Hara²⁾, Hidehito Nagai¹⁾

1) Department of Cardiorenal and Cerebrovascular Medicine, Faculty of Medicine, Kagawa University;

2) Seto Inland Sea Regional Research Center, Kagawa University, Kagawa, Japan.

I. Background

Atrial fibrillation (AF) frequently remains undetected and contributes to an increased risk of stroke, heart failure, dementia, and death¹⁾. The aim of this study is to develop a novel program that can accurately diagnose AF by discriminating it from other arrhythmias using the pressure pulse waveform data outputted from Omron automated BP monitor HEM-907.

II. Methods

BP measurements were performed 3 times each for 303 general cardiac patients using the Omron BP monitor HEM-907 with recording the real-time single lead ECG as the reference. The pressure pulse waveforms recorded in the HEM-907 device during BP measurements were outputted to a computer in real time. A total of 850 pressure pulse waveforms from 280 patients (include 40 AF patients), which were completely saved to a computer, were used for further analysis. We developed a program to analyze and visualize uniquely the characteristics of AF waveform through the autocorrelation-based waveform processing system. All visualized results were judged and classified into AF and other by two individuals blinded to the ECG results. For each patient who obtained 3 results, a two by two contingency table was created; and then sensitivity, specificity, and accuracy for diagnosing AF were calculated.

III. Results

- I. Among 720 waveforms with Sinus or Non-AF arrhythmias, only 21 waveforms (2 Sinus and 19 Non-AF arrhythmias) were misjudged as AF using the novel program. Among 120 waveforms with AF, only 7 waveforms were misjudged as Other.
- II. In analysis for each patient, when two or more AF judgements with the novel program were found in 3 waveforms, the diagnosis of AF had the sensitivity of 100% and the specificity of 97.9%. In this rule, the accuracy of AF reached up to 98.2%, and none of patients with Sinus was misjudged as AF.

IV. Conclusions

The novel program, which applied autocorrelation methods uniquely to analysis of the pressure pulse waveforms recorded by automated BP monitor, showed high sensitivity and specificity for AF diagnosis in general cardiac patients.

V. References

1. Chugh SS, et al. *Circulation* 2014; 129: 837-847.