

Right Ventricle Function Among Patients with Wellens Syndrome Versus De Winter Syndrome

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ABSTRACT

Objectives: The left ventricle ischemia or infarction led to reduction of blood flow for interventricular septum and can be affect right ventricle (RV) function. The aim of this study to compare the effects of Wellens syndrome and De Winter syndrome on the right ventricular functions.

Methods: Patients presents with first attach of acute coronary syndrome and confirm diagnosed of wellness syndrome or De winter syndrome included into this study. We compare echocardiographic measurements included left ventricle (LV) function, right ventricle Fractional Area Change (RVFAC) and RV tissue doppler measurements of Tricuspid annular plane systolic excursion (TAPSE) and Tricuspid S' peak systolic velocity within first 24 hours after admission between two syndromes.

Results: A total 101 patients (82 patients with Wellens syndrome and 19 patients with De winter syndrome) included this study with mean age was 57.1 ± 9.2 years and male patients were 83 (82.2%). The echocardiographic measurement of LV ejection fraction was not significant between two syndromes ($P; 0.122$), but right ventricle function parameters (TAPSE, Tricuspid S' peak systolic velocity and RVFAC) were significant lower in Di winter syndrome compared with Wellens syndrome (P values 0.0083, 0.0004 and 0.027) respectively.

Conclusion: Patients with Di winter syndrome compared to Wellens syndrome had significantly higher rate of right ventricle dysfunction despite the nonsignificant changes in left ventricle systolic function.

Keywords: Wellness, Di Winter, RV Dysfunction

Introduction

The Wallen's' syndrome is referred to severe or tight proximal left anterior descending (LAD) stenosis, in this cases patient presents with an acute coronary syndrome symptom plus additionally changes of resting electrocardiogram ECG (Pattern A; biphasic T wave in V2-V3 and pattern B; deep inverted T wave in V2-V3) and normal or elevated of cardiac troponin level [1]. The De Winter syndrome was reported as proximal acute LAD totally occlusion by thrombus. Diagnosed as changes of ECG typically upsloping ST segment depression and peaked T-waves in precordial leads plus cardiac enzyme elevation and it can be seen in around 2% of patients with anterior ST segment elevation myocardial infarction [2]. The proximal LAD tight stenosis or totally occlusion results in right ventricular

dysfunction through impaired septal contractility because of decreased blood to interventricular septum supply through septal perforators branches and ischemia of posterior aspect of apical septum or impaired right ventricle function by increased afterload after left ventricle dysfunction from LAD stenosis [3]. In this study we compare the right ventricle functional parameters between Wellens syndrome and de winter syndrome within the first 24 h after the event.

Methods

Study Patients

This is cross sectional study included patients who diagnosed with acute coronary syndrome and typical electrocardiography changes for Wellness or De winter syndrome and admitted to Alshifa hospital coronary care unit from January 2021 to August 2023 were eligible to be enrolled.

Inclusion criteria

1. Patients with first acute coronary syndrome events
2. ECG changes such as inverted or biphasic T waves in V2-3 leads or precordial leads.
3. ECG changes suggested that up sloping ST segment depression plus hyperacute T waves in precordial leads.

Exclusion criteria

1. Patients with previous myocardial infarction
2. Patients with history of percutaneous coronary intervention or coronary artery by-pass grafting.
3. History of cardiac surgery for prosthetic valve replacement
4. Patients with diagnosed of any type of cardiomyopathies.
5. Patients with history of atrial or ventricle septal defect
6. Patients with co-morbidities such as renal failure, cor pulmonale, pulmonary hypertension, or pulmonary embolism

Definitions

The Wallen’s syndrome is presentation of acute coronary syndrome with anterior ischemia and ECG changes characterized by deeply inverted or biphasic T waves in multiple precordial lead.

The De Winter syndrome presenting with acute coronary syndrome and ECG pattern typically displays tall T-waves with Upsloping ST depression in multiple precordial lead

Dyslipidemia if the patients having at least one of the following: total cholesterol ≥ 200 or triglyceride 150 mg/dL or High density lipoprotein < 40 mg/ dL in male or < 50 mg/dL in female or patients with lipid lowering treatment.

Diabetic mellitus was defined if the patients use of hypoglycemic agents or fasting blood glucose more than 126 mg/dl or HbA1c more than 6.5%.

Hypertension was defined as those who had a documented diagnosis of hypertension (BP $\geq 140/90$ mmHg and treated with at least one antihypertensive agents).

Echocardiographic Measurements

Echocardiographic measurements were per formed by blinded cardiologist to determine the values for left ventricle (LV) and right ventricle (RV) function measurement.

LV Function Measurement

Calculation of LV ejection fraction (LVEF) was calculated by Simpson method as ejection fraction equivalent $EDV - ESV/EDV$.

