CARDIOVASCULAR RISK FACTORS AND IN-HOSPITAL MORTALITY IN 1258 CASES OF CORONARY ARTERY BYPASS SURGERY IN TEHRAN HEART CENTER

M. H. Mandegar[1], M. Marzban[2], A. H. Lebaschi[3]*, P. Ghaboussi[4], A. R. Alai-Alamooti[5] and A. Ardalan[6]

1) Department of Cardiac Surgery, Shariati Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

2) Department of Cardiac Surgery, Tehran Heart Center, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

3) Department of Surgery, Imam Medical Complex, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

4) General Practitioner, Research Division, Tehran Heart Center, Tehran University of Medical Sciences, Tehran, Iran

5) Department of Pathology, Imam Medical Complex, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

6) Department of Epidemiology Faculty of Health and Institue of Health Research, Tehran University of Medical Sciences, Tehran, Iran

Abstract- Coronary artery bypass grafting (CABG) surgery is being performed increasingly in Iran. So far, no large-scale report has described characteristics and risk factor profile and in-hospital mortality of patients undergoing this procedure in Iran. We conducted this study to address these topics in order to help clarify Iran's current state of CABG and to provide assistance in planning combat against coronary artery disease based on frequency of major risk factors. Patients who underwent isolated, first-time, elective, on-pump (conventional) CABG in a cardiac surgery center in Tehran were prospectively studied from September 2004 and March 2005. Demographic data, risk factor profile and discharge status for each patient were recorded. There were 1258 patients, 937 men (74.5%) and 321 women (25.5%). The mean age was 58.7 years (range 28 to 81); 133 patients (10.6%) were 70 years old or older. Mean body mass index (BMI) was 27.01 and 42.2% of the patients were smokers, 39.4% were hypertensive, and 27.6% had diabetes. Family history was positive in 40.3%. Congestive heart failure was found in 26.6%. New York Heart Association functional class III or IV was observed in 52.8% of patients. Single-vessel, two-vessel, and multi-vessel disease was found in 4.2%, 21.1%, and 74.7% of patients, respectively. Left main was involved in 9.8% and 14.4% had ejection fraction < 35%. The in-hospital mortality was 1.5%, mainly due to cardiac causes. This study indicates significant prevalence of major cardiovascular risk factors in Iranian CABG patients. In-hospital mortality of primary isolated CABG in Iran is similar to reported rates.
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Key words: Coronary artery bypass surgery, risk factor, in-hospital mortality

* Corresponding Author:
Amir Hussein Lebaschi, Address: Head Office of the Department of Surgery, Imam Medical Complex, Tehran University of Medical Sciences, Tehran, Iran.
Tel: +98 9123159507
Fax: +98 21 66937185
Email: ah_lebaschi@yahoo.com

INTRODUCTION

Coronary artery bypass grafting (CABG) surgery has been the most intensely studied operation in the history of surgery (1). However, conducting studies of bypass surgery has been like aiming at a moving

target. As techniques and experiences improve, new other technologies develop and patients' demography and risk factors undergo some degree of alteration from time to time.

CABG is one of the most effective and most durable remedies for coronary artery disease (CAD). This procedure in now being performed with increasing numbers in Iran and the importance of scrutinizing Iranian patients characteristics and the outcome of surgeries cannot be overemphasized. Although some aspects are regarded as universal regardless of geographical and ethnic categorizations, each nation possesses unique circumstances that directly or indirectly affect patients' spectrum and risk factor profile, and since this profile is dynamic, a continuous system of registry is unavoidable (2-4).

In this study, characteristics and in-hospital mortality of a large number of patients undergoing isolated, elective, first-time CABG in Iran's busiest cardiac surgery center is presented. To the best of our knowledge, there has been no report of such a scale in Iranian literature, and it is hoped that the data presented in this paper will be of advantage while planning to combat CAD and to evaluate health care strategies in the future. The great volume of data obtained during this study could potentially provide us with various descriptive and analytical results, but as a basic and preliminary report, which is in fact the much-needed data for our current state of health problems, authors confine themselves to the reporting of the aforementioned information.

MATERIALS AND METHODS

From September 2004 to March 2005, data for patients who underwent isolated on-pump (conventional) CABG in Tehran Heart Center (affiliated to Tehran University of Medical Sciences) were prospectively collected. The inclusion criteria were isolated, first-time, elective CABG. Patients were entered into the study on a convenient basis, solely dependent upon the duration of the study without sample size calculation. Tehran Heart Center institutional ethics committee approved the study protocol. We obtained informed consent from all patients.

For all patients, the preoperative data, including known major risk factors (cigarette smoking, diabetes, hypertension, cerebrovascular accidents, myocardial infarction, hypercholesterolemia, family history of cardiac disease) and other clinical conditions (chronic pulmonary disease, chronic renal failure, dysrhythmias) as well as history of previous vascular interventions (peripheral vascular surgery, carotid endarterectomy, and percutaneous coronary intervention) were recorded in a standard data form by trained data collectors on the day of admission. Objective data (lipid profile, ejection fraction, number of diseased vessels, and involvement of the left main coronary artery) were recorded after completion of the pre-operative work up, mainly the day before surgery.

The definitions for various risk factors in this study were adopted from modified version of Society of Thoracic Surgeons (STS) National Cardiac Surgery Database guidelines made on November 1997 (5, 6). For documentation of functional class, the authors utilized New York Heart Association (NYHA) classification system.

After surgery, operative data were made a note of in the corresponding part of the data form and the patients were followed up until the day of discharge. Then, the discharge status of the patients and the cause of death, if death had occurred, were recorded.

Before actual data collection, data collectors recorded data for other patients and through extensive discussion sessions, the authors made sure of acceptable consistency in data collection process.

