

Use of Artificial Intelligence for Point-of-Care Echocardiographic Assessment of Left Ventricular Ejection Fraction Among COVID-19 Patients

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BACKGROUND

The association between COVID-19 infection and the cardiovascular system has been well described. Isolation precautions limit the use of formal echocardiography in this setting. Artificial intelligence (AI) utilization using a hand-held device in these patients can be a reliable tool for left ventricular ejection fraction (LVEF) assessment.

OBJECTIVE

To prospectively investigate the accuracy of an AI-based tool for LVEF assessment using a hand-held echocardiogram in patients with COVID-19.

METHODS

From April-28 through July-26, 2020, consecutive patients with COVID-19 underwent a real-time LVEF assessment within 48-h of admission using a hand-held echocardiogram evaluation (Vscan Extend, GE) equipped with LVivo EF (DiA Imaging Analysis, Figure 1), an AI-based tool that automatically evaluates LVEF. The examinations were further analyzed off-line by a blinded fellowship-trained echocardiographer for LVEF as a gold standard.

RESULTS

Among 42 patients, 21 (50%) were male, aged 53.3 ± 17.8 years, with a mean BMI of 27.6 ± 5.1 kg/m². The mean length of each study was 6.8 ± 2.2 minutes, battery usage was $13.4 \pm 4.9\%$, and mean operator-to-patient proximity was 64.5 ± 9.3 cm. A fair to good correlation was demonstrated between the AI and the echocardiographer LVEF assessment (Pearson's correlation of 0.619, $p < 0.001$, Figure 2). An almost perfect agreement was demonstrated between the AI and the echocardiographer for LVEF using a threshold of 45% ($\kappa = 0.806$, $p < 0.001$). The sensitivity of focused echocardiogram for 45% LVEF threshold is 85.7%, specificity is 97.1% with a PPV of 85.7% and NPV of 97.1%.

CONCLUSIONS

An AI-based algorithm incorporated into an existing hand-held echocardiogram device can be reliably utilized as a decision support tool by clinicians for automatic real-time LVEF assessment among COVID-19 patients.

FIGURE 1. LVIVO EF: THE AI-BASED TOOL

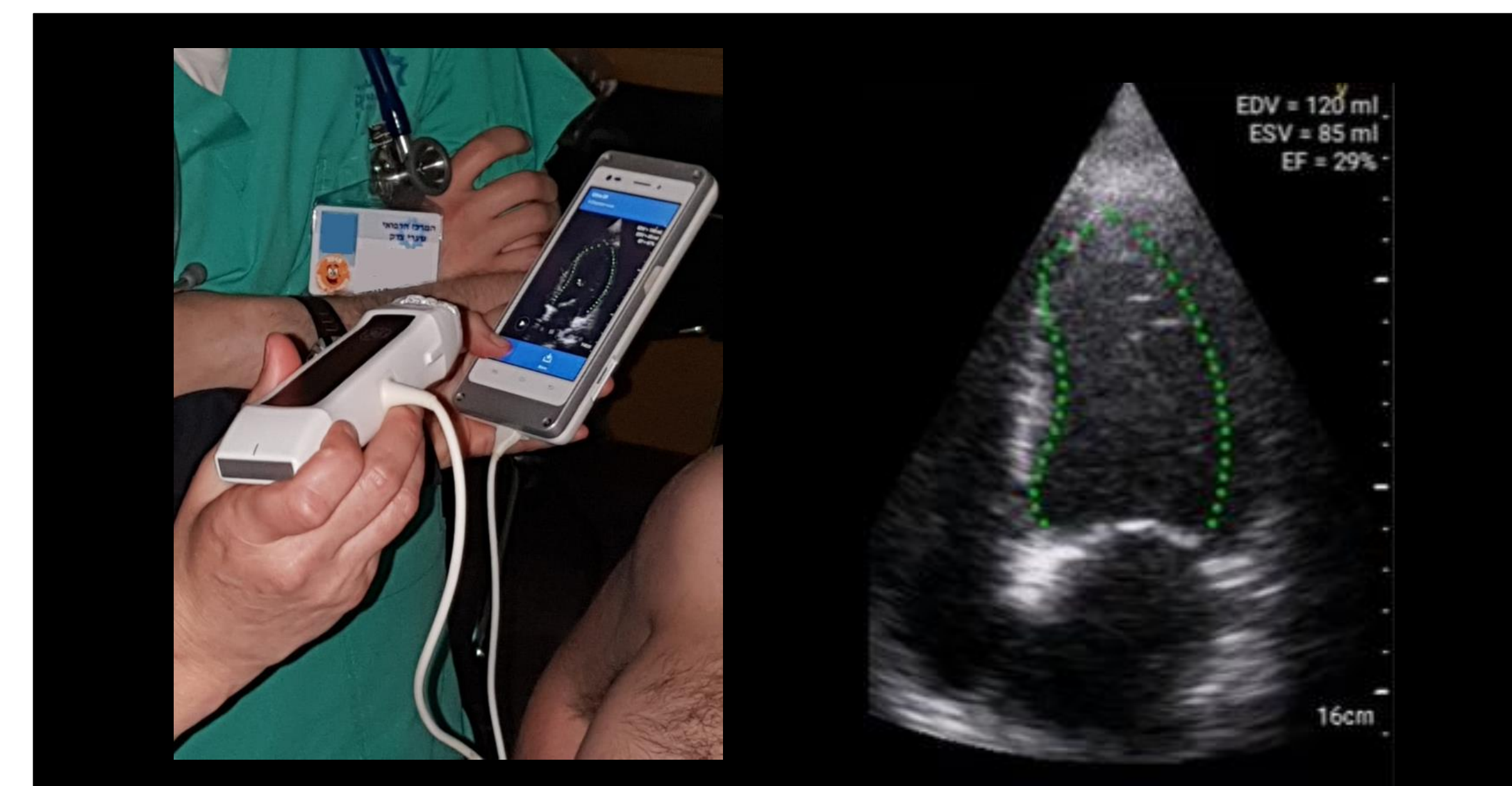


FIGURE 2. CORRELATION ANALYSIS OF LVEF ASSESSMENT BETWEEN THE AI MEASUREMENT VS. THE ECHOCARDIOGRAPHER

