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Outcomes of On-pump Coronary Artery Bypass Grafting in Patients with Metabolic Syndrome in Mashhad, Iran

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ABSTRACT

Introduction: Metabolic syndrome (MS) is considered as an important risk factor for advanced coronary artery disease. This condition can increase the mortality and morbidity in the patients undergoing coronary artery bypass graft (CABG) surgery. The aim of study was compared mortality and morbidity after off Pump-CABG surgery between patients with and without Metabolic syndrome.
Materials & Methods: This prospective cross-sectional study was conducted on 120 patients, who underwent off-pump CABG surgery within October 2014-October 2016. The participants were equally divided into two groups including the patients with and without MS (MS and non-MS, respectively).
Results: According to the results, 68 (56.6%) patients were male. Furthermore, out of the 60 participants with MS, 36 (60%) cases were male. The mean ages of the MS and non-MS groups were 64.96±9.6 and 65.62±10.6 P=0.6 years, respectively. No statistically significant difference was observed between the two groups in terms of the mortality and morbidity (e.g., surgical wound infection, length of Intensive Care Unit and hospital stay, atrial fibrillation rhythm, and bleeding in the first 24 h). The intubation time in patients with Metabolic Syndrome was significantly higher than patients without Metabolic Syndrome (6.66 ± 1.97 vs 5.83 ± 1.93 respectively; P=0.007)
Conclusion: Metabolic syndrome was not associated with higher mortality and morbidity after CABG surgery compare to patients without Metabolic syndrome, although patients with Metabolic syndrome had higher risk for long intubation time.

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Introduction

The prevalence of metabolic syndrome (MS) has been increasing rapidly in the recent decades as a consequence of physical inactivity and poor dietary habits (1-3). There are several diagnostic criteria for the MS among which the definitions recommended by the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) and International Diabetes Federation (IDF) are the most common ones (4-6).

Base on the NCEP-ATP III guideline, MS is diagnosed when the patients have at least three of

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the following criteria: blood pressure of ≥ 130/85 mmHg or the consumption of antihypertensive drugs, fasting glucose level of ≥ 110 mg/dL or known case of diabetes mellitus (DM), hyperlipidemia (HLP) (fasting plasma triglycerides ≥ 150 mg/dL) or the use of anti-lipid drugs, high-density lipoprotein level of < 40 mg/dL in men and < 50 mg/dL in women, and waist circumference of > 102 cm in males and > 88 cm in females (7, 8).

Several studies have reported that the patients with MS have higher cardiovascular and coronary artery disease (CAD) mortality (9, 10). Many of the patients afflicted with CAD have to undergo CABG, and the presence of one or more components of MS can affect the risk of morbidity and mortality after CABG procedure (10). Historically, clinicians believe that overweight and uncontrolled DM patients are at a greater risk of sternal wound infection and dehiscence (11, 12).

Other studies also demonstrated that hyperglycemia and HLP increased the rate of early graft failure, perioperative myocardial infarction, and other complications (13). In the long-term follow-up, the incidence of occluded vein graft after CABG surgery is higher in the patients with MS. With this background in mind, the current study aimed to assess and compare the mortality and morbidity between the patients with and without MS.

Materials and Methods

In prospective cross-sectional study within October 2014-October 2016 This study was conducted on 120 patients undergoing CABG surgery in the Department of Cardiovascular Surgery of Imam Reza Hospital in Mashhad University of Medical Sciences, Mashhad, Iran. The patients were divided equally into two groups consisting of the patients with and without MS (MS and non-MS groups, respectively) according to the criteria of ATP III (2001) and IDF (2005), which are listed in Table 1.

Statistical analysis was performed with SPSS (version 16, SPSS Inc., IL, and USA. Normal distribution of data was assessed by Kolmogorov Smirnov test. Chi Square test was used to determine differences in the frequency of variables between the two study groups. Continuous variables according to normal distribution were tested via independent sample T test or the Mann Whitney U test. A p-value ≤0.05 (two sided) was considered to be statistically significant

All of the procedures were performed with one surgical team. The data were collected from the medical records of the patients. The collected data included such information as age, gender, postoperative length of stay at the Intensive Care Unit (ICU), total length of stay at the hospital, amount of bleeding in the first 24 h after procedure, atrial fibrillation rhythm, superficial and deep wound infection, sternal dehiscence, and mortality of each group.

Results

According to the results, 68 (56.6%) patients were male. Furthermore, out of the 60 patients with MS, 36 (60%) cases were male. There was no statistically significant difference between the MS and non-MS groups in terms of their gender (P=0.461). The mean ages of the MS and non-MS groups were 64.96±9.6 and 65.62±10.6 years, respectively. The superficial wound infection (13.3% vs. 5%), deep wound infection concomitant with sternal dehiscence (2.5% vs. 1.7%), atrial fibrillation rhythm (10% vs. 5%) and smoking (35% vs. 26.7%) were more prevalent in the MS group than those in the non-MS group. Nevertheless, this difference was not statistically significant between the two groups.

