

## Possible effect of CABG on moderate mitral regurgitation

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### ABSTRACT

**Introduction:** Mitral valve insufficiency in adults is often a complication of ischemic heart disease. Coronary artery bypass grafting (CABG) is performed as a strategy for the treatment of coronary artery disease. The aim of this study was to evaluate mitral regurgitation (MR) before and after CABG.

**Materials and Methods:** This Experimental study was conducted on 100 patients who underwent CABG in University Hospitals of Tehran, Iran, from 2009 to 2013. Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc. Chicago, IL) for Windows was used for data analysis..

**Results:** Out of 100 patients (i.e., 60 males and 40 females) with the mean age of  $64.97 \pm 10.64$  years, 11 males (18.3%) and 12 females (30.0%) were identified with MR +2 after the surgery. There was no significant relationship between renal insufficiency and MR before the operation ( $P=0.370$ ). Furthermore, in patients with and without renal insufficiency, 2 (50.0%) and 21 (21.9%) subjects were identified with MR +2 after the operation, respectively. Out of 100 patients, 75 (75%) cases with MR +2 before the surgery were identified with MR +1 after the operation. Moreover, 23 (23%) subjects with MR +2 before the surgery were still reported with MR +2 after the operation. In this regard, there was a significant relationship before and after the surgery in MR severity ( $P=0.02$ ).

**Conclusion:** It is necessary to have sufficient knowledge of the risk factors in dealing with MR for the determination of the best therapy.

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### Introduction:

There are various treatments for coronary artery disease among which coronary artery bypass grafting (CABG) is one of the most

common methods [1]. Every year, coronary artery bypass operation is conducted on more than 800,000 people [2]. However, a suitable treatment for ischemic mitral regurgitation

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(IMR) is still being discussed. Coronary artery diseases and myocardial infarction (MI) can be combined with IMR [3-5]. The IMR can be due to the transformation of the left ventricle, MI, and/or annular dilatation following coronary artery disease, while the structure of the mitral valve seems normal in IMR [3-5]. This condition has an undesirable effect on the survival rate of heart failure during the time [6-9].

Repairing the mitral valve through CABG requires open heart surgery that can increase the risk of infection after the operation by increasing the duration of cardiopulmonary bypass and aortic clamp [7]. The combined method (i.e. CABG with repairing mitral valve) is used in patients with moderate IMR, which is accompanied by a significant reduction in post operation infection [7, 10]. Many studies have been conducted regarding this case; in some of them, there was no change in IMR rate after performing CABG [11, 12]. Moreover, the results of some other studies show that vascular surgery alone might be effective in IMR recovery [10, 13]. The aim of this study was to evaluate the effect of CABG on mitral regurgitation severity.

### **Materials and Methods:**

This quasi experimental analytic study was conducted on 100 patients with moderate MR and indication of CABG in University hospitals

of Tehran, Iran, from 2009 to 2013 were selected using convenience sampling method. Informed consent was obtained from the patients in this study. Moderate MR was considered as MR 2+ in echocardiography. These patients underwent echocardiography 1-2 days before the surgery and 2-3 days after the operation.

A checklist was completed, which including demographic data (e.g., age, gender, and body mass index), patients' risk factors (e.g., diabetes, hypertension, and hyperlipidemia), as well as description of open heart surgery and angiography. Patients with moderate MR and indication of CABG were enrolled in the study.

### **Ethical Considerations**

The present study followed the tenets of the Declaration of Helsinki, and written informed consent was obtained from all the patients. The study was approved by our Ethics Committee in Tehran, Iran.

### **Statistical Analysis**

Data analysis was conducted using Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc. Chicago, IL) for Windows. The Chi-square test, Fisher's exact test, and independent t-tests were used to investigate statistical relations. The Pearson correlation coefficient was used to determine the

Correlation between variables The significance level was considered  $P < 0.05$ .

### Results:

Out of 100 patients (i.e., 60 males and 40 females) with the mean age of  $64.97 \pm 10.64$  years, 11 males (18.3%) and 12 females (30.0%) were identified with MR +2 after the surgery. Out of 13 and 87 patients with and without peripheral artery disease, 12 (92.3%) and 87 (100.0%) cases were identified with MR +2 before CABG, respectively. There was no significant relationship in this case ( $P = 0.130$ ). (Table1)

After the surgery, 61.5% and 77.0% of the patients with and without peripheral artery disease were identified with MR +1, respectively. Furthermore, 4 (30.8%) of patients with peripheral artery disease and 19 (21.8%) cases without peripheral artery disease were recognized with MR +2 after the surgery. There was no significant relationship between peripheral artery disease and MR after the operation ( $P = 0.177$ ).

