Journal of
Cardio - Thoracic Medicine

http://jctm.mums.ac.ir

The Correlation between Left and Right Ventricular Ejection Fractions in Patients with Ischemic Heart Disease, Documented by Cardiac Magnetic Resonance Imaging

Ali Eshraghi[1], Mahmoud Mohammadzadeh Shabestri[2], Majid Jalalyazdi[1]*, Zahra Alizadeh Sani[1]

[1] *Cardiologist, Mashhad University of Medical Sciences, Mashhad, Iran*
[2] *Cardiologist, Atherosclerosis Prevention Research Center, Imam Reza Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran*

ARTICLE INFO

Article type:
Original Article

Article history:
Received: 24 Apr 2015
Revised: 13 Sep 2015
Accepted: 6 Feb 2016

Keywords:
Cardiovascular Magnetic Resonance
Left Ventricular Ejection Fractions
Right Ventricular Ejection Fractions

ABSTRACT

Introduction: The correlation between right and left ventricular ejection fractions (RVEF and LVEF, respectively) has been studied in only a small number of patients with a marked decrease in RVEF and LVEF. The aim of the present study was to compare LVEF and RVEF in patients with ischemic heart disease. RVEF and LVEF were measured by Cardiovascular Magnetic Resonance (CMR) imaging.

Materials and Methods: This observational study was done in Ghaem general hospital in 2014. LVEF and RVEF were measured in a series of 33 patients with ischemic heart disease, undergoing CMR for the evaluation of myocardial viability. The correlation between RVEF and LVEF in patients with ischemic heart disease was studied, using Pearson product-moment correlation coefficient analysis.

Results: Right ventricular end diastolic volume (186.33±58.90) and left ventricular end diastolic volume (121.72±61.64) were significantly correlated (r=0.223, P=0.005). Moreover, there was a significant correlation between right ventricular end systolic volume (88.18±40.90) and left ventricular end systolic volume (140.96±35.33) (r=0.329, P=0.000). The most significant association was observed between RVEF and LVEF (r=0.913, P=0.000).

Conclusion: Based on the findings, RVEF and LVEF were significantly correlated in patients with ischemic heart disease, although this association was not always present in all cardiac patients. The cause of this discrepancy is still unknown.

►*Please cite this paper as:*
Eshraghi A, Mohammadzadeh Shabestri M, Jalalyazdi M, Alizadeh Sani Z. The Correlation between Left and Right Ventricular Ejection Fractions in Patients with Ischemic Heart Disease, Documented by Cardiac Magnetic Resonance Imaging. J Cardiothorac Med. 2016; 4(1):407-410.

Introduction

Ejection fraction (EF) is commonly applied as a measure of cardiac performance. EF is known to be both preload and afterload dependent. Besides left ventricular dysfunction, decreased right ventricular EF (RVEF) is an independent predictor of mortality (1-3). However, the direct correlation between RVEF and left ventricular EF (LVEF) has been studied in only a small number of patients with moderate to severe cardiomyopathy (4, 5).

Research on various patients including those with severe pulmonary disease has indicated a poor correlation between RVEF and LVEF (6). The aim of the present study was to evaluate the correlation between RVEF and LVEF in patients with ischemic heart disease (IHD). RVEF and LVEF were measured by Cardiovascular

**Corresponding author:* Majid Jalalyazdi, Mashhad University of Medical Sciences, Mashhad, Iran. Tel: 00989155067246; Email: jalalyazdim@mums.ac.ir

Magnetic Resonance (CMR) imaging. This correlation can help us to estimate RV function by LV function and improve our clinical decision making.

Materials and Methods

This observational study was done in Ghaem general hospital in 2014 with simple sapling. In this study, we analyse CMR data of 33 patients with Ischemic heart disease, who had been referred to our hospital for assessment of cardiac viability. we evaluate the correlation of RVEF and LVEF. We exclude patients with myocardial infarction in the last month. This correlation was studied by correlation analysis, using SPSS 18. This association was evaluated in all patients with or without cardiomyopathy (defined as LVEF and RVEF < 50%) and those with severe cardiomyopathy (LVEF and RVEF < 30%).

All imaging procedures were performed, using a 1.5 T SIEMENS MRI scanner (manufactured by Germany). By use of MRI short axis cine views, RVEF and LVEF were assessed through conventional manual tracing of systolic and diastolic endocardial borders.

In the present study, the obtained data were normally distributed. Pearson's correlation coefficient test was used to explore theassociation between LVEF and RVEF. P-value less than 0.05 was considered statistically significant.

