Non-invasive assessment of severe ischemic heart disease in an emerging country through mathematical analysis of spectral ECG comparing to coronary angiography

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Background

In the emerging countries (South East Asia including Myanmar), the death rate by communicable diseases is still higher compared to the developed countries; however, the ratio of death caused by lifestyle diseases is gradually increasing in these countries. Among lifestyle diseases, coronary artery disease (CAD) is one of the highest causes of death and its prevalence is growing faster. On the other side, the number of Cath Lab and doctors with skills are limited in such countries especially in Myanmar. The prompt diagnosis of severe CAD patient is important in order to start appropriate (PCI/Optimal Medical Therapy) treatments.

Purpose

The Mathematical Analysis of Spectral ECG (MCG) is to extract spectral information which is not visible on standard ECG and analyze it by matching to the database with more than 40,000 patients' spectral data. This study is to evaluate the feasibility of MCG for the assessment of severe CAD in patients by comparing MCG with coronary angiography (CAG).

Methods

Total 28 patients (Average age 59 ±8.9 , Male: 19, Female: 9) with MCG (≥ 4 score) scheduled to do CAG were selected in Myanmar. Coronary Stenosis by CAG of ≥75% (75%-100% of stenosis) in a single or multiple vessels is defined as severe CAD necessary to start an appropriate treatment.

MCG score ≥ 6, 5, 4 were used as cut-off respectively to indicate presence of coronary stenosis by CAG (≥ 75%).

Result

MCG scores in patients with or without severe CAD are significantly different. (with CAD: 7.1, without CAD:5.4, p<0.001) (Figure 1). Best cut off value is MCG score ≥ 6, and is identified sensitivity 80.0% and specificity 69.2%, PPV 75.0%, NPV75.0%, and accuracy 75.0% (p<0.01)(Table 1).

Conclusion

MCG showed high sensitivity and specificity, and high score of MCG ≥ 6 likely indicates the presence of severe CAD by CAG (≥ 75%). It suggests that MCG could be used for prompt detection of severe CAD in order to start appropriate (PCI/ Optimal Medical Therapy) treatments in the emerging country such as Myanmar where less medical facilities and skills are available.

Reference

2. John E. Strobeck, Joseph T. Shen, Binoy Singh, Kotaro Obunai, Charles Miceli, Howard Sacher, Franz Ritucci, and Michael Imhoff, Comparison of a Two-Lead, Computerized, Resting ECG Signal Analysis Device, the MultiFunction-CardioGramsm or MCG (a.k.a. 3DMP), to Quantitative Coronary Angiography for the Detection of Relevant Coronary Artery Stenosis (>70%) - A Meta-Analysis of all Published Trials Performed and Analyzed in the US, International Journal of Medical Science 2009; 6(4):143-155