Author's response to reviews

Title: Non-uniform Recovery of Left Ventricular Transmural Mechanics in ST-segment Elevation Myocardial Infarction

Authors:

Giuseppe Caracciolo (caracciolo.giuseppe@mayo.edu)
Mackram Eleid (eleid.mackram@mayo.edu)
Haruhiko Abe (abe.haruhiko@mayo.edu)
Nisha Bhatia (bhatia.nisha@mayo.edu)
F. David Fortuin (fortuin.david@mayo.edu)
Susan Wilansky (wilansky.susan@mayo.edu)
Scipione Carerj (carerj.scipione@mayo.edu)
Partho Sengupta (sengupta.partho@mayo.edu)

Version: 2 Date: 19 July 2010

Author's response to reviews: see over
Dear Cardiovascular Ultrasound Editorial Team,

We thank the Editorial Team and the Reviewers for the constructive and insightful comments provided to us regarding our manuscript, “Non-uniform Recovery of Left Ventricular Transmural Mechanics in ST-segment Elevation Myocardial Infarction.”

We have addressed all of the Reviewer comments and believe that the implemented changes have strengthened our manuscript. Specifically, we have performed a re-analysis of the clinical record to include additional data including more detailed post-PCI flow data and follow-up medications in all patients.

Please find below detailed responses to each of the comments. We hope that you find this revised version of the manuscript acceptable for publication in your journal.

Sincerely,

Partho P. Sengupta, MD, DM and colleagues
Division of Cardiovascular Diseases
Mayo Clinic Arizona
13400 East Shea Blvd
Scottsdale, AZ 85259
Reviewer #1:
The present manuscript shows that the recovery of LV subendocardial shortening strain seen in the longitudinal direction underlies the improvement in LV global function despite persistent abnormalities in radial and wall motion score index- The study hypothesis is pathophysiologically sound and methodology appropriate. However, there are a few issue that authors should address:

We thank the Reviewer for their helpful comments.

1. Please detail the patient population characteristics
Additional study patient population characteristics are now fully detailed in Tables 1, 2 and 3.

2. Authors refer to a control group that is never described in detail. To have a normal echo is not synonymous of absence of disease.
Control group cardiovascular risk factors have now been included in the methods section (page 4, line 15).

3. It is not clear why authors need a control group since they are evaluating the changes before and after revascularization.
We understand the Reviewer’s point. We included a control group specifically to provide a nomogram for the extent of reduction and recovery in specific layer based mechanics which have not been previously described. The endocardial and epicardial strain values serve as a comparison for understanding the burden of abnormalities in left ventricular mechanics with the STEMI population and the extent of recovery seen on follow up.

4. There is no description of how successful were the revascularization procedures. Even though the outcome analysis is based on EF recovery, the success rate of the invasive procedure should be weighed in the analysis.
We have now added TIMI flow information pre and post PCI and compared this in the groups with and without recovery of global LV function.

5. In line with previous comment, authors state that WMSI is a worse parameter than longitudinal strain because it is the expression of only radial LV mechanics. However, WMSI is a subjective marker whereas strain is a more objective one and this should be considered in the analysis (how experienced were the sonographers). Authors report the intra and inter-observer variability of strain but not for WMSI.
We thank the Reviewer for this important comment and have accordingly added data regarding kappa coefficient agreement of both strain and WMSI (page 8, line 8).

6. Wall motion abnormalities are the expression of deep subendocardial
underperfusion. Ischemia induces abnormalities only when more than 30% of the wall is altered. The possibility to analyse subepicardium performance would be highly informative. Please address.
We agree with the Reviewer’s comment and believe it would be informative to analyze transmural mechanics at varying depths. Data regarding epicardial mechanics has been presented, however, strains at multiple transmural locations could not be analysed because the software only provides 2 layer mechanics in the current version.

7. Strain is able to recognize myocardial viability. Please discuss similar studies.
A discussion of strain reflecting myocardial viability has now been added to the discussion section under “LV Mechanical Function in Myocardial Infarction” (page 10, line 19).

8. The clinical implications of the study are not clear. WMSI is a dirty marker of regional dysfunction but highly feasible and informative in the clinical arena.
We agree with reviewer’s comments and have revised the discussion (page 10, line 13). Our study provides new insight into the pathophysiology underlying global LV function recovery in the STEMI population treated with PCI. Additionally, recent studies have shown the ability of strain to predict clinical outcomes such as heart failure and death in the acute MI population.

Reviewer #2:
The aim of the study ” Non-uniform Recovery of Left Ventricular Transmural Mechanics in ST-segment Elevation Myocardial Infarction” was to explore left ventricular (LV) transmural mechanics in patients with ST-segment elevation myocardial infarction (STEMI) and who underwent to primary percutaneous coronary intervention (PCI). Moreover, the authors’ purposes were to understand the mechanism underlying recovery of global LV function after primary PCI and detect new echocardiographic markers which could predict this improvement.
In the clinical practice the echocardiographic evaluation has a key role in the management of the patients who experienced STEMI, in the acute phase and during the follow-up.
The reviewer’s opinion is that it could be very useful to predict LV global function recovery, in order to optimize the clinical and therapeutic management, especially in the population with worse prognosis. Therefore, this reviewer believes that the study offers an interesting approach in this field of research and could be of potential interest for the scientific community. The study is led elegantly, the methods are appropriate and well described and both discussion and conclusions are well balanced and
adequately supported by data. Hence, only a minor essential revision and few discretionary revisions would be useful before the paper could be considered for publication in Cardiovascular Ultrasound.

We thank the Reviewer for their helpful comments.

- Minor Essential Revisions:
  1. The reviewer believes that the Authors should implement their results showing the compliance to the therapy during the follow-up in the unrolled population, because of its potential role in preventing heart remodelling and improving global LV function. In fact, the reviewer’s opinion is that an eventual difference among the two groups could influence the results.

We agree and have now added additional follow-up data on medication dosage changes in both groups and no significant difference was seen. Patients were believed to be compliant with their medical therapy during the follow-up period but compliance was not definitively measured.

- Discretionary Revisions
  1. The reviewer’s opinion is that it could be useful to integrate the results with the data of PCI and indicate also any difference in term of successful revascularization among the two groups.
  We agree and have added this data as mentioned above in comment #4 addressed to Reviewer #1.

  2. The Authors properly showed in table 1 the percentage and the statistically significant differences among the two groups in term of diabetes, hypertension and diastolic blood pressure; the reviewer believes that these data should be reported extensively in the manuscript.
  The trends in the differences in prevalence of hypertension, hyperlipidemia and diabetes have been discussed in the manuscript (page 9, line 14).