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Role of Global longitudinal peak systolic strain (GLPSS) as a predictor of adverse outcome in patient with acute coronary syndrome (ACS): Gender specific differences

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Abstract

Global longitudinal strain (GLS) obtained by 2D speckle tracking echocardiography (STE) is a well-established predictor of HF. GLS has been proven to be more reproducible and precise compared to conventional left ventricular ejection fraction (LVEF). Additionally, STE has been advocated as a more sensitive marker for detection of subclinical left ventricular systolic dysfunction Recent studies have shown global longitudinal strain (GLS) obtained from 2D-speckle tracking echocardiography to be a strong predictor of adverse outcomes in several cardiac diseases especially ACS.

Keywords: GLS, Adverse outcomes, Acute Coronary Syndrome.

1. Introduction

Acute coronary syndrome (ACS), characterized by acute change in plaque with sudden impairment of coronary blood flow, is associated with the higher rates of adverse clinical events across the entire spectrum of coronary artery disease (CAD).**[1]**

Previous study had demonstrated that women with CAD have a higher mortality rate and undergo fewer therapies recommended by international guidelines than men, and that women with CAD undergoing percutaneous coronary intervention (PCI) are generally older and more often affected by multiple comorbidities than men.**[2]**

Even after adequate statistical adjustment for confounding and modifying factors, results have been inconsistent with regard to whether female sex is a risk factor for unfavorable outcomes following PCI **[3]**

Cardiovascular disease is the leading cause of death in both men and women, accounting for one-third of all deaths. **[4]**

Although several studies have shown an improvement of prognosis in women over time, overall outcomes remain worse for women compared with men, [5] providing a strong rationale for focusing on the study of sex-based differences in the outcome of acute coronary syndromes (ACS).

Aim of the work was to evaluate the Role of Global longitudinal peak systolic strain (GLPSS) as a predictor of adverse outcome in patient with acute coronary syndrome (ACS): regarding gender specific differences

2. Material and methods

This will be an observational ,case series ,single center study that will include patients with acute coronary syndrome(ACS) who will be admitted at coronary care unit at "Benha University hospital".

- This study will evaluate role of tissue doppler imaging with speckle tracking for patients with acute coronary syndrome both in hospital stay(in second day of admission) and at 6 months follow up as a predictor of adverse cardiac outcome.
- In addition to left ventricular remodeling in patients with STEMI using speckle tracking (GLPSS) will be done at baseline and 6 months follow up.
- The study will primarily compare the outcomes between males and females patients with ACS.

Study End Point-

- 6 months GLPSS in patients with ACS.
- 6 months mortality ,myocardial infarction ,stroke ,revascularization.

Methods

The included patients will be subjected to the following:

Baseline evaluation

All patients will have review of medical history including

age, sex, Risk Factors of coronary artery disease (DM-HTN-Dyslipidemia- smoking), prior history of coronary artery disease , ,prior history of intervention, other comorbidities, drugs.

Full clinical examination:

With particular emphasis on the pulse and blood pressure of the patients, as well as auscultation of the back to elicit the presence of any clinically detectable pulmonary venous congestion, auscultation of the heart for the presence of third heart sounds or audible murmurs

Baseline Electrocardiography:

Twelve leads ECG will be done for each patient.

Cardiac biomarkers: including troponins and CKMB

Baseline Echocardigraphy and Speckle tracking echocardiography:

All patients will be evaluated by echocardiography for the assessment of regional wall abnormalities and overall left ventricular systolic function and GLPS

Follow up: -

- 6 months follow up will include assessment of clinical variables among males and females patients including all cause mortality,myocardial infarction,stroke,heart failure, revascularization
- sub group analysis of patients with STEMI will include 6 months left ventricular remodeling using speckle tracking (GLPSS)

3. Results

A total of 200 patients were included in the final analysis, all patients were admitted to CCU unit after diagnosis of cardiac ischemic attack in the form of ACS. Patients had a mean age of 55.3 ± SD 12.9 years old.