The study design and conduct suffers from some limitations. We would like to include more variables in the study to document factors such as patients' ethnicity. We would also favor collection of data concerning post-operative complications.

Data were entered into a dedicated database (Microsoft Access 2000, Microsoft Corp) and were analyzed with SPSS 10.5 (SPSS Inc). Quantitative values were compared using t test for independent groups, and for categorical data, Chi-square and Fisher's exact tests were applied.

RESULTS

At the end of the study period, data from 1258 patients operated on by six surgeons were collected. There were 937 men (74.5%) and 321 women (25.5%). The mean age was 58.7 years (range 28 to 81 years). The mean age of men was 57.87 and that of women was 60.97 years (*P* value < 0.001); 133 patients (10.6%) were 70 years old or older. The mean weight was 73.49 kg (95% CI 72.81-74.17) and the mean height was 165.35 cm (95% CI 164.82-165.88), leading to a mean body mass index (BMI) of 27.01 (95% CI 26.69-27.33). Table 1 summarizes distribution of different BMI categories among patients. Most of the patients were non-obese, but still the majority of the patients had more-than-appropriate BMI.

Table 2 summarizes distribution of major risk factors as well as other clinical conditions, and the overall lipid profile of the patients is shown in Table 3. Silent disorders such as hypertension and diabetes had significant prevalence among patients. A positive family history could be unequivocally obtained in about 40% of the patients. Nearly all of our patients were symptomatic with respect to cardiac ischemia in the form of angina pectoris, and half of the patients had at least one attack of myocardial infarction. There were few patients who had undergone percutaneous coronary intervention prior to surgery.

Table 4 shows the data concerning functional class, number of diseased vessels, and ejection fraction.

Of 1258 patients operated on, 19 patients (1.5%) died in hospital. The causes of death were cardiac (17, 89.5%), infectious (1, 5.3%), and neurologic (1, 5.3%).

Table 1. Distribution of BMI categories among patients

BMI Category	Percent
Non-obese (BMI ≤ 30)	
Less than appropriate (BMI ≤ 20)	2.8%
Appropriate (20 < BMI ≤ 25)	32.6%
More than appropriate (25 < BMI ≤ 30)	44.3%
Obese (BMI > 30)	
Obese (30 < BMI < 40)	19.7%
Severely obese (BMI ≥ 40)	0.6%

Abbreviation: BMI, body mass index.

Table 2. Distribution of risk factors and other clinical conditions among patients

Risk factor/Condition	Percent with positive finding
Cigarette smoking	42.2%
Hypertension	39.4%
Diabetes mellitus	27.6%
Family history	40.3%
Myocardial infarction	50.5%
Angina	97.3%
Congestive heart failure	26.6%
Dysrhythmia	5.2%
Cerebrovascular accident	3.3%
Chronic pulmonary disease	3.9%
Chronic renal failure	0.9%
History of percutaneous coronary intervention	3.2%
History of carotid endarterectomy	0.3%
History of peripheral vascular surgery	0.4%

DISCUSSION

In this study, the authors have presented the characteristics of patients who required surgery as a treatment of CAD. There is a question of whether the results of this study can be generalized to all CAD patients nationwide. There has been no report if patients of Tehran Heart Center can perfectly represent all Iranian patients, but since it is a very high-volume institute that receives patients form all regions of the country, it may not be unreasonable to regard the data of this report as one that can be applied to Iranian CABG patients in general.

Iranian CABG patients' characteristics are somewhat similar to other great Asian nations (7, 8). In reports from India and China, each comprising more than a thousand patients, patients age and gender ratio as well as overall risk factor profiles were similar to those of our patients. In contrast, reports from North America and Europe indicate a larger proportion of older patients and increasing number of CABG in high risk groups (9-13).

Table 3. Lipid profile of the patients

Lipid	Mean (Mean ± 2SD) (Range)
Cholesterol (mg/dl)	227.02 (124.4 - 329.62)(32-448)
LDL (mg/dl)	141 (51.54 – 230.46)(49-328)
HDL (mg/dl)	39.02 (17.24 – 60.8)(17-84)
Triglyceride (mg/dl)	226.9(85.48 – 368.32)(49-861)

Abbreviations: LDL, low density lipoprotein; HDL, high density lipoprotein.

Table 4. Functional class, number of diseased vessels, and ejection fraction among patients

Item	Data concerning positive finding
Functional Class	
Class I	7.2%
Class II	40%
Class III	33.7%
Class IV	19.1%
Number of diseased vessels	
One	4.2%
Two	21.1%
Three	74.7%
Left main involvement	9.8%
Ejection fraction	48.42% (15%-75%)
Ejection fraction <35%	14.4%

In-hospital mortality rate of the primary isolated CABG is reported to be 1-3% (1). The in-hospital mortality in our study was 1.5%, which is an acceptable figure. Several reports have indicated a change in CABG patients' characteristics during last two decades (14, 15). These older and newer reports indicate a gradual increase in CABG mortality because of the increasing number of elderly patients (greater than 70 years of age), the escalating frequency of reoperative CABG cases, and growing number of acute myocardial infarction patients with unstable angina pectoris presenting for CABG. These reports predict that the operative mortality will continue to rise.

In conclusion, authors have presented a picture of Iranian CABG patients, indicating a significant prevalence of major cardiovascular risk factors. They emphasize the role of preventive measures to reduce the magnitude and severity of these risk factors. CABG in-hospital mortality rate in Iran is similar to that reported by most institution, pointing to the fact that it is as safe as most other centers. Registration of CABG patients' characteristics in a continuous manner will help assess the efficacy of preventive strategies.

Acknowledgement

Conflict of interests

The authors declare that they have no competing interests.

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