A NOVEL AI BASED SYSTEM CAN ASSIST WORKFLOW AUTOMATION BY SEAMLESS INTERPRETATION OF ECHOCARDIOGRAPHIC EXAMINATIONS

Noah Liel-Cohen[1], Sergio L. Kobal[1, 2], Adi Butnaru[3], Liat Alper-Suissa[3], Steve Feinstein[4]
1 Ben-Gurion University of the Negev, Beer Sheva, Israel   2 Soroka University Medical Center, Beer Sheva, Israel
3 Shaare Zedek Medical Center, Jerusalem, Israel   4 Rush University Medical Center, Chicago, USA

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BACKGROUND

- Echocardiographic examination interpretation is time consuming, depends on the user's expertise and may vary when performed by different methods. The workload on the cardiologist in the echo lab is enormous and the urgency of interpretation is not always known.

- The **LVivo Seamless (DiA Imaging Analysis)** is a novel AI based solution that performs automated evaluation of ultrasound exams on the server, without user's involvement, by using automated view recognition. The system selects the optimal views, performs the evaluation, and sends the results to the PACS.

- In this study we evaluated the use of **LVivo Seamless** combined with the **LVivo EF** module for automated biplane ejection fraction (EF) evaluation and assessed its ability to automatically identify 4 chamber (4ch) and 2 chamber (2ch) views, and to accurately provide EF, End Diastolic Volume (EDV), End Systolic Volume (ESV) and Global Longitudinal Strain (GLS).

METHODS

- 100 full echo examinations with adequate images were processed by the **LVivo Seamless**. 4ch and 2ch views were automatically recognized by the machine learning trained system and the optimal views for evaluation were selected according to quality and depth criteria.

- Manual tracing was performed on the selected clips by two expert sonographers blinded to the **LVivo EF**. The Biplane results by **LVivo EF** were compared to the results by manual Biplane (MBP).

FINDINGS

- Echo exams of 100 patients were included, mean age 62.8 [18-100], 29% had coronary artery disease, LV function was impaired in 62% (29% severe, 20% moderate, 13% mild).

- The **LVivo Seamless** successfully identified both 4ch and 2ch views in 97% of cases, 7 cases did not pass system's criteria. Automated EF was possible in 87 cases (96%).

- Excellent correlation was found between the sonographer's MBP and the **LVivo EF** with r=0.87 [95% CI 0.8-0.91]. The average difference and limits of agreements were -5.79 ± 14.98%. Excellent correlations were also found for the EDV and ESV with r=0.90 [95% CI 0.85-0.93] and r=0.91 [95% CI 0.860-0.94] respectively.

- Biplane GLS was compared to MBP EF using Normal/Abnormal threshold of -18% with very good specificity and sensitivity of 0.8 and 0.79 respectively.
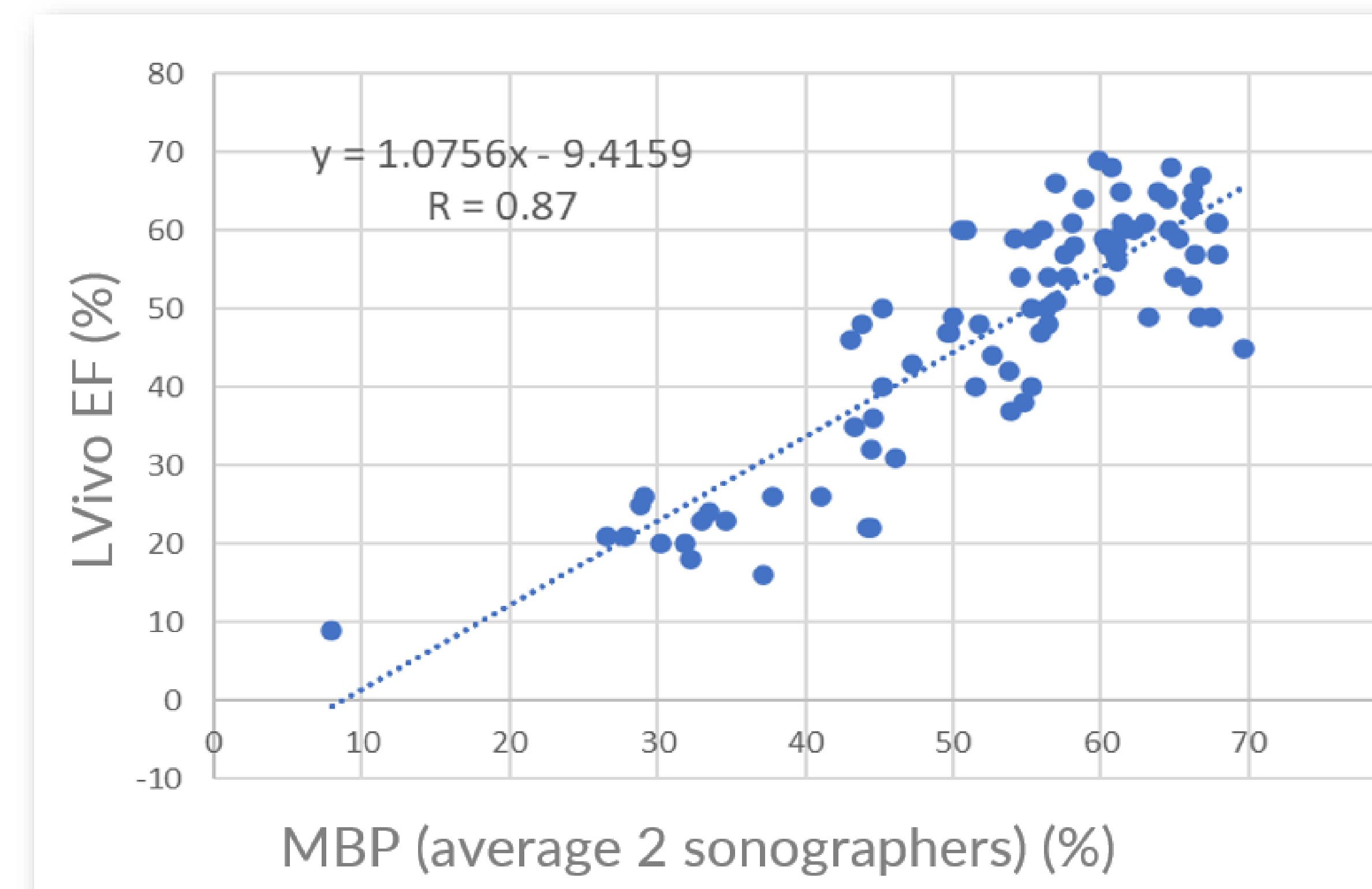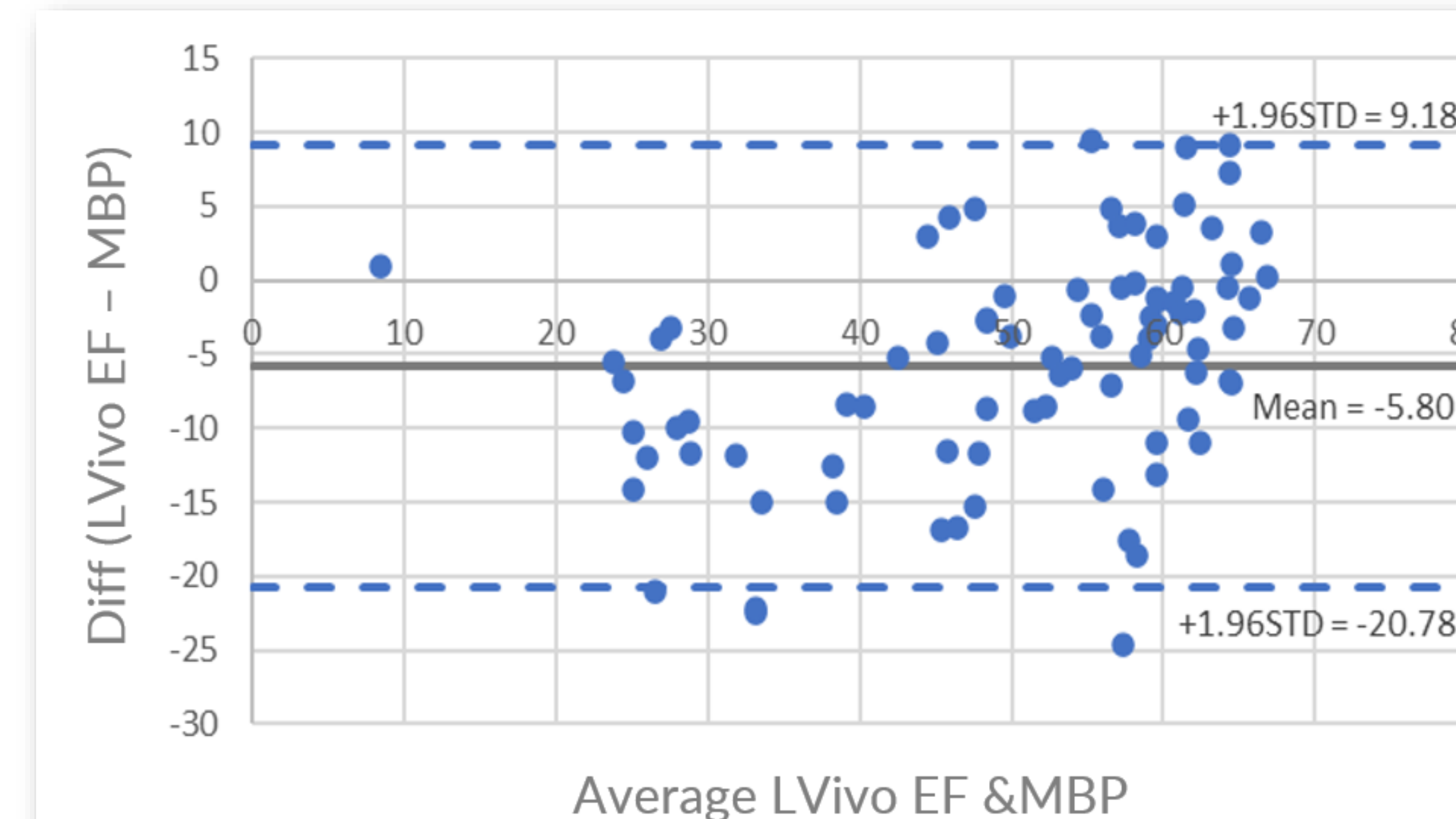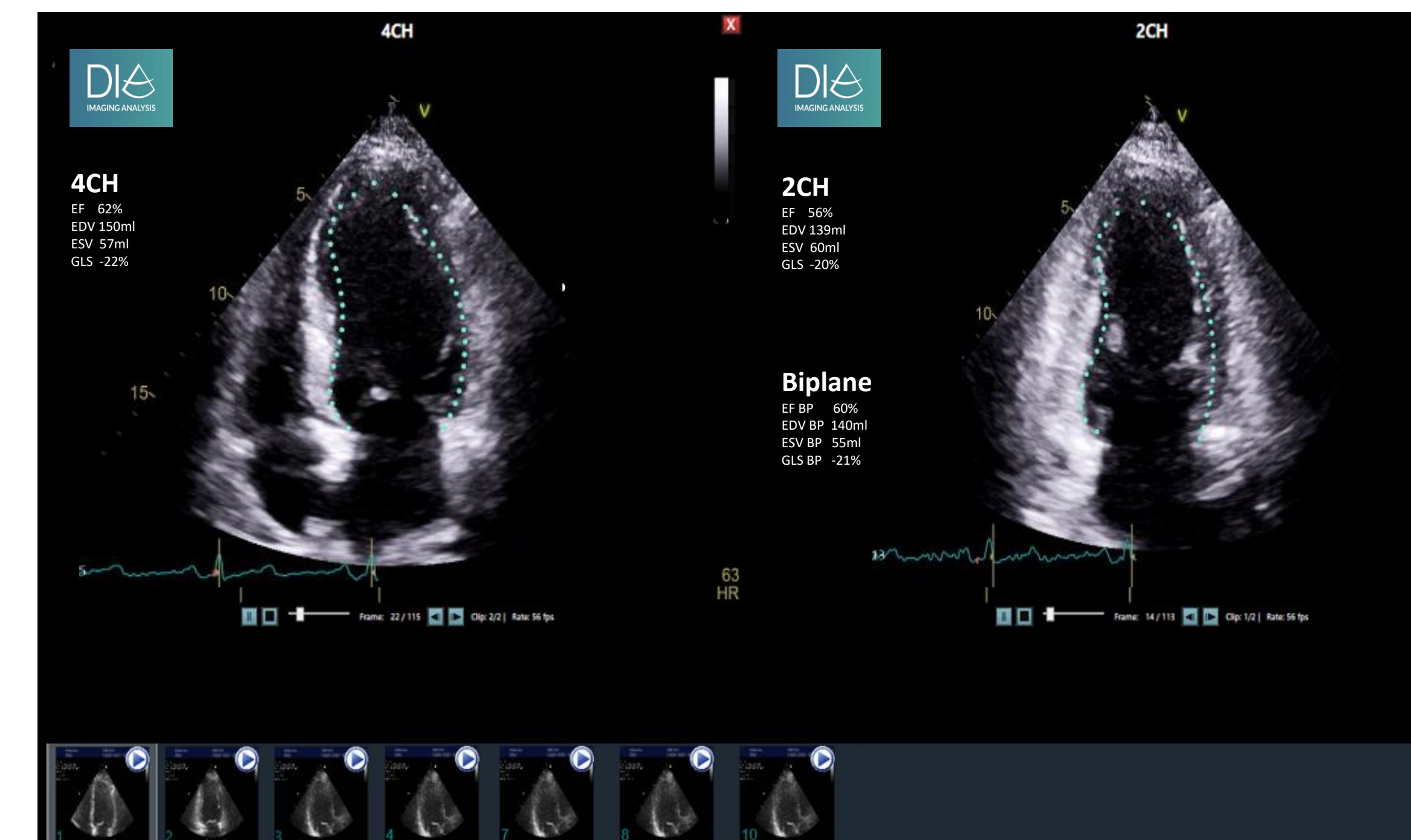
Figure 1: Biplane EF - Correlation

$y = 1.0756x - 9.4159$
$R = 0.87$

LVivo EF (%) vs MBP (average 2 sonographers) (%)

LVivo Seamless Result Example

Figure 2: Biplane EF Bland Altman

+1.96STD = 9.18
Mean = -5.80
+1.96STD = -20.78

Diff (LVivo EF – MBP) vs Average LVivo EF &MBP

CONCLUSIONS

- The results provided by the AI-based **LVivo Seamless** combined with the **LVivo EF** showed excellent capabilities to identify 4ch and 2ch views, along with excellent results compared to MBP.

- The **LVivo Seamless** combined with **LVivo EF** has demonstrated the potential to improve echo workflow as the results are already available to the cardiologist when opening examination for review. In addition, the automated previews selection and results may help set preferences for reporting urgency.

For more info:
info@dia-analysis.com.

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