Results

A male predominance was observed in the study population (61%). Baseline characteristics of patients are presented in Table 1.

Right ventricular end diastolic volume (RVEDV) was measured in all patients. Minimum and maximum RVEDV were reported to be 77 mm^3 and 200 mm^3, respectively, with the mean of 186.33 mm^3 (standard deviation= 58.90). Left ventricular end diastolic volume (LVEDV) was also measured in all patients. Minimum LVEDV was reported to be 108 mm^3 and maximum LVEDV was 342 mm^3; the mean value was estimated at 121.72 mm^3 (standard deviation= 61.64).

As the results indicated, correlation between RVEDV and LVEDV was statistically

Table 1. Baseline characteristics of patients

Characteristics	Patients (n=33)
Male sex	20(61%)
Age	52.27(5.88)
Ischemic heart disease	33 (100%)
History of coronary artery bypass grafting	5 (15%)
History of diabetes	15(45%)
History of hypertension	14(42%)
History of smoking	5 (15%)
History of chronic obstructive pulmonary disease	2 (6%)

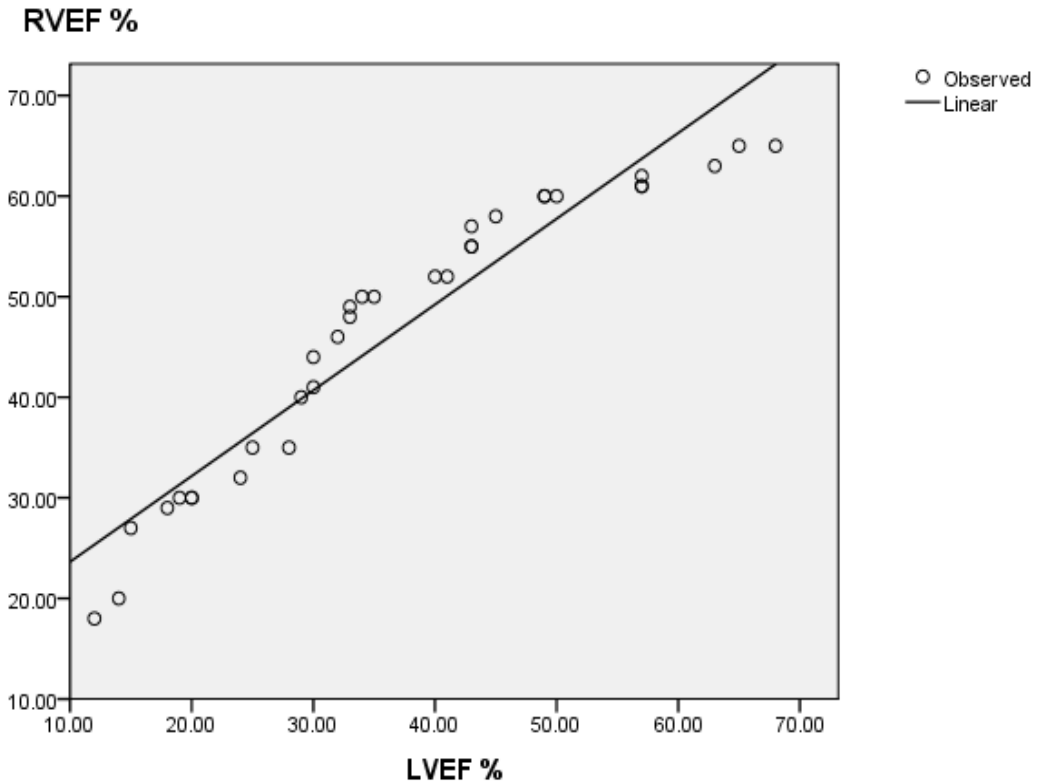

Figure 1. The significant correlation between RVEF and LVEF

significant (P=0.005). Right ventricular end systolic volume (RVESV) (88.18±40.90) and left ventricular end systolic volume (LVEDV) (140.96±35.33) were also significantly correlated (P=0.000). The significant correlation was observed between RVEF and LVEF (r=0.913, P=0.000) (Figure 1).

Discussion

The most important finding of our study was the significant correlation between RVEF and LVEF in IHD patients with normal or reduced EF. Previous studies on the correlation between RVEF and LVEF have focused on a small number of patients with a marked decrease in ventricular function and these studies found a moderate correlation (r=0.63) between right and left ventricular functions in patients with cardiomyopathy (4-8). However, no patients with preserved ventricular function were evaluated in the mentioned studies.