RV Function Measurement

1. **Tricuspid annular plane systolic excursion (TAPSE)** calculating the systolic excursion of the right ventricular annular segment from an apical four-chamber image by passing an M mode cursor through the tricuspid annulus at peak systole and measuring the annulus' longitudinal motion.
2. **Tricuspid S’ peak systolic velocity:** pulsed-wave DTI at tricuspid annulus, obtained from the apical approach with parallel alignment of Doppler beam with RV free wall longitudinal excursion.
3. **Right Ventricle Fractional Area Change (RVFAC)** was measurement by tracing the RV end-diastolic area (RVEDA)

and RV end systolic area (RVESA) in the apical 4-chamber view using the formula $(RVEDA - RVESA)/RVEDA \times 100$.

Statistical Analysis

Data was analyzed by SPSS version 23. Continuous data were presented as mean \pm standard deviation and categorical data as absolute numbers and percentages. independent t-test for continuous variables such as left ventricle ejection fraction, TAPSE, Tricuspid S’ peak systolic velocity and RVFAC. P values < 0.05 were considered significant

Results

Baseline characteristics of the patients were listed in table 1, the total number of patients was 101 (82 patients with Wellness syndrome and 19 patients with Di winter syndrome), male patients were 83 (82.2%) with mean age was 57.1 ± 9.2 years.

Table 1: Baseline Characteristics of the Patients

	Total (N:101)
Age, years	57.1 \pm 9.2 years
Female/male gender	18 (17.8%)/83 (82.2%)
Diabetes mellitus	39 (38.6%)
Hypertension	58 (57.4%)
Dyslipidemia	35 (34.6%)
Smoking	45 (44.5%)
Family history of coronary artery disease	17 (16.8%)

Number and Percentage of Significant Coronary Artery Disease

Significant coronary artery stenosis was defined if coronary artery stenosis more than 70% or left main trunk stenosis more than 50%. One vessel coronary artery disease 52 (51.5%) patients, two coronary artery disease 33 (32.8%) patients, three coronary artery disease 16 (15.8%) patients. Two cases have 3 coronary artery disease and left main trunk stenosis.

Echocardiographic Measurement of Patients

The echocardiographic measurement of LVEF was not significant between 2 groups (P:0.122), but right ventricle parameters (TAPSE, Tricuspid S’ peak systolic velocity and RVFAC) were significant lower in Di winter syndrome compared with Wellens syndrome (P values 0.0083, 0.0004 and 0.027) respectively. Table 2

Table 2: Echocardiographic Measurement of Patients

	Wellens syndrome (N; 82 Patients)	Di Winter syndrome (N; 19 Patients)	P Value
LVEF	49.72 \pm 7.23 %	46.89 \pm 6.78 %	0.122
TAPSE	19.1 \pm 3.5 mm	16.8 \pm 2.6 mm	0.0083
Tricuspid S’ peak systolic velocity	11.43 \pm 2.11 cm/sec	9.60 \pm 1.32 cm/sec	0.0004
RVFAC	31.98 \pm 4.1%	36.34 \pm 3.8%	0.027

LVEF; left ventricle ejection fraction, TAPSE; Tricuspid annular plane systolic excursion RVFAC; Right Ventricle Fractional Area Change

Discussion

The prevalence of hypertension in patients with Wellens syndrome and Di Winter syndrome was 57.4%. The mean TAPSE score in patients of Wellens syndrome was 19.1 ± 3.5 mm and in patients with Di winter syndrome 16.8 ± 2.6 mm. (P;008). And Tricuspid S' peak systolic velocity was 11.43 ± 2.11 cm/sec in Wellens syndrome and 9.60 ± 1.32 cm/sec in Di Winter syndrome (P;0.0004). This suggests that right ventricular dysfunction is more common in Di Winter syndrome than Wellens syndrome.

Many studies suggested that the right ventricular dysfunction occurs in patients with inferior myocardial infarction as well as anterior myocardial infarction [4,5]. Schmid et al. had shown that patients with right ventricle dysfunction (TAPSE score ≤ 18 mm) had poorer outcomes as compared to patients with normal right ventricle function [6].

In most trials the LV systolic function was highly significantly lower in the anterior myocardial infarction compared to the inferior myocardial infarction group. The TAPSE reduction in the anterior myocardial infarction may be explained by the positive correlation between TAPSE and low LVEF regardless of the RV systolic functions [7].

Cabin et al. suggested that 13% of patients with anterior myocardial infarction have right ventricle dysfunction [8]. In Cardiac Magnetic Resonance trial, the right ventricular ischemic changes were found in up to 33% of anterior left ventricular infarcts due to the ischemic dysfunction of left ventricular wall [9]. Also, the interventricular septum and myocardial tracts running between the right and left ventricles can explain the physiology of ventricular-ventricular interactions [10].

In our trial the comparison between Di Winter syndrome (anterior myocardial infarction due to proximal LAD occlusion) and Wellens syndrome (high risk non-ST elevation acute coronary syndrome due to LAD tight stenosis) and about 50% of the patients have multivessel coronary artery stenosis. So that we don't find significant difference of LVEF between two groups. And we found significant lower of TAPSE, Tricuspid S' peak systolic velocity and RVFAC because of reduction of blood flow to the interventricular septum.

Conclusion

Patients with Di Winter syndrome is at higher risk for RV dysfunction than those with Wellens syndrome regardless left ventricle ejection fraction may be related to ischemia of intraventricular septum because of reduction of blood flow in two conditions.

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