Determination of Haemodynamic Parameters: Current Problems and Perspectives

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Abstract (300 word limit)

Haemodynamic parameters are significant markers for many medical fields. They could be used, for example, as markers of tissue perfusion adequacy, as predictive markers of several cardiovascular diseases or as stability markers in intensive care. Although there are many methods for estimating hemodynamic parameters, their correct determination is still a topical issue. Proper determination of haemodynamic parameters and research of new procedures, devices, contexts and interpretations are still needed.

The proposed speech deals with the current problems and perspectives of haemodynamic parameters determination. The basic methods for measuring blood pressure will be briefly introduced, and their problems will be discussed in more detail. For the auscultatory method, the problems of routine blood pressure measurement will be introduced; the effect of the cuff deflation rate and the size of the cuff on the measurement accuracy will be discussed in detail. For the oscillometry method, the problem of artefacts in the oscillometry pulsations signal will be presented.

The difference in mean arterial pressure (MAP) measured by oscillometry during inflation and deflation of the cuff for young and elderly people will be presented in the second part. The potential effect of this difference on the accuracy of blood pressure determination will be discussed in more detail.

Consequently, the current topic of pulse wave velocity (PWV) determination using the occlusion technique will be introduced. And finally, the optical methods for non-invasive blood pressure measurement will be discussed. In both cases, the aim is to find a simple, fast and affordable way to determine selected hemodynamic parameters, either in clinical practice or everyday life. Monitoring selected hemodynamic parameters enables early detection of patients at risk of cardiovascular failure anyway and helps prevent life-threatening situations.

Recent Publications (minimum 5)

1. Fabián, V.; Matera, L.; Bayerová, K.; Havlík, J.; Křemen, V.; Pudil, J.; Šajgalík, P.; Zemánek, D.: Noninvasive Assessment of Aortic Pulse Wave Velocity by the Brachial Occlusion-Cuff Technique: Comparative Study. Sensors. 2019, 19(16), ISSN 1424-8220.
2. Fabián, V. - Havlík, J. - Dvořák, J. - Křemen, V. - Sajgalik, P. - et al.: Differences in mean arterial pressure of young and elderly people measured by oscilometry during inflation and deflation of the arm cuff. Biomedizinische Technik / Biomedical Engineering. 2016, vol. 2016, ISSN 0013-5585.
3. Havlík, J.; Fabián, V.: VERIFICATION OF CLINICAL ACCURACY OF AUTOMATED NON-INVASIVE SPHYGMOMANOMETERS: IS IT APPROPRIATE TO USE BLOOD PRESSURE SIMULATORS? Lékař a technika – Clinician and Technology. 2020, 50(1), 5-11. ISSN 0301-5491.
4. Stergiou GS, Alpert B, Mieke S, Asmar R, Atkins N, Eckert S, et al. A Universal Standard for the Validation of Blood Pressure Measuring Devices: Association for the Advancement of Medi-cal Instrumentation/European Society of Hypertension/Inter-national Organization for Standardization (AAMI/ESH/ISO) Collaboration Statement. Hypertension 2018 Jan 31;71(3):368–74. DOI: 10.1161/HYPERTENSIONAHA.117.10237
5. Lopes A. A., O'Leary, P. W., "Measurement, interpretation and use of hemodynamic parameters," Cardiol. Young, vol. 19, (Supplement S1), pp. 8, 2009. Available: http://dx.doi.org/10.1017/S1047951109003886. DOI: 10.1017/S1047951109003886.
6. Safar, M. E., Henry, O., Meaume, S., "Aortic pulse wave velocity: an independent marker of cardiovascular risk," Am. J. Geriatr. Cardiol., vol. 11, (5), pp. 295-298, 2002.

Photograph



Biography (150 word limit)

Jan Havlík received the M.Sc. degree in electronics and the Ph.D. degree in electrical engineering theory from the Czech Technical University in Prague, in 2001 and 2008, respectively. He is currently an Assistant Professor with the Department of Circuit Theory, Czech Technical University, Prague. His research interests include medical electronics, hardware development for biomedical systems, biomedical signal processing, and telemedicine and telemonitoring.

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Notes/Comments: