Multi-view Three-Dimensional Echocardiography Fusion System in Patients with Cardiac Resynchronization Therapy Devices

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BACKGROUND

Comprehensive visual and quantitative evaluation of heart function is essential in heart failure patients with Cardiac Resynchronization Therapy (CRT) devices. According to the American Society of Echocardiography, the Three-Dimensional Echocardiography (3DE) is the method of choice for quantification of left ventricular systolic function, however its use is limited due to signal dropouts and narrow Volume Of View (VOV).

To overcome those limitations, a Multi-view Three-Dimensional Fusion Echocardiography (M3DFE) prototype has been developed. We hypothesize that M3DFE prototype can be applied successfully in a clinical echo lab setting in addition to the standard echo protocol.

METHODS

In a prospective, single center pilot study the M3DFE protocol has been applied in CRT patients after their standard Two-dimensional Contrast Echocardiography (2DCE) visit.

Siemens SC2000 echocardiography system was used for single 3D ultrasound datasets acquisition from different transducer positions on the chest. The position of the transducer, corresponding sound field and patients' movements were tracked by a customized optical tracking system.

Single 3DE and Optical tracking datasets were pre-aligned by a customized fusion software. Pre-aligned output was uploaded into a modified 3D Slicer software for registration and wavelet transformation-based processing.

The M3DFE end product will be presented.

METHODS (Cont'd)

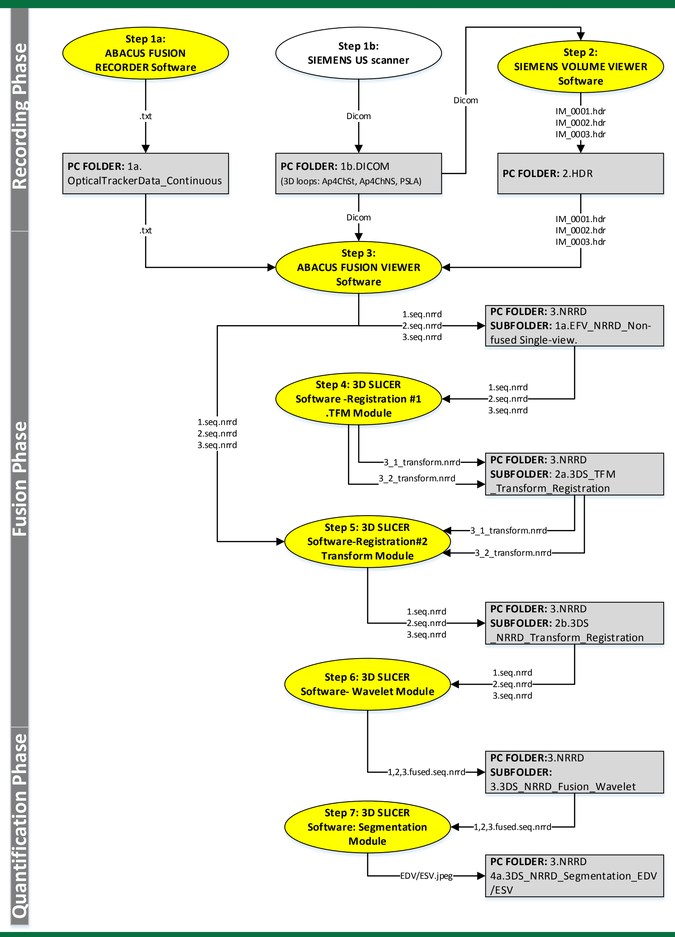

Figure 1: M3DFE intervention design per patient

PRELIMINARY RESULTS

Eleven participants are enrolled since January 2019. Four more patients are expected to be enrolled before end of June 2019. In 10 out of 11 participants the M3DFE recording could be processed with the prototype software. One subject had arrhythmia during the M3DFE recording, therefore the pre-alignment with the ABACUS fusion viewer software couldn't be performed.

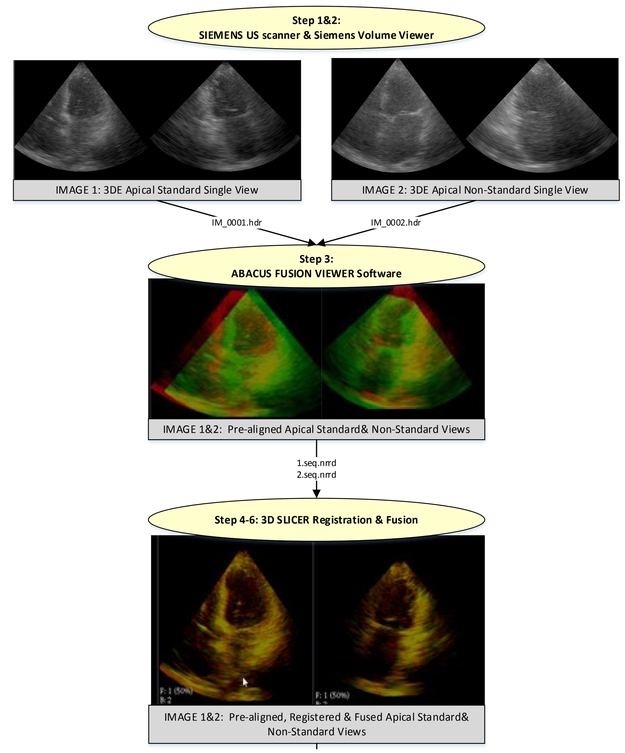

Figure 2: Example case showing the application of M3DFE- protocol in a CRT patient

DISCUSSIONS

This pilot project is in the enrollment phase, therefore the final results are not available at this stage. Once the M3DFE protocol is applied in all enrolled participants, the image quality and volumetric analysis of M3DFE end-product will be measured and compared with single view datasets.

This project is expected to be completed before the end of 2019.

CONCLUSIONS

This is the first application of M3DFE in patients. Further analysis will be performed to assess the accuracy of this method.

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