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Original Article

Comparing angiography features of inferior versus anterior myocardial infarction regarding severity and extension in a cohort of Iranian patients

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Abstract

BACKGROUND: The location of acute myocardial infarction (MI) is an important prognostic factor for risk stratification of patients with first ST-segment elevation MI (STEMI). The main goal of this study was to compare the severity and extension of coronary involvement in inferior and anterior MI.

METHODS: This study reviewed angiographic reports of 579 patients with a first anterior wall STEMI and 690 with a first inferior STEMI that were referred to Tehran Heart Center between March 2004 and September 2007. The number of coronary vessels involvement and the presence of left main lesion were determined based on angiography reports. The Gensini score was also calculated for each patient from the coronary arteriogram.

RESULTS: Incidence of left main lesion was similar between the two groups. Although coronary arteries involvement according to Gensini score was more severe in anterior wall MI group compared with inferior wall MI group, the number of involved coronary arteries was significantly higher in the inferior MI patients. Recommendation of coronary artery bypass grafting, percutaneous coronary intervention (PCI) or medical treatment were the same for both groups; however, patients with anterior MI were treated more with primary PCI.

CONCLUSIONS: According to our angiography database, despite anterior wall MI is associated with more severity of coronary artery disease; inferior wall MI is more extent with regard to the number of involved coronary vessels. Location of MI can predict the severity and extension of infarction.

KEYWORDS: Myocardial Infarction, Coronary Vessels, Angiography.

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Coronary artery disease (CAD) is one of the most common causes of morbidity and mortality, particularly in developing countries such as Iran. Although age-adjusted mortality from myocardial infarction is gradually falling in developed countries, the death rate has increased to 20%-45% among Iranians, especially in the younger population.[1,2] It is believed that changing lifestyles such as high consumption of processed foods rich in saturated fat and a low level of physical activity are leading to a progressive increase in the prevalence of MI and its risk profile.[3] Despite the importance of determining correlates of the severity and extension of infarction, the role of some factors such as location of cardiac ischemia for predicting coronary artery severity and its-related life-threatening events particularly in our population has been already questioned.

Several factors have been shown to predict the increased risk for recurrent cardiac events and death after acute myocardial infarction; one of the most important factors includes anterior location of the infarct.[4] This factor can influence the improvement rate of left ventricular ejection fraction and wall motion after the onset of acute myocardial infarction and

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may be accompanied by different complications and mortality rates in comparison with other types of wall involvement.[5] Some studies compared the prognosis of two common types of inferior and anterior wall myocardial infarction and confirmed that anterior wall infarction were associated with worse complications and higher mortality than inferior.[6] However, some recent studies have hypothesized that inferior wall myocardial infarction can be associated with a significantly higher risk of mortality than anterior wall and this result has been obtained based on long-term evaluations.[7] It was also found that although patients with initial anterior wall myocardial infarction had a relatively unfavorable early outcome, the late outcome appeared to be unaffected.[3] In addition, it was shown that the site of the infarct can be influenced by early outcomes but not long-term prognosis.[8] Inferior myocardial infarction causing substantial myocardial damage usually is large and often includes right ventricular involvement, the factor that influences long-term prognosis. However, an important question remains about the differences in the severity and extension of coronary arteries involvement in the two types of inferior and anterior wall infarction.

The main goal of the present study was to compare the severity and extension of coronary artery involvement in the two types of myocardial infarction according to our angiography database.

Methods

Between March 2004 and September 2007, 579 patients with first anterior wall myocardial infarction and 690 patients with first inferior wall myocardial infarction were admitted to the angiography ward of the Tehran Heart Center within 6 hours of the onset of chest pain. In the present study, demographic characteristics, clinical criteria, and angiographic data of these patients were extracted from hospital recorded files and entered into a computerized database form. Patients had the following criteria: (1) typical chest pain lasting ≥ 30 min; (2) ST-segment elevation ≥ 0.2 mV in ≥ 2 contiguous precordial leads (for the diagnosis of anterior wall myocardial infarction) or ≥ 0.1 mV in II, III, and aVF leads (for the diagnosis of inferior wall myocardial infarction) on the admission ECG; (3) increase in serum creatine kinase (CK) level more than twice the normal value; (4) no previous myocardial infarction; and (5) no other heart or lung disease. Coronary artery disease was considered significant if there was a 70% or greater stenosis in the luminal diameter of coronary arteries in any view. A stenosis of 50% or more in the left main coronary artery was considered significant.[9] Patients with Behcet's disease and other inflammatory disorders were excluded. Patients were also given self-administered questionnaires about their medical history and early complications after myocardial infarction. The following data were included for analysis:

