



PROGNOSTIC VALUE OF RIGHT VENTRICULAR FREE WALL STRAIN IN PATIENTS WITH ACUTE DECOMPENSATED HEART FAILURE

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ABSTRACT

AIM: To Determine the Prognostic Value Of 2D- Right ventricle Free Wall Longitudinal Strain In Patients With Acute Decompensated Heart Failure.

BACKGROUND

- The prognostic impact of 2-dimensional strain is unclear in patients with acute decompensated heart failure (HF).
- we investigate whether left ventricular and right ventricular (RV) strain parameters assessed by speckle tracking echocardiography provide incremental prognostic information in hospitalized patients because of acute decompensated HF.

METHODS AND RESULTS

- FOURTY SIX patients (age, 54±9 years; 6.5% women; ejection fraction, 36±5%) hospitalized for acute decompensated HF underwent clinical and echocardiographic evaluation just before discharge. We performed strain analyses of left ventricular global longitudinal strain and RV longitudinal strain only from the free wall (RV-fwLS) and from all segments of the RV global longitudinal strain wall by echocardiogram. The primary composite end point was cardiovascular death and readmission for HF. There were 30.4% cardiac events during a median follow-up of 180 days. Among echocardiographic parameters, only impaired RV-fwLS (Less Than 11.4±4.9) was independently associated with cardiac events. Adding RV-fwLS to clinical risk evaluation (age, New York Heart Association class III/IV, blood urea nitrogen, and brain natriuretic peptide) markedly improved prognostic utility.

CONCLUSIONS:

- RV-fwLS is an independent predictor of cardiac events in acute decompensated HF. Although there are various standard echocardiographic parameters, RV-fwLS has improved prognostic utility.

KEYWORDS : GLOBAL LONGITUDINAL STRAIN, HEART FAILURE, RV FREEWALL LONGITUDINAL STRAIN

INTRODUCTION:

Heart failure is a major cause cardiovascular of morbidity and mortality in India^{1,2}. India is supposed to have the dual burden of heart failure due to the emergence of new age disease such as Diabetes, hypertension and coronary disease along with persistence of old age diseases such as Rheumatic heart disease and congenital heart disease. Indian patients are younger and the disease burden is mostly below 65 years³ and they need lifelong treatment. Although there are several evidence based medical therapies, patients with heart failure experience repeated hospitalisation and poor prognosis⁴.

Echocardiography is the most feasible method for assessing cardiac morphologies and function, prognostic importance of echo parameters in heart failure patients have been evaluated in many studies⁵. Two-dimensional strain analysis by speckle tracking echocardiography have been used to detect myocardial deformation⁶. We have studies revealing Left ventricular global longitudinal strain (LV-GLS) and left ventricular global circumferential strain (LV-GCS) as prognostic indicators in chronic heart failure^{7,8}.

only few studies are available for acute decompensated heart failure⁹. meanwhile the importance of right ventricular systolic dysfunction is an independent predictor of adverse outcomes in patients with left sided heart failure¹⁰. compared with traditional echo parameters 2D strain of both left ventricle and right ventricle may be a more predictable parameters. so the aim of this study is to investigate whether LV and RV strain provide incremental prognostic information to standard echocardiographic and clinical findings in patients with acute decompensated heart failure.

MATERIALS & METHODS:

Study population comprises of adult patients presenting to Department of Cardiology, Government Rajaji Hospital & Madurai Medical college, Madurai with Acute Decompensated Heart Failure.

- Study period-** From 1st AUGUST 2021 till 31st JANUARY 2022.
- Sample Size:** 46

Inclusion Criteria

All Patients More Than 20 Years with a Clinical Diagnosis of Acute Decompensated Heart Failure by Framingham's Criteria and NT-pro BNP levels underwent guidelines directed medical therapy and after recovering from failure patients under went left ventricle global longitudinal strain and Right ventricle free wall longitudinal strain along with other parameters by echocardiogram before discharge.

Exclusion Criteria:

- Valvular Heart Disease
- Acute Coronary Syndrome
- CKD
- Death During Hospitalization
- Poor Drug Compliance

All patients underwent two-dimensional(2D) echocardiography before Discharge. A standard echocardiographic study was done using echocardiography machine GE Healthcare Vivid Ultrasound T8 according to the guidelines of the American Society of Echocardiography. Data acquisition was performed using 3.5MHz transducer. LV function was assessed by measuring EF using Simpson's biplane method of disks as well as 2D speckle tracking to assess GLS-LV, GLS-RV, RV Free wall longitudinal strain.

All the patients were followed for duration of 6 months.

The primary end points were rehospitalization due to Heart failure and cardiovascular death.

STATISTICAL ANALYSIS:

The paired t-test was used to compare patients with primary endpoint and no readmission. Categorical variables are presented as number and were analyzed by chi square test.

RESULTS:

Of the 46 Patients Included in the Study the Clinical Characteristics are Shown in Table 1 and Echocardiographic Parameters in Table 2. The

primary endpoint occurred in 14 patients (30.4%), of which 9 patients were readmitted for heart failure and 5 deaths were observed. Out of the 5 deaths 3 were due to heart failure and 2 were arrhythmic deaths.