All-cause mortality occurred in 7 % of all patients (3% versus 8% in males and females respectively, p =0.214), re-hospitalization was reported in 17% of all patients (10% versus 15% in males and females respectively, P =0.41), re-infarction was evident in 6% of all patients (2 % versus 5% in males and females respectively, P =0.153),Stroke was evident in 5 % of all patients (2.5% versus 4.5% in males and females respectively, p= 0.153) no reported cases of hemorrhage in both group. ***(Table1).***

Twelve percent of the patients showed re-ischemia, with no significant difference between males and females (P-value = 0.704). Only one patient showed a stroke (2%), with no significant difference between both genders (P-value = 0.393). seven percent of the patients showed heart failure, with no significant difference according to gender (P-value = 0.2). three percent of patients showed re-vascularization, with no significant difference between both genders (P-value = 0.65). Only one percent of the patients died, with no significant difference between both genders (P-value = 0.059). The mean six months GLPSS was -12.1 for the whole patients, with no significant difference according to gender (P-value = 0.479) (Table2).

Table (1) Complications in the whole patients & according to gender.

	Total (n = 200)	Males (n = 134)	Females (n = 66)	P-value
Re-infarction	6 %	3 %	5 %	0.153
Stroke	5	2.5 %	4.5 %	0.153
Hemorrhage	0 (0.0)	0 (0.0)	0 (0.0)	-
Re-hospitalization	17 %	10 %	15 %	0.41
Mortality	7 %	3 %	8 %	0.214

Table (2) Six months outcome in the whole patients & according to gender.

	Males(n = 134)	Females(n = 66)	P-value
Re-ischemia	5%	6.7%	0.704
Stroke	3%	4.5%	0.393
Heart failure	8%	6.9%	0.2
Revascularization	5.5%	4.8%	0.65
Mortality	0 (0.0)	3%	0.059
6M GLPSS	-12 ±3	-12.3 ±2.9	0.479

4. Discussion

Acute coronary syndrome (ACS) is a significant cause of incident heart failure (HF). Identifying ACS patients at high risk of HF is challenging. Improved risk stratification will facilitate this identification, allowing intensive monitoring of high-risk patients, and facilitate early treatment when necessary. Additionally, patients at low risk of developing HF can be treated conservatively. Improved risk stratification is socioeconomically beneficial and will moreover increase survival rates and general health of ACS patients. [**7**]

Global longitudinal strain (GLS) obtained by 2D speckle tracking echocardiography (STE) is a well-established predictor of HF [**8**]. GLS has been proven to be more reproducible and precise compared to conventional left ventricular ejection fraction (LVEF) [**9**]. Additionally, STE has been advocated as a more sensitive marker for detection of subclinical left ventricular systolic dysfunction [**10**]

Recent studies have shown global longitudinal strain (GLS) obtained from 2D-speckle tracking echocardiography to be a strong predictor of adverse outcomes in several cardiac diseases. [**11**]

GLS has already been suggested as a more sensitive marker of cardiac function than conventional echocardiography. [12] It has been demonstrated to be a more powerful predictor of outcome than left ventricular ejection fraction (LVEF) as it may reflect subclinical LV systolic dysfunction. [**13**]

A common and adverse complication following a myocardial infarction (MI) is heart failure (HF). To prevent HF, and improve the prognosis it is necessary to identify high risk patients to initiate more intensive monitoring or treatment. The main aim of this study was to evaluate the Role of Global longitudinal peak systolic strain (GLPSS) as a predictor of adverse outcome in patient with acute coronary syndrome (ACS): regarding gender specific differences.

In our study we found that six percent of the patient experienced re-infarction or stroke, with no significant differences between both genders; P-value was 0.153 for each. Only 10.4% experienced haemorrhage, with no significant difference between both genders (P-

value = 0.41). Only 7% died, with no significant difference according to gender (P-value = 0.214)

However earlier studies have found that the rate of adverse clinical outcomes is higher among females after coronary intervention. [14]

Also, more resent study by **Wada et al., 2017** reported that study there were higher incidence of adverse clinical outcomes after PCI in female, than in male patients medicated with statins. This was mostly explained by the females being older and having comorbidities. The baseline characteristics including lipid profiles were worse for the females.

As regard GLPS, our results agree to several studies where female gender remained an independent predictor of in-hospital death [**15**], although there have also been studies that have found no gender difference in mortality after ACS [**16**]

5. Conclusion

GLPSS was non significantly differed between males and females. The postoperative outcome and 6 months outcomes were comparable between the studied groups. there was no significant correlation between GLPSS and Adverse outcome at six months for all males and females separately

6. Limitations

Although adequate number of study population was used in this study, it is still limited in number to generalize the results.

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