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Original Article

The Existence of Obesity Paradox and Effect of Obesity on In-Hospital-Outcomes on Elderly Patients Treated with Primary Percutaneous Coronary Intervention

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SUMMARY

Background: Many studies have been conducted about the existence of obesity paradox in cardiovascular diseases. But, there is limited data on elderly patients. The aim of this study is to explore the existence of the "obesity paradox" and effect of obesity in periprocedural outcomes in patients presenting with acute myocardial infarction (AMI).
Methods: This study involved elderly patients (≥65 years) who admitted our clinic with AMI and treated for acute STEMI between April 2011 and November 2014. Patients were divided into two groups according to their body mass index (BMI [kg/m^2]) and a BMI>30 kg/m^2 was accepted as obese. We compared angiographic, electrocardiographic, echocardiographic data and in-hospital mortality between two groups.
Results: A total of 127 patients were included in the study and obese (BMI>30 kg/m^2) patients comprised 27.3% (47) of all AMI patients. Analysis of the acute coronary angiographic data revealed that the number of significant coronary lesions was higher in non-obese group (p:0.04). The last TIMI-3 rate was higher in the obese group (%91.5 vs %79.2, p:0.05), whilst corrected TIMI frame count was lower (26 ± 13 vs 32 ± 14, p:0.01). In multivariate analysis, the number of lesions was correlated with obesity (OR 0.47, 95% CI 0.37–0.99, p:0.04).
Conclusion: In our study, obesity was associated with better coronary flow after percutaneous coronary intervention and the number of lesions was lower in obese patients compared to non-obese elderly patients treated for STEMI. Our results were consistent with the phenomenon of "the obesity paradox".

1. Introduction

Based on previous reports, 26% of adults worldwide are overweight (body mass index [BMI], 25–29.9 kg/m^2), and 13% are obese (BMI ≥30 kg/m^2). In the United States, 33.6% of adults are overweight, and 34.9% are obese.[1] Obesity is a well-recognized cardiovascular risk factor. In addition, it has a significant role in metabolic syndrome.[2,3] However, the evidence is contradictory in patients with coronary artery disease. On evaluating patients with coronary artery disease or those who have undergone percutaneous coronary intervention, recent evidence has intended to the presence of an paradoxical relationship between obesity and cardiovascular prognosis.[4] Obesity paradox can be described as unexpected decrease in total number of deaths observed among patients with coronary artery disease who have higher BMI values compared to normal weight patients.

The increased risk of cardiovascular disease in obesity may be due to chronic oxidative stress mediating segmental acceleration of the aging process.[5] In contrast, aging is a prominent risk factor for atherosclerosis and cardiovascular disease. Obesity and aging are caused processing by atherosclerosis. The frequency of cardiovascular system diseases shows a linear increase with age, and two thirds of deaths after 65 years old are a consequence of

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cardiovascular system diseases.[6] Older patients are selectively excluded from acute coronary syndrome (ACS) and revascularization studies as they have a high mortality rate. For this reason, the results are an adaptation of the information obtained from younger patients applied to those patients with high morbidity and mortality. Older patients are included in very low rates in the recorded data, especially in randomized studies.[7]

The aims of this study are to evaluate the obesity paradox through angiographic, echocardiographic, and electrocardiographic parameters for patients who underwent primary (PCI) for acute ST elevation myocardial infarction (STEMI) and to investigate the effect of obesity on those parameters.

2. Materials and methods

This study is a retrospective and registry trial. Patients who were consulted to our clinic with the diagnosis of STEMI between April 2011 and November 2014 and whom primary PCI process were performed were included in the study consecutively. 237 of 834 patients were at 65 years old and over. We obtained 204 patients meeting eligibility criteria. We had 174 patient's BMI results. Patients at 65 aged and over and with ischemia duration less than 12 h were included in the study. Exclusion criteria were cardiogenic shock, having by-pass history, TIMI-2, 3 flow degree on admission and non-passable lesion. Creatinine Clearance was calculated according to Cockcroft-Gault Equation. Patients were divided into 2 groups as obese and non-obese, according to body mass index. BMI>30 kg/m^2 was considered as obese. Heart failure, mechanics complication and arrhythmia-related deaths were accepted as in-hospital mortality.

This study was approved by Kocaeli University Medical Faculty Clinical Trials Ethics Committee.