In patients with and without renal insufficiency, 4 (100.0%) and 95 cases were identified with MR +2 before the surgery, respectively. There was no significant relationship between renal insufficiency and MR before the operation ( $P = 0.370$ ). Moreover, in patients with and without renal insufficiency, 2 (50.0%) and 73 (76.0%) subjects were recognized with MR +1 before

the surgery, respectively. Furthermore, in patients

With and without renal insufficiency, 2 (50.0%) and 21 (21.9%) subjects were identified with MR +2 after the operation, respectively. There was not a significant relationship between renal insufficiency and grade of MR after the surgery ( $P = 0.296$ ). According to wall motion abnormality, there was a significant relationship between moderate MR and inferior area ( $P = 0.018$ ).

### Status of MR severity after surgery:

Out of 100 patients, 75 (74%) cases with MR +2 before the surgery were identified with MR +1 after the operation. Moreover, 23 (23%) subjects with MR +2 before the surgery were still reported with MR +2 after the operation. In this regard, there was a significant relationship before and after the surgery in MR severity ( $P = 0.02$ ).

### Discussion:

In this study, effective factors on moderate MR were investigated in patients who underwent CABG. The obtained results of the present study revealed that there was a significant association between diabetes, hypertension, hyperlipidemia, ejection fraction, and cerebrovascular disease with MR severity after CABG.

**Table 1:** Rate of Change in moderate MR according to underlying disease

		MR surgery									
		before					after				
		+0	+1	+2	Total	p-value	+0	+1	+2	Total	p-value
Diabetes	Yes	0(0%)	0(0.0%)	50(100%)	50(100%)	0.50	0(0.0%)	33 (66%)	17 (34%)	50(100%)	0.01
	no	0 (0%)	1 (25%)	49 (98%)	50 (100%)		2 (4%)	42(84%)	6 (12%)	50 (100%)	
	Total	0(0%)	1 (1%)	99 (99%)	100(100%)		2 (2%)	75 (75%)	23 (23)	100(100%)	
Hyperlipidemia	Yes	0 (0%)	0 (0.0%)	63 (100%)	63 (100%)	0.370	0 (0.0%)	45(71.4%)	18(28.6%)	63 (100%)	0.035
	no	0 (0%)	1 (2.7%)	36(97.3%)	37 (100%)		1 (3.2%)	28(90.3%)	2 (6.5%)	31 (100%)	
	Total	0 (0%)	1 (1%)	99 (99%)	100 (100%)		2 (2%)	75 (75%)	23 (23%)	100 (100%)	
Hypertension	Yes	0(0%)	0 (0.0%)	69 (100%)	69 (100%)	0.310	1 (1.4%)	47(68.1%)	21(30.4%)	69 (100%)	0.012
	no	0(0%)	1 (3.2%)	30(96.8%)	31 (100%)		1 (3.2%)	28(90.3%)	2 (6.5%)	31 (100%)	
	Total	0(0%)	1 (1%)	99 (99%)	100 (100%)		2 (2%)	75 (75%)	23 (23%)	100 (100%)	
Cerebrovascular disease	Yes	0(0%)	0 (0.0%)	7 (100%)	7 (100%)	0.930	0 (0.0%)	2 (28.6%)	5 (71.4%)	7 (100%)	0.014
	no	0(0%)	1 (1.1%)	92(98.9%)	93 (100%)		2 (2.2%)	73(78.5%)	18(19.4%)	93 (100%)	
	Total	0(0%)	1 (1%)	99 (99%)	100 (100%)		2 (2%)	75 (75%)	23 (23%)	100 (100%)	
Ejection fraction	Total	0(0%)	1 (1%)	99 (99%)	100(100%)	0.550	2 (2%)	75 (75%)	23 (23%)	100 (100%)	<0.001
	50<	0(0%)	1 (2.8%)	35(97.2%)	36 (100%)		2 (3.8%)	45(86.5%)	5 (9.6%)	52 (100%)	
	40-50	0(0%)	0 (0.0%)	45 (100%)	45 (100%)		0 (0.0%)	29(76.3%)	9 (23.7%)	38 (100%)	
	40-30	0(0%)	0 (0.0%)	10 (100%)	10 (100%)		0 (0.0%)	0 (0.0%)	8 (100%)	8 (100%)	
	30>	0(0%)	0 (0.0%)	9 (100%)	9 (100%)		0 (0.0%)	1 (50%)	1 (50%)	2 (100%)	

