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JACC: Cardiovascular Imaging

Volume 6, Issue 11, November 2013, Pages 1141–1151



Original Research

Lung Ultrasound for the Evaluation of Pulmonary Congestion in Outpatients : A Comparison With Clinical Assessment, Natriuretic Peptides, and Echocardiography

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The aim of this study was to define the performance of lung ultrasound (LUS) compared with clinical assessment, natriuretic peptides, and echocardiography, to evaluate decompensation in patients with systolic heart failure (HF) in an outpatient clinic.

Background

Evaluation of pulmonary congestion in chronic HF is challenging. LUS has been recently proposed as a reliable tool for the semiquantification of extravascular lung water through assessment of B-lines.

Methods

This was a cohort study of patients with moderate to severe systolic HF. Receiver-operating characteristic (ROC) analyses were performed to compare LUS with a previously validated clinical congestion score (CCS), amino-terminal portion of B-type natriuretic peptide (NT-proBNP), E/e' ratio, chest x-ray, and 6-min walk test.

Results

Ninety-seven patients were enrolled. Decompensation was present in 57.7% of patients when estimated by CCS, 68% by LUS, 53.6% by NT-proBNP, and 65.3% by E/e' ≥ 15 . The number of B-lines was correlated to NT-proBNP ($r = 0.72$; $p < 0.0001$), E/e' ($r = 0.68$; $p < 0.0001$), and CCS ($r = 0.43$; $p < 0.0001$). In ROC analyses, considering as reference for decompensation a combined method (E/e' ≥ 15 and/or NT-proBNP $> 1,000$ pg/ml), LUS yielded a C-statistic of 0.89 (95% confidence interval: 0.82 to 0.96), providing the best accuracy with a cutoff ≥ 15 B-lines (sensitivity 85%, specificity 83%). A systematic approach using CCS, E/e', NT-proBNP, chest x-ray, and 6-min walk test in different combinations as reference for decompensation also corroborated this cutoff and found a similar accuracy for LUS.

Conclusions

In an HF outpatient clinic, B-lines were significantly correlated with more established parameters of decompensation. A B-line ≥ 15 cutoff could be considered for a quick and reliable assessment of decompensation in outpatients with HF.

Key Words

B-lines; heart failure; lung ultrasound; natriuretic peptides; pulmonary congestion; ultrasound lung comets


Abbreviations and Acronyms

6MWT, 6-min walk test; CCS, clinical congestion score; CXR, chest x-ray; E/e', ratio of early diastolic

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mitral inflow velocity to early diastolic velocity of mitral annulus; EVLW, extravascular lung water; HF, heart failure; LA, left atrial; LUS, lung ultrasound; LV, left ventricular; NT-proBNP, amino-terminal portion of B-type natriuretic peptide

Dr. Miglioranza received a post-graduate grant from CAPES, a Brazilian governmental agency for post-graduate support. Dr. Kallil received a research grant from CNPq, a Brazilian governmental agency for research support. The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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