2.1. Obtaining angiographic data

Coronary angiography images of the intervention performed by SIEMENS (AXIOM-Artis 90806) device were watched. TIMI flow was evaluated according to TIMI trial classifications,[8] before and after the intervention. Corrected TIMI frame count (CTFC) was measured. The details about TIMI frame count calculation were described beforehand.[9] Frame count for LAD was corrected by diving into 1.7 since LAD artery length was longer than other two arteries.

2.2. Obtaining echocardiographic data

Wall motion score index (WMSI) was calculated via 16 segment model described by the American Ultrasound Committee and over 4 points. Ejection fraction was calculated through modified Simpson method. For diastolic function assessment, E and E′ were measured.

2.3. Obtaining electrocardiography data

Properly filmed electrocardiographs before and after the intervention were taken (amplitude: 10 mV. Speed: 25 mm/s). They were categorized as under 50% and over 50% of ST resolution.

2.4. Obtaining clinical data

Cardiogenic shock (post intervention (PI)) is defined as deterioration of organ perfusion (altered mental status, cold, clammy skin, oliguria) in patients with a systolic blood pressure <90 mmHg for at least 30 min or need for vasopressor therapy or intra-aortic balloon support to maintain systolic blood pressure >90 mmHg. Patients who died before hospital discharge are accepted as in-hospital mortality.

2.5. Statistical analysis

Statistical analyses were performed using SPSS software version 22 (SPSS Inc. Chicago, IL, USA). The variables were investigated using visual (histograms, probability plots) and analytical methods (Kolmogorov−Smirnov/Shapiro−Wilk test). To determine whether or not they are normally distributed. Descriptive analyses were presented using mean ± standard deviation for normally distributed variables. Ordinal variables were presented as number of cases with percentage. Continuous variables were compared between BMI greater than 30 and BMI lower than 30 patients were evaluated by Mann-Whitney Test and categorical variables were compared by chi-square test in the non-parametric cases. While investigating the association between non-normally distributed and/or ordinal variables, the correlation coefficients and their significance were calculated using the Spearman test. In the multivariate analysis the possible factors identified with univariate analyses were further entered into the binary logistic regression analysis to determine independent predictors of risk factors among obese patients with STEMI. Hosmer-Lemeshow goodness of fit statistics were used to assess model fit. A 5% type-I error level was used to infer statistical significance.

3. Results

Regarding baseline characteristics, age was not significantly different between the groups (72 ± 6 years vs. 73 ± 6, p = 0.27). Female sex difference in the obese group was determined as having diabetes mellitus and high blood pressure (p = 0.001, p = 0.03, and p = 0.04, respectively). Hyperlipidemia was similar between the groups (36.2% vs. 42.6%, p = 0.44). Heart rate was higher in the obese group than in the non-obese group (76 ± 19 beats/min vs. 82 ± 16 beats/min, p = 0.03). Other baseline characteristics are given in Table 1.

Single vascular disease rate was higher in the obese group, but lesion number was higher in the non-obese group (p = 0.04). There was no difference between the groups in terms of other operational features. There were no differences in medication used between groups (Table 2).

CTFC was found to be lower on angiographic assessment of the obese group compared to that in the non-obese group (32 ± 14 vs. 26 ± 13, p = 0.014). TIMI-3 flow was in favor of the obese group (79.2% vs. 91.5%, p = 0.05). E/E′ ratio was higher in the obese group than in the non-obese group (11 ± 4 vs. 14 ± 5, p = 0.038). No difference was found between the groups in terms of other echocardiographic assessments (Table 3). A >50% ST segment resolution was found to be similar in two groups (76.1% vs. 80.6%, p = 0.60). Post-intervention cardiogenic shock (PI) rates were similar in both groups (4.3% vs. 4.7%, p = 0.89). In-hospital mortality rate was not different between two groups (2.4% vs. 0%, p = 0.56). Two patients died of arrhythmia and one died due to a cardiac pump failure in non-obese group.

Statistically significant factors were identified using univariate analyses; TIMI-3 flow count (p = 0.05) was further entered into the binary logistic regression analysis to determine independent predictors of risk factors among obese patients with STEMI. Obesity was inversely related with number of coronary lesions (p = 0.04). Male sex was correlated with obesity. TIMI-3 flow showed a tendency to be directly proportional (Table 4).

4. Discussion

Age older than 65 years is found to be related to poor prognosis, and the mortality and morbity increases with age.[10] In contrast,

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