Left Ventricular Wall Motion Score Index as an Early Predictor of Hemodynamic State after Myocardial Infarction

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Abstract

Background- Coronary artery disease is the most common etiology of disability and death in the world. We evaluated the efficacy of echocardiography in patients after myocardial infarction, as a diagnostic means for identifying risk of future cardiac events.

Methods- This is a cross –sectional study on 150 patients admitted with acute myocardial infarction who were followed for three months. We compared the baseline wall motion score index (WMSI) accessed within the first 24 hours and the hemodynamic function as determined according to Killip's classification in patients admitted with acute myocardial infarction to Shaheed Rajaie Cardiovascular Medical Center in Tehran, Iran.

Results- There was a positive correlation between WMSI determined immediately following admission in patients with acute myocardial infarction and good prognosis. Patients included in this study were grouped into four Killip's classes: Class I (n=72 patients), Class II (n=58 patients), Class III (n=13 patients) and Class IV (n= 7 patients). Overall, patients with high WMSI were subclassified within higher Killip's classes. Early mortality rate was greater in patients with both WMSI≥2 and a higher Killip's class. Patients with anterior myocardial infarction (MI), WMSI≥2 and high Killip's class had higher peak CPK-MB levels.

Conclusion- Echocardiographic left ventricular WMSI obtained shortly after an acute myocardial infarction is an affordable and readily available technique, which provides important prognostic information regarding patients' clinical outcome and prognosis. We conclude that patients presenting with high WMSI need early invasive procedures for improved prognosis ***(Iranian Heart Journal 2007; 8 (2): 16-21)***.

Key words: wall motion score index ■ myocardial infarction ■ killip's class

Coronary artery disease is one of the most important causes of mortality and morbidity in the world. This disease has a high economic burden resulting in millions of dollars spent per year for treatment of affected patients. Nowadays, this disease appears to affect young and active individuals as well.

The present study evaluated the usefulness of left ventricular WMSI in patients with acute MI as an early predictor of outcome.

Methods

This is a cross-sectional prospective study of patients admitted with acute myocardial

