Author's response to reviews

Title: The Impact of Preload on 3-Dimensional Deformation Parameters: Principal Strain, Twist and Torsion

Authors:

Hyo-Suk Ahn (alaco0502@gmail.com)
Yong-Kyun Kim (drkimyk@catholic.ac.kr)
Ho Chul Song (drsong@catholic.ac.kr)
Euy Jin Choi (euyjin@catholic.ac.kr)
Gee-Hee Kim (anthleemd@naver.com)
Jung Sun Cho (tworugi@gmail.com)
Sang-Hyun Ihm (hearthimsh@yahoo.co.kr)
Hee-Yeol Kim (cumckhy@catholic.ac.kr)
Chan Seok Park (chanseok@catholic.ac.kr)
Ho-Joong Youn (younhj@catholic.ac.kr)

Version: 1 Date: 21 Aug 2017

Author’s response to reviews:

Reviewer reports:

Reviewer #1: The Impact of Preload on 3-Dimensional Deformation Parameters: Principal Strain, Twist and Torsion

Rather well-presented paper: intro and discussion are OK. The choices made in the method are necessarily the ones that are the most valuable for the readers (explained just below).

It would be nice to highlight more the principal strain and the area strain

: The process of measuring principal strain was further emphasized. Area and principal strains are completely different parameters. Area strain represents fractional changes of the area and principal strain represents deformation along the principal direction. And we also added the data about the correlation of area and principal strain. Two parameters showed correlation only in post-hemodialysis group.
It would be nice to compare the GE software (rawdata) and the Tomtec one (DiCom) considering only the 3D.

: 2D strain analysis were performed on only Tomtec (2 dimensional CPA and 4D LV analysis), and correlations between 3D global PS and 2D global LS were also investigated. So, inevitably the content of 2D was included in the method.

We also added the parameters analyzed using EchoPAC (version 12.0) of 3-dimensional echocardiographic images to compare the differences of vendor-dependent (EchoPAC, version 12.0) and vendor-independent software (4D LV analysis, version 3.1). Vendor-independent software provides principal strain, twist and torsion as well as longitudinal, circumferential and radial strain values. Vendor dependent software only can give the values of area, longitudinal, circumferential and radial strain values. Therefore, the direct comparison between the software is limited and it showed significant differences and weak correlations (Table 6). We added table comparing the values acquired from different software. We also added the plot demonstrating the correlation between the unique parameters only available from 3-dimensional image, area strain and principal strain (Figure 4). But the correlation between the two parameters were not strong. Previous study performed by Yuda et al. (Ref. 29; Echocardiography 2014;31:597-604) compared the various strain values acquired by 3D echocardiographic images also showed the significant differences according to the analyzing software. Our result is coincidental to the previous study performed by Yuda et al.

The 2D and 3D strains correlation is somehow useless.

: Previous study (Reference 13, Eur J Echocardiogr 2010, 11(3):283-289) showed that 2D speckle-tracking echocardiography (STE) was affected by acute preload changes and our study is first about load dependency of 3D STE. We believe that the correlation between 2D STE and 3D STE reinforced the evidence for load dependency.

The quality of the figures could be improved.

: We improved the quality of the figure 2 vividly and deeply. The descriptions of subdivision in figure 2 were added. We used larger characters for figure 3 and 5 (previously 4).

Reviewer #2: Well-designed study and very well written manuscript. However, the results of the study are predictable. The dependence of myocardial strain on pre-load has clear pathophysiological explanation. Therefore, there is no reason to suspect that the change in the method of strain measurement (3D instead of 2D) can change this relationship, which has been observed and confirmed in previous 2D studies. Nevertheless, such study might be of interest to those with closely related research interests.

: Thank you very much.

Author:
For additional statistical analysis, newer version of R package was used. Therefore, the version of R package was updated. Several packages of R for statistical analysis were used and they were added to the manuscript as well as references. We erased short title due to the similarities between the main and short titles.