A NOVEL ARTIFICIAL INTELLIGENCE-BASED SYSTEM PROVIDES GLOBAL LONGITUDINAL STRAIN AUTOMATICALLY BEHIND THE SCENES

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BACKGROUND

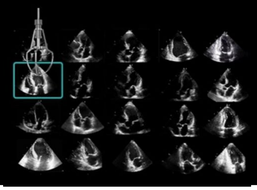
- Global longitudinal strain (GLS) evaluation is an essential part of echocardiography studies and is indicated in many clinical situations. It is most frequently undertaken using software available on an ultrasound (US) device or on a dedicated workstation. Evaluating GLS is time-consuming because it requires selection of 3 apical views with sufficient image quality. In addition, the software for strain evaluation varies between vendors and may provide different results.
- **LVivo Seamless (DiA Imaging Analysis)** is a novel artificial intelligence (AI) based vendor neutral solution that performs automated evaluation of US exams in DICOM format on the server without user involvement. The system selects the optimal views, performs the evaluation, and sends the results to the PACS, providing a novel workflow (Fig. 1).
- **Purpose:** To evaluate the ability of LVivo Seamless to automatically identify 4 chamber (4CH), 2 chamber (2CH) and 3 chamber (3CH) views and to compare the automated GLS results based on these 3 views, to GLS results calculated by the routinely used method

METHODS

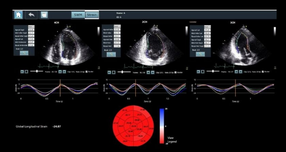
- 100 full echo examinations for which GLS was previously calculated by Automated Functional Imaging (AFI, GE Healthcare) were retrospectively collected from Soroka University Medical Center and processed by LVivo Seamless. The optimal 4CH, 2CH and 3CH views were automatically recognized by the system, selected according to quality and depth criteria.
- A GLS result was only possible if all three views were selected by the system. The automatically calculated GLS values were compared to those reported by AFI.

Fig. 1- LVivo Seamless Workflow - Example

Echo study transferred to hospital server → **LVivo Seamless**
Auto selection of optimal 3 apical views
+ auto strain analysis behind the scenes → **Selected views and Strain results presented on PACS viewer**



Strain Results



RESULTS

- LV function was impaired in 48% (21% severe, 14% moderate, 13% mild). Moderate or severe valvular heart disease was found in 17%. 13% of the studies included patients receiving chemotherapy. 28% of the patients had normal GLS (GLS<-18%). LVivo Seamless successfully identified the 3 apical views in 95% of the studies. In 2 cases the identified views did not pass the system's criteria. GLS calculation was possible in 87 out of 93 cases available for analysis, fully automated.
- Excellent correlation was found between GLS by AFI and GLS by LVivo Seamless with r=0.88 [95% CI: 0.82-0.91]. The average difference and limits of agreements were -1.4 ± 3.9%. The specificity and sensitivity using a normal/abnormal threshold of -18% were 0.9 and 0.83 respectively (Fig.2+3).

Figure 2: GLS Correlation

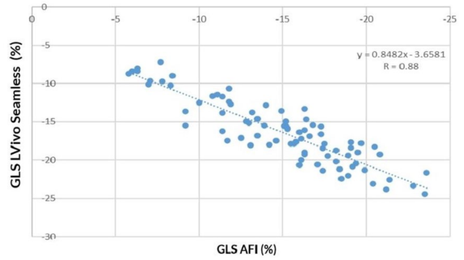
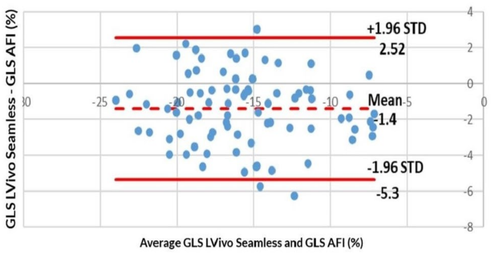


Figure 3: GLS Bland Altman



CONCLUSIONS

- The AI based results by LVivo Seamless showed excellent capability to automatically identify 4CH, 2CH and 3CH views, along with excellent GLS results compared to AFI.
- LVivo Seamless has the potential to improve echocardiography workflow by making the results available to the cardiologist when starting the study review and in the future may become the standard method for strain evaluation.