**Table 2:** Changes of moderate mitral regurgitation (MR) according to wall motion abnormality

		MR surgery				
		before				
		+0	+1	+2	Total	p-value
Anterior	Yes	0 (0.0%)	7 (53.8%)	6 (46.2%)	13 (100%)	0.103
	no	2(2.3%)	68(78.2%)	17(19.5%)	87 (100%)	
	Total	2 (2%)	75(75%)	23 (23%)	100 (100%)	
Inferior	Yes	0 (0.0%)	5(41.7%)	7 (58.3%)	12 (100%)	0.018
	no	2 (2.3%)	70 (75.6%)	16(18.2%)	88 (100%)	
	Total	2 (2%)	75 (75%)	23 (23%)	100 (100%)	
Posterior	Yes	0 (0.0%)	7 (70%)	3 (30%)	10 (100%)	0.753
	no	2 (2.2%)	68 (75.6%)	20 (22.2%)	90 (100%)	
	Total	2 (2%)	75 (75%)	23 (23%)	100 (100%)	
Lateral	Yes	0 (0.0%)	1 (25%)	3 (75%)	4 (100%)	0.080
	no	2 (2.1%)	74 (77.1%)	20 (20.8%)	96 (100%)	
	Total	2 (2%)	75 (75%)	23 (23%)	100 (100%)	

The behavior of moderate MR before and after CABG can be useful in the prediction and evaluation of recovery process in these patients. In a study carried out by Kang et al. in Singapore [14], it was shown that repairing the mitral valve by CABG alone in IMR treatment can be a preferable alternative for

patients with moderate MR. In the present study, it was also observed that CABG can significantly improve the rate of MR. In addition, in a study conducted by Hwang [15], in off-pump CABG, significant recovery was observed in MR patients a year after the

operation. This finding is in line with the results of the present study.

In a study conducted by Juha Mustonen in Finland, it was revealed there was a recovery rate of 42% in moderate MR through CABG [3]. However, in the present study, there was a higher recovery rate than that of the above-mentioned study. The identification of complications and risk factors before and after CABG could be used as a predictor of possible mortality. Before studying underlying diseases, the present study investigated the relationship between age and gender with MR. In the present study, there was a significant relationship between age and MR grade that is consistent with the findings of other studies [16].

In some studies, risk factors have been evaluated separately according to gender (e.g., the relation between weight and gender) [17,18]. However, no significant relationship was observed between MR and gender in the present study. Renal dysfunction and underlying diseases, such as diabetes, hypertension, and hyperlipidemia, are among other risk factors in this field [19,20]. In the present study conducted on the relations between underlying diseases and MR, diabetes, hypertension, hyperlipidemia, ejection fraction, and cerebrovascular disease had a significant relationship with MR after the surgery. These findings are in line with

the results of two meta-analyses by Nalysnyk [2] and Sarano [16]. Wall motion disorders, which can be the result of a heart attack, was another factor investigated in the present study. In this case, only inferior area motion had a significant relationship with moderate MR and; however, this finding is not in line with the results of a study by McGee et al. [21].

### **Conclusion**

In conclusion, it should be mentioned that it is necessary to have sufficient knowledge of the risk factors in dealing with the behavior of MR for the determination of the best therapy. However, there are many limitations to the prognosis. Through careful investigations, more accurate estimations can be obtained regarding the mortality of these patients. According to the determination of performing surgery as an alternative to other treatment methods, many cautions should be exercised in patients before the operation. Moreover, given the importance of this issue, further studies should be conducted with a larger sample size.

### **Conflicts of Interest:**

The authors declare that there is no conflict of interest.

### **Author Contributions:**

All the authors contributed equally to the present project.

### **Financial Disclosure:**

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