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Improving MCG Interpretation

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Letter to the Editor

Dear Editor:

We are offering comments on the study entitled, “Non-invasive assessment of functionally significant coronary stenosis through mathematical analysis of spectral ECG components”, by Amano et al, published in this journal [1]. The study, comparing multifunctional electrocardiogram (MCG) data with fractional flow reserve (FFR) and coronary angiographic (CAG) data highlights the emergence of an important addition to the armamentarium in the noninvasive evaluation of coronary artery disease. However the sensitivity and specificity of the MCG studies can be improved by categorizing the severity scores using empirical session analysis principles developed by the manufacturer, Premier Heart,and by considering the significance of the secondary pathological and pathophysiological diagnoses reported at each MCG session.

It is critical that MCG assessment is viewed as physiologic and not anatomic data. There is always the possibility of inevitable physiologic and anatomic discordance. Gould et al, in an elegant review of positron emission tomography (PET) modality, published in JACC, discussed the anatomic versus physiologic discordance in the assessment of ischemia correlated with angiographic findings [2]. PET was used as the measure of ischemia. Discordance of FFR, coronary flow reserve (CFR) and ischemia measured by PET on the one hand, may occur when correlated with anatomic CAG findings on the other. This discordance may be seen in the presence of microvascular coronary disease, developed collateral circulation and diffuse disease. The resultant measured ischemia that does not match CAG findings should not be viewed as false negative/positive, but as reflecting physiologic principles.

Premier Heart, the developer of MCG has looked at this problem and has conducted extensive statistical session analyses of MCG data in an attempt to provide a framework to mitigate the influence of this physiologic-anatomic discordance. The methodology used by Premier Heart in these statistical analyses is not yet published, but it has created a new algorithm in the interpretation of an MCG study. The findings of an MCG report can be categorized as falling into one of 7 levels.

- Level 7. Extremely High. Minimum MCG severity score=15 with presence of local/global ischemia
- Level 6. Very High. Minimum severity score=7.5 with presence of local/global ischemia
- Level 5. High. Minimum severity score equal or greater than 3.5 with the presence of local/ global ischemia
- Level 4. Intermediate. All Severity scores fluctuating above and below 3.5 and myocardial ischemia patterns fluctuate between local/global/absent ischemia
- Level 3. Collateral Circulation Group. Any severity score < 2.0 with significant Pathological and Pathophysiological conditions related to long-term exposure to myocardial ischemia such as myocardial remodeling, asynchronization, decreased myocardial compliance as noted in the secondary MCG findings.
- Level 2. Low. Maximum Severity Score <3.5 but equal to or greater than 2.0. Fluctuating myocardial ischemia showing local/global/absent ischemia
- Level 1. Normal. Any severity score <2.0 without local or global ischemia and minimal secondary Pathological and Pathophysiological findings.

The entire MCG community would be grateful if Dr. Amano were to re-analyze his data by considering these cut points. Even if this request is not practical, we think this study has demonstrated the availability of another clinical tool to enhance our decision-making prior to invasive intervention.

Thank you.

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References:

1. Amano T, Shinoda N, Kunimura A, Harada K, Uetani T, Takashima H, et al. Non-invasive assessment of functionally significant coronary stenoses through mathematical analysis of spectral ECG components. Open Heart. 2014;1(1):e000144.
2. Gould KL, Johnson NP, Bateman TM, Beanlands RS, Bengel FM, Bober R, et al. Anatomic versus physiologic assessment of coronary artery disease. Role of coronary flow reserve, fractional flow reserve, and positron emission tomography imaging in revascularization decision-making. J Am Coll Cardiol. 2013;62(18):1639-53.