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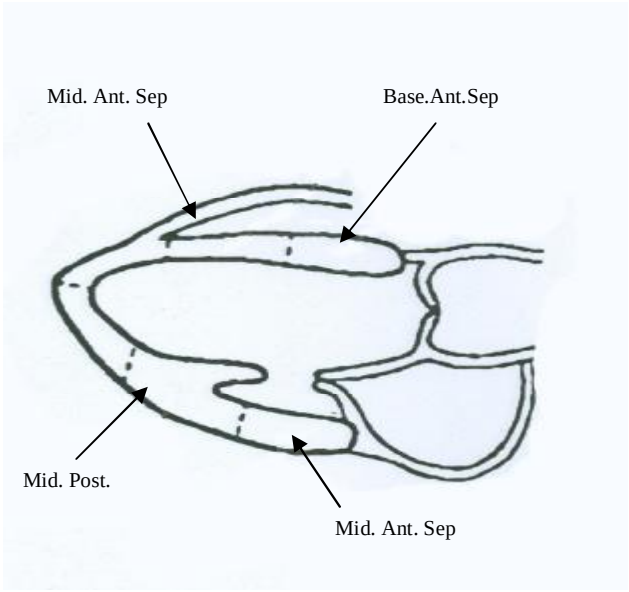
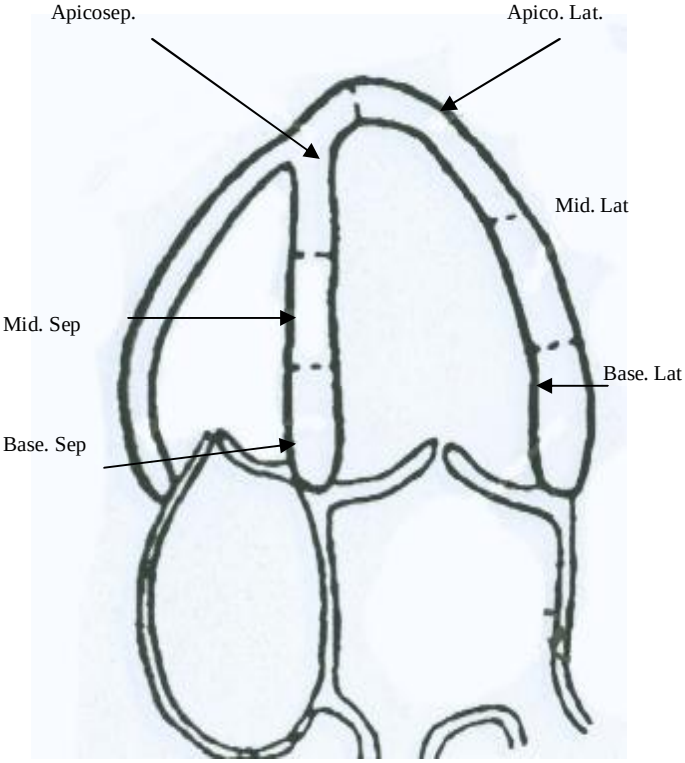
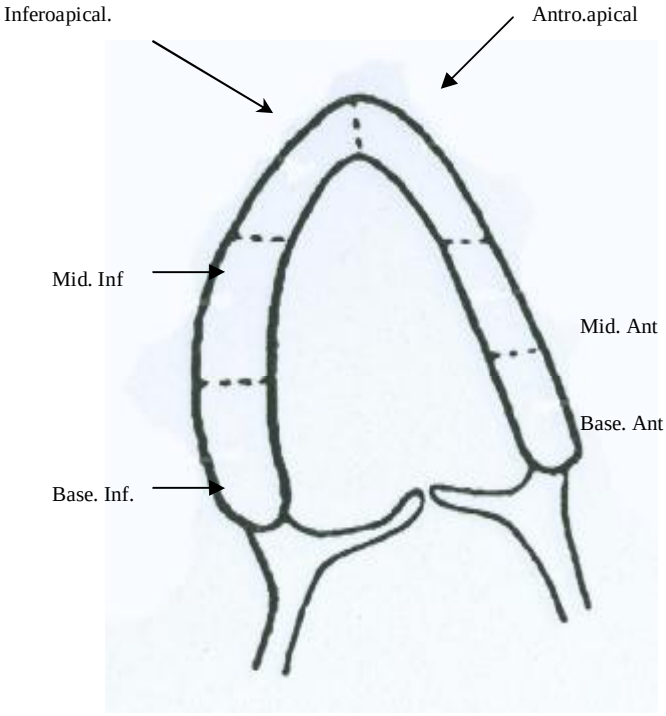
infarction to Shaheed Rajai Cardiovascular Medical Center in Tehran, Iran. Patients' baseline echocardiographic WMSI measured within the first 24 hours of admission was compared with their hemodynamic function.
We used 16 segments of the myocardial wall to calculate WMSI. This model is depicted in Fig.1.







Normal kinesis =1	>5mm thickening
Hyperkinesis =2	2-5 mm
Akinesis =3	≤ 2mm
Dyskinesis =4	outward motion

Each segment score was defined as:

The sum of the scores obtained from the 16 segments of the myocardial wall was divided by 16 in order to calculate the WMSI.
Patients were grouped according to Killip's classification as indicated bellow:
Killip's Class 1= No rale, No S3
Killip's Class 2= S3± Rales in less than ½ lungs
Killip's Class 3=S3 + Rales in more than ½ lungs
Killip's Class 4=Cardiogenic shock

Patients were also sub-classified into three groups, based on type of myocardial infarction, with the following characteristics:
Anterior MI: anterior MI, anteroseptal MI and anterolateral MI.
Posterior MI: inferior MI, inferolateral MI, posterior MI and posterolateral MI.
InferoRV MI: inferior and RV MI.