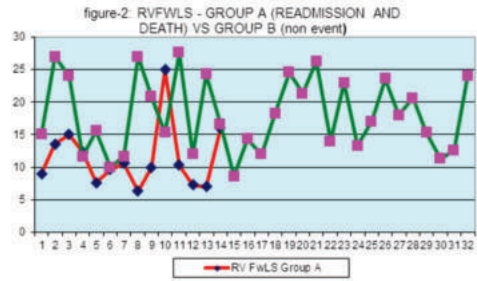
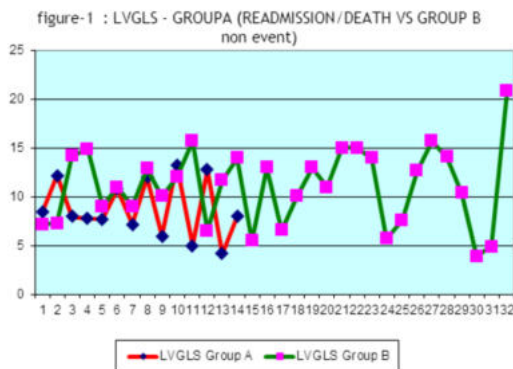
Patients with primary end point of readmission due to heart failure and death had significantly lower RV free wall longitudinal strain of 11.4 ± 4.9 and patients with no clinical events had RV free wall longitudinal strain of 18.01 ± 5.7 which is statistically significant ($p < 0.001$) (figure-1). LV GLS was also low in primary endpoint group of 8.8 ± 2.9 and higher in non-event group 11.1 ± 3.9 (figure -2) which was statistically not significant. N-terminal pro Bnp values were higher in primary endpoint group with values of 3324 ± 2889 pg/ml were as NT pro Bnp values were comparatively lower in non-event group of 979 ± 861 pg/ml which was higher than the standard values and was statistically significant. ($p < 0.001$).

Table-1 Clinical Charactreistes

Variables	Events (14)	No events (32)	P value
AGE	56 ± 9	53 ± 10	0.380
BMI	26 ± 4	24 ± 2	0.200
SYTOLIC BP	126 ± 19	123 ± 21	0.665
DIASTOLIC BP	78 ± 10	79 ± 11	0.760
HEART RATE	92 ± 17	85 ± 12	0.168
GENDER (M/F)	12 / 2	31 / 1	0.446
HYPERTENSION (Y/N)	8 / 6	9 / 23	0.123
DM (Y/N)	7 / 7	13 / 19	0.789
COPD	2 / 12	1 / 31	0.446
AF/AFL	0/14	0/32	1
ICM/DCM	4/10	8/24	0.912
HB%	11 ± 2	11 ± 2	0.300
UREA	40 ± 6	39 ± 10	0.903
CR	1 ± 0.2	1 ± 0.2	0.147
SODIUM	132 ± 5	132 ± 4.5	0.616
NT- BNP(Pg/ml)	3324 ± 2889	979 ± 863	< 0.001

Table 2- Echocardiographic characteristics

ECHO	EVENTS(14)	NO EVENTS(36)	P value
LVEDV	176 ± 62.7	144.8 ± 44	0.060
LVESV	121 ± 48	96.2 ± 38	0.062
EF%	32 ± 5.6	36.2 ± 8.5	0.107
IVST, mm	7 ± 1.9	7.2 ± 2	0.859
PWT, mm	6.7 ± 1.4	6.7 ± 1.6	0.945
LAVI ml/m ²	33.8 ± 10.5	31.2 ± 11	0.447
E cm/s	77.1 ± 27.7	65.2 ± 24.6	0.154
e'	6 ± 2.5	5.7 ± 2	0.616
E/e'	14.9 ± 7.9	12.6 ± 6.3	0.304
TAPSE mm	15.6 ± 5.3	16.4 ± 3.5	0.542
FAC%	24.2 ± 7.7	27.5 ± 8.4	0.225
TRPG	24.5 ± 10	17.6 ± 11.2	0.053
IVC	13.9 ± 4	12.5 ± 4.7	0.332
LV-GLS	8.8 ± 2.9	11.1 ± 3.9	0.060
RV FwLS	11.4 ± 4.9	18.01 ± 5.7	< 0.001



DISCUSSION:

As per this study RV -fwLS is the most critical predictor of adverse outcome in patients with acute decompensated heart failure. So, it can be used to increase the prognostic value adding to the conventional prognostic values like BNP levels, BUN, NYHA class, age.

The left sided parameters like LV GLS, ejection fraction, LAVI did not provide prognostic information.

Our results revealed that the ability of Right ventricle systolic function in affecting future cardiac events. Due to pulmonary venous hypertension the failing LV secondarily aggravates RV dysfunction¹¹. Apart from the above reason ventricular interdependence, myocardial ischemia of RV because of decreased venous return, neurohormonal interaction are also the reasons behind RV dysfunction.

Kjaergaard et al¹² reported decreased TAPSE was associated with increased mortality in ADHF patients, only a few studies investigated whether RV-fwLS is associated with outcomes in patients with ADHF. other echo parameters like IVC diameter, LAVI, secondary MR, e'/e' did not give information about prognosis. LVGLS even though significantly lower in all patients did not provide prognostic information.

Our study demonstrates that RV-fwLS is associated with adverse events. Initially while Performing the Study RVGLS was done and from that only RV-fwLS Values alone taken Because only RV-fwLS shows intrinsic RV function Whereas RVGLS was closely associated with LV function due to Septal Contribution.

LIMITATION:

Limited number of Participants. Complication of Heart failure Leading to decreased EF and eventually Renal failure may also lead to Readmission. We Include Rehospitalisation for Heart Failure as Composite Endpoint but at baseline everyone had Heart Failure and Patients were studied before discharge so we focussed on progression of Heart failure.

CONCLUSION:

RV- fwLS assessed by speckle tracking echocardiogram provides additional prognostic information in patients with ADHF. This parameter will be cost effective and useful in identifying vulnerable patients at high risk of cardiac events after discharge.

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