The Preoperative Variables

1) General characteristics: age, gender, and body mass index (BMI)

2) Coronary artery disease risk factors: current smoking history (patients regularly smoke a tobacco product one or more times per day or have smoked in the past 30 days prior to admission),[10] alcohol abuse (repeated use despite recurrent adverse consequences),[11] opium dependence (according to the DSM-IV Criteria for Substance Dependence),[12] hypercholesterolemia (total cholesterol ≥5.0 mmol/L, HDL-cholesterol ≥ 1.0 mmol/L in men, and ≥ 1.1 mmol/L in women, and triglycerides ≥ 2.0 mmol/L),[13] family history of CAD (first-degree relatives before the age of 55 in men and 65 in women),[14] hypertension (systolic blood pressure ≥ 140 mmHg and/or diastolic ≥ 90 mmHg and/or on antihypertensive treatment),[15] diabetes mellitus (positive findings from any two of the following tests on different days: symptoms of diabetes mellitus plus casual plasma glucose concentration ≥ 11.1 mmol/L or fasting plasma glucose ≥ 126 mmol/L or 2hrPPG ≥ 11.1 mmol/L after a 75-g glucose load),[16] cerebrovascular disease, renal failure, and carotid disease

3) Hemodynamic and cardiac status: Killip class and the number of coronary vessels involvements on the basis of angiographic reports

4) Clinical recommendations and the types of final treatments. The number of coronary vessels involvement and the presence of left main lesion were determined based on angiography reports. The Gensini score was also calculated for each patient from the coronary arteriogram. The Gensini score was computed by assigning a severity score to each coronary stenosis according to the degree of luminal narrowing and its geographic importance.[17]

Results were reported as mean ± standard deviation (SD) for the quantitative variables and percentages for the categorical variables. The groups were compared using the Student's t-test for the continuous variables and the chi-square test (or Fisher's exact test if required) for the categorical variables. P values of 0.05 or less were considered statistically significant. All the statistical analyses were performed using SPSS version 13.0 (SPSS Inc., Chicago, IL) and SAS version 9.1 for Windows (SAS Institute Inc., Cary, NC, USA).

Results

Demographic characteristics and clinical data are shown in table 1. There was no difference between the two groups in terms of sex ratio, however those with anterior wall myocardial infarction were older than other patients. Except for hyperlipidemia and obesity that were more prevalent in inferior myocardial infarction group, other coronary artery disease risk factors were similar between the two study groups. The patients with inferior wall myocardial infarction were slightly in lower Killip class than the anterior wall myocardial infarction group. Incidence of left main lesion was similar between the two groups. Although coronary arteries involvement was more severe in anterior wall myocardial infarction group compared with inferior wall group, the number of involved coronary arteries was significantly higher in the inferior patients. Recommendation of coronary artery bypass grafting (CABG), percutaneous coronary

Table 1. Patients baseline characteristics and clinical data of patients with anterior in comparison with inferior wall involvement group

	Anterior wall MI* (n = 579)	Inferior wall MI (n = 690)	P value
Male gender	745 (79.6)	678 (79.9)	0.890
Age (year)	57.69 ± 10.54	56.51 ± 10.85	0.021
Obesity (BMI** > 30 kg/m^2)	145 (15.5)	174 (20.5)	0.006
Family history of CAD***	212 (23.0)	209 (25.2)	0.297
Current cigarette smoking	179 (19.2)	181 (21.4)	0.280
Opium use	139 (14.9)	124 (14.6)	0.317
Hyperlipidemia	539 (58.3)	545 (64.7)	0.006
Diabetes mellitus	265 (28.3)	238 (28.1)	0.897
Hypertension	410 (43.9)	353 (41.6)	0.323
Renal failure	21 (2.2)	12 (1.4)	0.193
Cerebrovascular disease	29 (3.1)	21 (2.5)	0.424
Killip class:			
I	636 (67.9)	560 (66.0)	
II	102 (10.9)	128 (15.1)	0.061
III	87 (9.3)	71 (8.4)	
IV	111 (11.9)	90 (10.6)	
Number of coronary arteries involvement:			
Normal	70 (7.5)	72 (8.5)	
One vessel	311 (33.2)	166 (19.6)	< 0.001
Two vessels	242 (25.9)	247 (29.1)	
Three vessels	313 (33.4)	364 (42.9)	
Left main lesions	28 (3.0)	35 (4.1)	0.196
Gensini score	29.67 ± 20.05	24.99 ± 20.13	< 0.001