The present research is the only study evaluating RVEF and LVEF correlation in IHD patients with normal and reduced EF. Although Maddahi et al. (9) simultaneously measured left and right ventricular functions using multiple-gated equilibrium blood pool scintigraphy. They have only 11 patients with normal RV and LVEF > 50%. They found no correlation between the two chambers size and function. Maddahi in his study found that mean RVEF was significantly less than left ventricular ejection fraction ($p < 0.001$).

The findings reported by Vizza et al. (6) indicating a poor correlation between LVEF and RVEF (r=0.44) further substantiate our results (r=0.32). Moreover, multiple studies are in accordance with the present findings regarding the significant correlation between left ventricular and right ventricular systolic functions in patients with decreased EF (4, 5, 10, 11). For instance, Emilsson (10) and MacNee et al. (11) found that RVEF and LVEF are only correlated in patients with severe emphysema and decreased left and right ventricular functions.

Furthermore, Benedetto and Nusynowitz (12) found a strong correlation between LVEF and RVEF in patients with cardiomyopathy. However, patients with preserved left and right ventricular functions were not evaluated. In the present study, we assessed the correlation between LVEF and RVEF in IHD patients with normal or decreased RVEF and LVEF and we found strong correlation between them . small study population and restriction in IHD patients like other study may be our limitation.

Conclusion

Estimation of RVEF is very important in clinical practice. Based on the findings, there was a significant correlation between LVEF and RVEF in patients with IHD. This association was observed in patients with preserved or reduced EF, although such a correlation is not present in all cardiac patients. The cause of this discrepancy is still undetermined. We suggest further study in different type of cardiomyopathy and with larger sample. verifying of this correlation is very important in clinical decision and practice.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Juilliere Y, Barbier G, Feldmann L, Grentzinger A, Danchin N, Cherrier F. Additional predictive value of both left and right ventricular ejection fractions on long-term survival in idiopathic dilated cardiomyopathy. Eur Heart J. 1997; 18:276-80.
2. Di Salvo TG, Mathier M, Semigran MJ, Dec GW. Preserved right ventricular ejection fraction predicts exercise capacity and survival in advanced heart failure. J Am Coll Cardiol. 1995; 25:1143-53.
3. Zornoff LA, Skali H, Pfeffer MA, St John Sutton M, Rouleau JL, Lamas GA, et al. Right ventricular dysfunction and risk of heart failure and mortality after myocardial infarction. J Am Coll Cardiol. 2002; 39:1450-5.
4. Beck-da-Silva L, de Bold A, Davies R, Chow B, Ruddy T, Fraser M, et al. Effect of bisoprolol on right ventricular function and brain natriuretic peptide in patients with heart failure. Congest Heart Fail. 2004; 10:127-32.
5. Quaife RA, Christian PE, Gilbert EM, Datz FL, Volkman K, Bristow MR. Effects of carvedilol on right ventricular function in chronic heart failure. Am J Cardiol. 1998; 81:247-50.
6. Vizza CD, Lynch JP, Ochoa LL, Richardson G, Trulock EP. Right and left ventricular dysfunction in patients with severe pulmonary disease. Chest. 1998; 113:576-83.
7. Berger HJ, Matthay RA, Loke J, Marshall RC, Gottschalk A, Zaret BL. Assessment of cardiac performance with quantitative radionuclide angiocardiography: right ventricular ejection fraction with reference to findings in chronic obstructive pulmonary disease. Am J Cardiol. 1978; 41:897-905.
8. Gentzler RD 2nd, Briselli MF, Gault JH. Angiographic estimation of right ventricular volume in man. Circulation. 1974; 50:324-30.
9. Maddahi J, Berman DS, Matsuoka DT, Waxman AD, Stankus KE, Forrester JS, et al. A new technique for assessing right ventricular ejection fraction using rapid multiple-gated equilibrium cardiac blood pool scintigraphy. Description, validation and

findings in chronic coronary artery disease. Circulation. 1979; 60:581-9.
10. Emilsson K. Right ventricular long-axis function in relation to left ventricular systolic function. Clin Physiol Funct Imaging. 2004; 24:212-5.
11. MacNee W, Xue QF, Hannan WJ, Flenley DC, Adie CJ, Muir AL. Assessment by radionuclide angiography of right and left ventricular function in chronic bronchitis and emphysema. Thorax. 1983; 38:494-500.
12. Benedetto AR, Nusynowitz ML. Correlation of right and left ventricular ejection fraction and volume measurements. J Nucl Med. 1988; 29:1114-7.