Journal of Cardiovascular Magnetic Resonance

Oral presentation

Ultrafast in-line computation of ejection fraction from cardiac cine steady-state free precession (SSFP) images

Amol Pednekar*[1], Raja Muthupillai[2], Claudio Arena[2], Janie Swaab[2] and Benjamin Cheong[2]

Address: [1]Philips healthcare, Houston, TX, USA and [2]St. Luke's Episcopal Hospital, Houston, TX, USA
* Corresponding author

from 13th Annual SCMR Scientific Sessions
Phoenix, AZ, USA. 21-24 January 2010

Published: 21 January 2010

Journal of Cardiovascular Magnetic Resonance 2010, **12**(Suppl 1):O47 doi:10.1186/1532-429X-12-S1-O47

This abstract is available from: http://jcmr-online.com/content/12/S1/O47

Introduction

In clinical practice estimation of global LV function from cine-SSFP images involves at least two workstations, i.e., one to acquire (scanner), and another to process. These workstations are often present at distant locations, and therefore the physicians and technologists at the scanner console often do not get a real-time, quantitative feedback regarding patients LV function. A fast automated in-line processing tool can eliminate this gap, and integrate the process of data acquisition and post-processing on one console.

Purpose

The purpose of this abstract is to describe our computationally inexpensive, in-line post-processing algorithm that can calculate EF on the scanner console immediately upon the completion of data acquisition and to investigate its clinical feasibility.

Methods

The EF computation program automatically runs in the background as a part of the acquisition protocol on the console of a 1.5 T Philips Achieva clinical scanner (Intel Xeon, 3.20 GHz, 6 GB RAM). The program seamlessly retrieves, processs, and saves resultant contoured LV images back into the patient database.

LV Segmentation

The algorithm steps: 1) automatically recognize LV; 2) classify partial volumed pixels as blood or muscle using periodic intensity variation intrinsic to the cardiac cine-MR; and 3) incorporate smoothness of the LV shape through convex, closed, and piecewise parametric curve to delineate endocardial boundary (details in [2]).

Study Population

12 (11 m/1 f, age 52 ± 17 yrs) clinical patients participated in this study. A stack of contiguous short-axis cine SSFP slices were acquired.

Results

total of 221 slices were analyzed using our algorithm (A) and manually by a clinical expert (R). The only user input to the processing algorithm was to specify the basal and apical slice number. The processing time was 80-120 ms/slice. The manual contours for slice with LV outflow tract were used for accurate volumetric and LVEF measurement. Some representative images describing the segmentation process and BA comparisons of EDV, ESV, and EF are shown in Fig. 1.

The mean bias computed using Bland-Altman (BA) analysis between expert manual contours and automated contours for EF (-6%), EDV (-15 ml, -8%), and ESV (5 ml, 5%) were comparable to that of the typical inter- and intra-observer variability (<5% EDV, <8% ESV, <5% EF) [1].

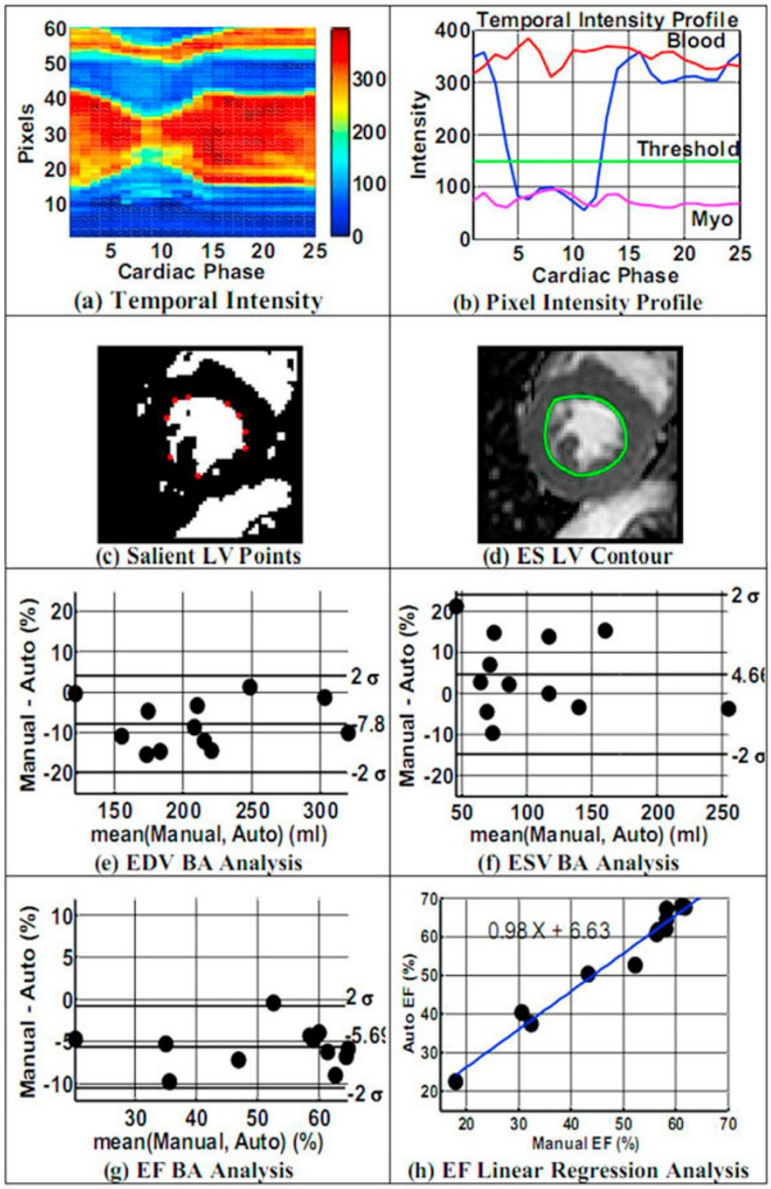

Figure 1

Conclusion

It is feasible to integrate the computation of global LV functional indices such as EDV, ESV, and EF as a part of acquisition in real-time on the scanner console.

References

1. *J Magn Reson Imaging* 2008, **28:**39-50.
2. *ISMRM* **09:**3749.