Results

The study was performed on 150 patients, who were followed up for 3 months. The mean age of these patients was 61.96 ± 11.31 years. The gender distribution of the patients was 111 (74%) male and 39 (26%) female.
Patients in this study fell within one of four Killip's classes: Class I: 72, Class II: 58,
Class III: 13 and Class IV: 7 patients. In Killip's class 4, all patients died in less than 7 days (100%). In class 3, four patients died in less than 7 days (31%); while in class 2, five patients (9%) and in class 1, 2 patients (3%) died in less than 7 days.
We found a statistically significant correlation between early mortality, Killip's class and WMSI (P<0.0001). Mortality rate was greater in patients with WMSI≥ 2, (Fig. 5).
Mean ejection fraction in patients was as follows: Killip's class 1 was 37.84% ± 7.84%, Class 2 was 33.49% ± 9.38%, class 3 was 17.69% ± 8.98% and in class 4 was 17.14% ± 8.9%, (Fig. 2).

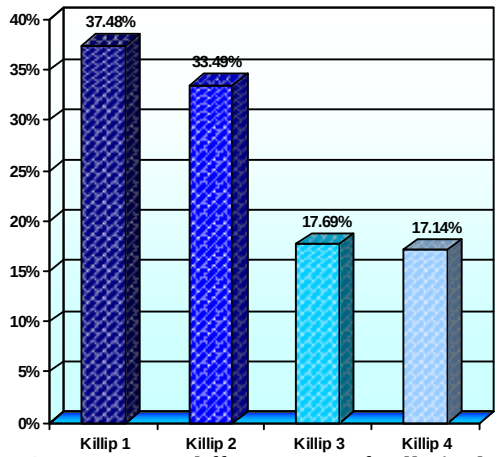


Fig. 2. Mean EF in different types of Killip's classes.

There was a statistically significant correlation between ejection fraction and Killip's class: the greater the Killip's class the less the ejection fraction (P<0.0001).
We found that mean WMSI in Killip's classes 1, 2, 3, and 4 was approximately 1.92 ± 0.31, 2.14 ± 0.3, 2.52 ± 0.24 and 2.49 ± 0.14, respectively (Fig. 3).

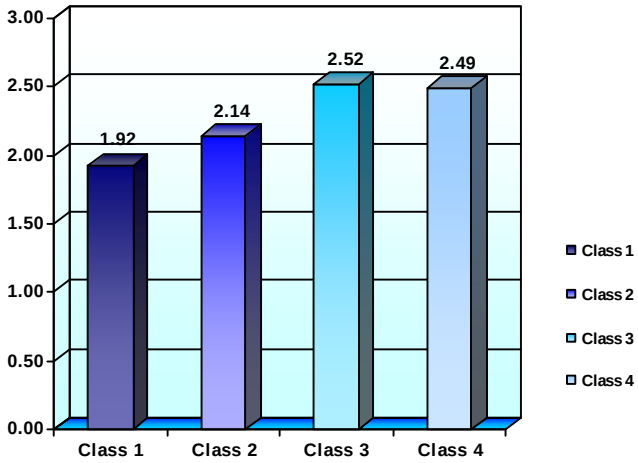


Fig. 3. Distribution of WMSI in different types of Killip's classes.

We also found a positive correlation between WMSI and Killip's class (P< 0.0001).
However, there was no WMSI<2 in patients with Killip's class 3, 4, (Table I).

Table I. Distribution of mean EF, mean peak CPK-MB and different type of Killip's class in two groups of WMSI.

	Killip Class 1	Killip Class 2	Killip Class 3	Killip Class 4
WMSI<2	44	19	0	0
WMSI>=2	28	39	13	7

Peak CPK-MB was approximately 169.35 ± 148.48 in patients from Killip's class 1, 228.14 ± 186.65 in patients from Killip's class 2, 395.69 ± 176.89 in patients from

Killip's class 3, and 119.43 ± 55.86 in patients from Killip's class 4.

There was a correlation between peak CPK-MB and Killip's class. The lower peak CPK-MB in patients with Killip's class 4 may be due to the early mortality of these patients. The distribution of different MI in Killip's classes is depicted in Fig. 4.

