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2.1 Derivation of Central Aortic Pressure Using the Radial Pulse Waveform Acquired by Millimetre-Wave Radar

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ABSTRACT

A new wearable sensor using millimetre-wave radar and electromagnetic technology provides 64 signals reflected from one radar sinusoidal signal beamed around the radial artery. It is non-invasive, can be non-contact, and is potentially simpler in acquiring the radial pulse then tonometry. This study assesses whether selection of a signal from the radar sensor and processing that signal using the generalized transfer function employed in the Cardiex SphygmoCor device (conventionally used with tonometry) provides a derived central aortic blood pressure equivalent to that using applanation tonometry. 17 subjects (13 male, age 45 + 10/29–68 years, systolic/diastolic pressure 121 + 19/76 + 13 mmHg) had simultaneous 2 minutes recordings of the radar and tonometer sensor during rest and two manoeuvres (hand-grip challenge and mental stress-test) that changed blood pressure, heart rate and pulse morphology. Of the resulting 51 radar signal recordings, 40 provided analysable data based on the SphygmoCor signal quality index. At least one signal (max 18 signals) was/were selected for each recording. Central systolic pressure ($\Delta = -0.6 + 1.1$ mmHg, $r = 0.94$, $p = 0.0015$), augmentation pressure ($\Delta = -0.2 + 0.9$ mmHg, $r = 0.92$, $p = 0.09$) and augmentation index ($\Delta = 0.9 + 2.8$ %, $r = 0.92$, $p = 0.05$) were similar when derived from radial radar or tonometry signal. Results strongly indicate that the wearable millimetre wave radar device can produce a radial signal that is valid for derivation of central aortic blood pressure.

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