Arash Gharehbaghi, Int J Cardiovasc Res 2018, Volume 7
DOI: 10.4172/2324-8602-C1-005

Potentials of the intelligent phonocardiography as an emerging approach in cardiac assessments

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Recent progresses in artificial intelligence made development of efficient decision support systems feasible. Application of such the DSS is rather seen in primary healthcare centers where accuracy of cardiac diagnosis is substantially low because of the complexities of cardiac auscultation. Our longstanding studies on heart sound analysis resulted in the novel methods that can provide sufficient means to extract significant medical information from the sounds to help the physicians in decision making. These methods were incorporated into a stand-alone system composed of an electronic stethoscope in conjunction with a portable computer. The resulted system, which we called the Intelligent Phonocardiography (IPCG), provides an easy-to-use and inexpensive approach for cardiac assessments. Both the accuracy and the sensitivity of the IPCG in screening children with congenital heart disease were estimated to be higher than 87.0%, when a patient population of more than 250 individuals was employed. In a separate study, performance of the IPCG was investigated for assessing severity of valvular aortic stenosis in elderly patients, and the reliability and accuracy of the approach were estimated to be more than 80%. It is worth noting that screening patients with aortic stenosis based on IPCG had already been studied, where an accuracy of higher than 85% was achieved. Potential of the IPCG for pediatric cardiac assessments was rather studied in disease identification and also in discrimination between different cardiac defects with the systolic murmurs. Screening of the children with isolated bicuspid aortic valve, ventricular septal defect, and discrimination between valvular aortic and pulmonic stenosis are considered as the examples of such studies. Results show that the IPCG has a high potential to be used in primary healthcare centers as an efficient decision support system. This can drastically reduce unnecessary echocardiography which is by far a more expensive approach.

Recent Publications

1. Gharehbaghi A, et al (2015) Assessment of aortic valve stenosis severity using intelligent phonocardiography. International Journal of Cardiology 198:58-60.
2. Sepehri A, et al (2016) An intelligent phonocardiography for automated screening of pediatric heart diseases. Journal of Medical Systems 40(1).
3. Gharehbaghi A, et al (2017) Intelligent phonocardiography for screening ventricular septal defect using time growing neural network. Informatics Empowers Healthcare Transformation 238:108.
4. Gharehbaghi A, et al (2015) A novel method for screening children with isolated bicuspid aortic valve. Cardiovascular Engineering and Technology 6(4):546-556.

Biography

Arash Gharehbaghi completed his MS in Biomedical Engineering, on screening valvular and septal defects using heart sound signal analysis from Amir Kabir University, Tehran, Iran, in 2000. He has been the Head of two research projects on cardiac signal analysis from 2004 to 2008 that led to the international and domestic patents. He completed his second MS on detecting ejection click from heart sound signal, from the Mon University, Belgium, in 2010 and; PhD degree from Linköping University, Sweden, on severity assessment of valvular aortic stenosis using phonocardiography, in 2014. He is currently a research leader at Mälardalen University with the rise of coronary artery detection using intelligent phonocardiography.

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