* MI: Miocardial infarction; **BMI: Body Mass Index; ***CAD: Coronary Artery Disease

intervention (PCI), or medical treatment were the same for both groups, however, patients with anterior myocardial infarction were treated more with primary PCI (Table 2).

Discussion

Our study showed that despite the fact that left main lesion was similar in the two types of myocardial infarction, the number of involved coronary arteries was significantly higher in the inferior myocardial infarction patients. It has been suggested that each site of acute myocardial infarction has relatively specific mechanisms so that predominant pathophysiology in inferior infarction can be vasoconstriction and in anterior infarction can be advanced atherosclerotic process.[17]

In our study, 33.2% of anterior wall myocardial infarction patients and 19.6% of inferior wall patients had single vessel disease. We also found that 72.0% of inferior wall myocardial infarction patients had multi-vessel coronary artery disease, while this figure was 59.3% for anterior wall myocardial infarction. In line with our study, Bamrah et al found that of 80 patients with confirmed acute inferior myocardial infarction diagnosed by Thallium-201 scintigraphy, multi-vessel involvement was found in 72% of them and half of the patients had three-vessel disease.[18] A probable explanation for this finding may be the fact that our results was obtained based on our angiographic database and maybe the patients with inferior wall myocardial infarction who referred for angiography to our center had high risk features and did not include all the inferior myocardial infarction population.

Another important finding in our study was more common use of primary PCI protocol in patients with anterior wall myocardial infarction. In a study by Solodky et al patients with anterior wall myocardial infarction allocated to primary PCI had better clinical outcomes than patients with other types of myocardial infarction and this result was clearer in young patients.[19] Previous randomized trials have established the superiority of PCI over fibrinolytic treatment in patients with myocardial infarction, especially in anterior wall involvement and the beneficial effect of primary PCI was mainly found among young patients.[20]

Although we did not observed any difference in the presence of the history of diabetes mellitus between the two study groups, multivessel involvement was significantly more common in those with inferior myocardial infarction. It has been evidenced that the extent of coronary disease is greater among diabetic patients compared to non-diabetic ones. In the Multiple Risk Factor Intervention Trial, the age-adjusted incidence of coronary heart disease was four times greater in people with diabetes than in those without it.[21]

However, it seems that other factors such as age more than 65 years old, previous myocardial infarction, previous admissions because of unstable angina, peripheral artery disease, presence of more than two coronary risk

Table 2. Treatment recommendations and types of treatments in patients with anterior in comparison with inferior wall involvement group

	Anterior wall MI (n = 579)	Inferior wall MI (n = 690)	P value
Type of recommendation:			
PCI	317 (33.9)	248 (29.2)	0.128
CABG	351 (37.5)	332 (39.1)	0.642
Medical therapy	267 (28.6)	269 (31.7)	0.286
Type of treatment:			
Primary PCI	179 (19.2)	87 (10.3)	< 0.001
PCI	25 (2.7)	19 (2.3)	0.565
CABG	13 (1.4)	19 (2.3)	0.185
Medical therapy	718 (76.7)	722 (85.1)	0.146

CABG: Coronary Artery Bypass Grafting; PCI: Percutaneous Coronary Intervention

factors, left ventricular dysfunction, and low functional capacity have more important roles than the diabetes mellitus appearance for determining and predicting multi-vessel involvement.[22]

Conclusions

In summary, regarding extension of coronary artery involvement, inferior wall infarction is superior to anterior wall myocardial infarction; however, anterior wall myocardial infarction is associated with more severity in coronary artery disease compared with inferior wall myocardial infarction. Location of myocardial infarction can predict the severity and extension of the infarction.

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Conflict of Interests

Authors have no conflict of interests.

Authors' Contributions

All the authors have carried out the study, participated in the design of the study and acquisition of data performed the statistical analysis and wrote the manuscript. All authors read and approved the final manuscript.

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