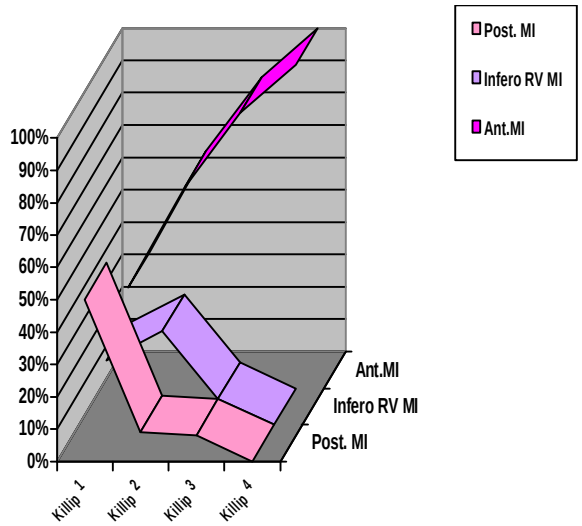


Fig. 4. Distribution of different types of MI in different Killip's classes

In Killip's class 1, posterior MI was most prevalent, while in Killip's classes 3 and 4, anterior MI was primarily seen. Therefore, the poorest prognosis was with anterior MI.

The mean age of patients with anterior MI, posterior MI and infero-RV MI was 61.78 ± 12.60, 61.17 ± 8.51 and 63.78 ± 13.25, respectively.

No significant difference was seen in the mean age of different types of MI (P=0.601).

Amongst the different types of MI in this study, anterior MI had the lowest ejection fraction. Ejection fraction in patients with anterior MI was 28.55% ± 10.83%, while mean ejection fraction in infero-RV and posterior MI was 37.5% ± 9.54% and 39.10% ± 6.87%, respectively.

There was a significant difference between different types of MI and ejection fraction. Mean WMSI in patients with anterior MI, infero-RV MI and posterior MI was 2.23 ± 0.28, 1.96 ± 0.42 and 1.90 ± 0.28. A significant difference between different types of MI and WMSI was determined (P<0.0001), suggesting that WMSI is higher in anterior MI than both infero-RV MI and posterior MI.

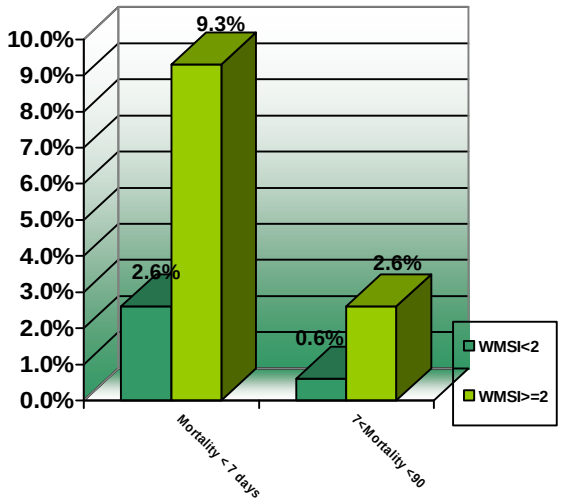


Fig. 5. Mortality in different group of WMSI

Discussion

In this study, we compared WMSI, as determined by echocardiography early after an acute coronary event, with Killip's classification in order to determine patients' risk following an acute MI episode.

Even though there is a correlation between WMSI and Killip's classes, we found WMSI to be a better predictor of patients' risk than Killip's classification. In our study, some patients with higher WMSIs fell within lower Killip's classes and had poorer prognoses. Therefore, we suggest classifying patients with higher WMSI as 'high risk'.

Early mortality in patients with higher WMSI was higher than that in those with lower ones. Patients with higher Killip's class and WMSI had lower ejection fractions.

We propose calculating WMSI by echocardiography within the first several

hours of admission in all patients with acute myocardial infarction. This technique is a reliable means for classification of low and high risk patients according to WMSI. Furthermore, this allows physicians to define improved, immediate therapeutic strategies including intervention procedures according to WMSI.

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