Artery Research
Vol. **26**(**S1**); 2020, *p.* S24
DOI: https://doi.org/10.2991/artres.k.201209.018; ISSN 1872-9312; eISSN 1876-4401
https://www.atlantis-press.com/journals/artres

Conference Abstract

P.04 A Transfer-Function-Free Technique for the Non-Invasive Estimation of Central Arterial Pressure

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Keywords
Non-invasive pressure estimation

ABSTRACT

Background: Central aortic pressure (CAP) is important for the determination of the cardiovascular risk. Transfer function (TF)-based techniques allow for estimating CAP non-invasively from pressure waveforms acquired distally in the circulation. However, TF-based CAP might preserve the high frequencies of the distal waveform [1]. Therefore, we propose a new method where CAP is estimated from local direct non-invasive measurements of diameter (D) and blood velocity (U) waveforms.

Methods: Aortic root D and U were measured using an ultrasound scanner (GE, Vivid E95) in 10 healthy volunteers (46 ± 15 years, 5 men), and used to determine local wave speed (PWV) using the lnDU-loop method [2]. Brachial systolic (P_s) and diastolic blood pressure (P_d), as well as central P_s, were also estimated using a sphygmomanometer (Uscom, BPPLUS-R7). CAP was determined as:

, where, and blood density = 1060 kg/m^3.

Results: Mean brachial P_s and P_d were 124.1 ± 9.5 and 77.9 ± 5.4 mmHg, respectively. Mean PWV was 3.07 ± 0.71 m/s, leading to = 1.00 ± 0.46. The average calculated P_s was only –0.4% lower than TF-P_s (116.4 ± 11.2 vs. 116.9 ± 8.9, mmHg). Estimated calculated aortic and measured brachial mean pressure were almost identical with a difference of 0.01% (97.8 ± 6.9 vs. 97.8 ± 6.5, mmHg).

Discussion: This proof-of-concept study shows that the CAP waveform can be estimated non-invasively from measurements of brachial P_d, and aortic D and U obtained using equipment available in almost every cardiovascular clinic. Further studies are warranted to establish the full utility of the new technique.

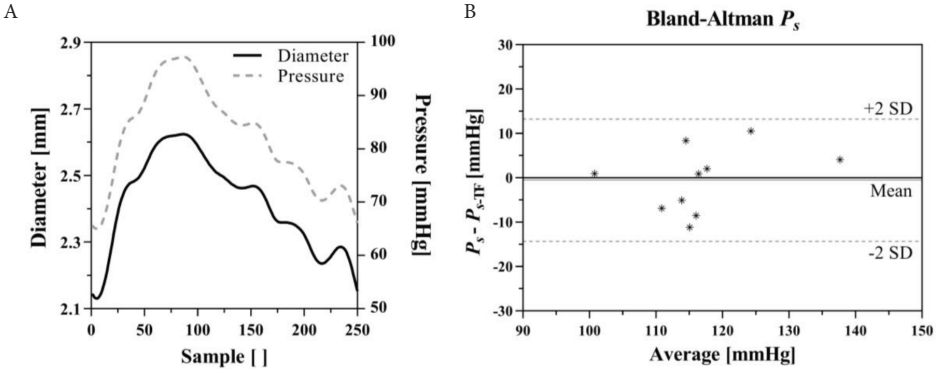

Figure | A: typical example of aortic D converted into CAP. B: Bland-Altman comparison between calculated and TF P_s.

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