The length of ICU stay was longer in patients with MS (2.48 ± 0.83 vs 2.38 ± 0.93; P =0.65) but was not statistically significant. The same pattern was seen for length of hospital stay; that was not statistically significant higher days in patients with MS compared to patients without MS (6.39 ± 2.35 vs 6.10 ± 1.88; P= 0.409). The mean amount of bleeding in the first 24 h following the surgery, was not significant

Table 1. Diagnostic criteria of metabolic syndrome developed by the National Cholesterol Education Program Adult Treatment Panel III and the International Diabetes Federation

National Cholesterol Education Program Adult Treatment Panel III	International Diabetes Federation
Abdominal obesity: waist circumference 94-102 cm (males) 80-88 cm (females)	Central obesity Triglyceride > 1.7 mmol/L or receiving specific treatment
Triglycerides > 1.7 mmol/L	High-density lipoprotein cholesterol < 1.03 mmol/L (males) < 1.29 mmol/L (females)
High-density lipoprotein cholesterol < 1.03 mmol/l (males) < 1.29 mmol/l (females)	Hypertension Systolic pressure > 130 mmHg Diastolic pressure > 85 mmHg or specific treatment
Hypertension Systolic pressure > 130 mmHg Diastolic pressure > 85 mmHg	Fasting plasma glucose > 5.6 mmol/L or known case of diabetic mellitus type II
Fasting blood sugar > 6.1 mmol/L	

between the two groups (P=0.84). In addition, the mortality indices were 4 (6.7%) and 2 (3.3%) in the MS and non-MS groups, respectively; nonetheless, this difference was not statistically significant (P=0.67). A significant difference (P=0.007) was obtained between the MS (6.66±1.97 h) and non-MS (5.83±1.93 h) groups regarding the intubation time (Table2)

Table 2. Clinical and demographic data of the patients with and without metabolic syndrome undergoing coronary artery bypass grafting

Characteristics	Metabolic syndrome (n=60)	Non-metabolic syndrome (n=60)	P-value
Gender female male	 24 36	 28 32	0.461
Age (years) mean±SD	64.96±9.6	65.62±10.6	
Superficial wound infection N(%)	8(13.3)	3(5)	0.114
Deep wound infection and sternal dehiscence N(%)	3(2.5)	1(1.7)	0.619
Atrial fibrillation rhythm N(%)	6(10)	3(5)	0.32
Mortality index N(%)	4(6.7)	2(3.3)	0.67
Smoking N(%)	21(35)	16(26.7)	0.32
Bleeding (ml) (first 24 hours after surgery)	590.18±281	590.52±295	0.84
Intensive care unit stay (day)	2.48±0.831	2.38±0.93	0.409
Hospital stay (day)	6.39±2.3	6.10±1.88	0.65
Intubation time (hours)	6.66±1.97	5.83±1.93	0.007

Discussion

The presence of MS can be considered as an important risk factor for advanced CAD. In the western countries, the prevalence of MS has been increasing, especially with aging (2, 14). Based on the ATP criteria, the prevalence of MS has been recently reported to be 50.8% in Iran. There are a number of studies revealing the higher prevalence of MS among the females with CAD (15). On the other hand, some other studies indicated the increased prevalence of this syndrome in the males (16, 17).

However, our study showed no significant differences between the males and females in this regard. Brackbill et al. reported that gender could be a good predictor in the patients undergoing CABG surgery (15). The majority of the patients who have MS will eventually need to undergo the CABG procedure. Many of the patients with DM, HLP, chronic hypertension, and overweight can be classified in MS category (3, 18). This subgroup of patients are at a greater risk of the CABG complications and mortality (19, 20).

Uncontrolled or poorly controlled diabetes is a well-known risk factor for superficial or deep sternal wound infection and dehiscence (19). The role of DM was estimated in a large study that was performed in numerous referral hospitals. In the mentioned study, it was reported that 30-day mortalities after CABG procedure in the patients with and without DM were 3.7% and 2.7%, respectively (20). The patients with body mass index of ≥ 30 kg/m2 (i.e., obese status) are a challenge for the cardiac surgeons and have more chance for postoperative complications such as wound infection, prolonged intubation, and myocardial infarction (21, 22).

On the other hand, according to several studies, the patients with low body mass index have reported to have a higher risk of postoperative morbidity and mortality, compared to their obese or normal-weight counterparts (23, 24). Moreover, in another study conducted on 10,268 patients undergoing isolated CABG, overweight was reported as an unimportant risk factor for early and hospital mortality after CABG procedure (19).

The findings reported by different studies investigating the effects of MS on perioperative outcomes after CABG procedure are contradictory. While some studies have reported MS as an independent and powerful risk factor for mortality after CABG surgery, others have indicated no significant effect of MS on operative mortality (25). Ardeshiri et al. (26) demonstrated that the perioperative morbidity rate was higher in the patients with MS undergoing CABG surgery than those without MS. In the mentioned study, the most common complications were reported to be bleeding, atelectasia, dysrhythmia, and myocardial infarction.

The meta-analysis of 18 trials with 18,457 CAD patients yielded the increased risk of morbidity and mortality after revascularization (25). On the other hand, in two studies conducted by Pimenta et al. (26) and Ozyazicioglu et al. (26), no difference was reported between the two groups regarding the increased morbidity and mortality after CABG surgery.

Likewise, in our study, there was no difference between the two groups in terms of the CABG mortality; however, the patients with MS had a significantly longer intubation (P=0.007). Furthermore, in the present study, the amount of bleeding in the first 24 h after CABG surgery was not statistically different between the patients with and without MS.

In a recent study investigating the hemorrhage after CABG requiring reexploration, it was reported that the need to reoperation in no-obese patients was significantly lower than

that in the obese patients (19). In another study conducted in Japan in 2009, it was shown that the patients with MS had an important risk factor for postoperative morbidity after CABG. These patients had odds ratios of 2.47 and 3.81 for postoperative CVA and postoperative renal failure, respectively (20, 21).

Conclusion

Metabolic Syndrome was not associated with increased mortality and morbidity compare to patients without Metabolic Syndrome.

Acknowledgments

Non

Conflict of Interest

The authors declare no conflict of interest.

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