

Investigation the Effects of Coronary Artery Bypass Graft on Electrocardiogram Changes in Patients in Afshar Cardiovascular Research Center, Yazd, Iran

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Abstract: Myocardial infarction which happens post operatively belongs to surgery is due to myocardial infarctions with hemodynamic instability. The mortality is increased and reduce the survival of patients undergoing CABG surgery that depends on revascularization and ejection fraction. This study was designed to determine the electrocardiogram changes in patients undergoing coronary artery bypass graft in Afshar cardiovascular research center, Yazd, Iran. In a before-after study, 200 patients who were undergone Coronary Artery Bypass Graft surgery, from October 2001 to October 2002 in Afshar Cardiovascular Research Center in Yazd, Iran were investigated. Patient s selection was done by Haphazard method that including 145 men and 55 women. Among them 21 patients were treated with off-pump surgery and the other 179 ones treated with on-pump CABG surgery. An electrocardiogram for each patient was done once before surgery, also immediately after surgery (that was in intensive care unit after CABG surgery) and finally when they were discharged from hospital. ECGs were investigated for Q and T waves in Lateral, Anterior and Inferior segments and also left anterior hemi block, left posterior hemi block, left bundle branch block and right bundle branch block. In lateral leads 22 patients had T – depression in preoperative evaluations which was seen in 23 patients in immediately after operation and in 21 patients when they were discharged that it was not significant by chi-square test (P-Value>0.05). Pathologic Q wave were found in 13 patients with one vessel obstruction category in inferior leads while 28 patients were reported for the same wave with three vessels. In three categorized ejection fraction, 2 patients were found with pathologic Q wave in EF between 35 to 45% and one patient above 45%. In conclusion, We found that Pathologic Q wave and Reversed T in lateral, anterior and inferior leads did not changed significantly in pre and post operation investigations in our study. In this survey among conductive disorders only LBBB changed significantly between pre operation and ICU investigation and also between ICU and discharge-time ones which it may because of cardiac inflammation and edema in CABG procedure especially in first two days after surgery and it can be better just with rest.

Key words: Myocardial Infarction • CABG • Ejection Fraction

INTRODUCTION

Myocardial infarction which happens post operatively belongs to surgery. Although new ways was established to prevent of myocardial muscles and surgery techniques was increased, different types of Myocardial Infarction (MI) were reported during

Coronary Artery Bypass Graft (CABG) surgery which prevalence of them in well-equipped centers are 5-15% [1-3].

Myocardial Infarctions with hemodynamic instability increase mortality rate and reduce the survival of patients undergoing CABG surgery that depends on revascularization and ejection fraction. In a

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study, prognosis of patients with ejection fractions of more than 40% and complete revascularization was reported very well [3, 4].

Because of non specific changes in electrocardiograms (ECG) and enzymes like Creatine Phosphokinase (CPK) after CABG surgeries, post-operative MI diagnosis is very difficult. The diagnosis is reached with combination of electrocardiograms' changes (like Q waves and ST), new myocardial dysfunction areas in echocardiography and increasing CPK [5, 6].

New Q wave is the mostvaluable finding in post -operative MI, but this wave should be permanent in serial ECGs. ST-T changes confirm diagnosis beyond to other diagnostic findings, but they are not important lonely because some conditions like hypothermia, pericarditis after CABG surgery and drugs may induce ST-T changes [3].

Atrial fibrillation (AF) and atrial flutter happen usually after most types of cardiac surgery. AF has been reported approximately in 15 to 40 percent of patients in the early postoperative period undergoing coronary artery bypass graft surgery (CABG) [7-9].

Atrial fibrillation can decrease 15 to 25 percent in cardiac output after cardiac surgery [10].

In a study in Singapore, prevalence of Atrial arrhythmia after CABG surgery was 14.25% and the most one was Atrial fibrillation [11].

Yousif H. and *et al.* reported 24% supra ventricular arrhythmia between 100 patients who had no arrhythmia before CABG surgery [12].

This study was designed to determine the electrocardiogram changes in patients undergoing coronary artery bypass graft in Afshar cardiovascular research center, Yazd, Iran.

MATERIALS AND METHODS

In a before-after study, 200 patients who were undergone Coronary Artery Bypass Graft surgery, from October 2001 to October 2002 in Afshar Cardiovascular Research Center in Yazd, Iran were investigated.

Patient s selection was done by Haphazard method that including 145 men and 55 women. Among them 21 patients (10%) were treated with off-pump surgery and the other 179 ones (87.6%) treated with on-pump CABG surgery.

Determination the type of on-pump or off-pump surgery was accomplished by surgeon upon patients' situations.

Before surgery patients were asked about age, gender and history of Unstable Angina, diabetes mellitus, hyperlipidemia, smoking, acute MI, hypertension and coronary artery disease. They also investigated for congestive heart failure and Atrial fibrillation.

An electrocardiogram for each patient was done once before surgery, also immediately after surgery (that was in intensive care unit after CABG surgery) and finally when they were discharged from hospital.

ECGs were investigated for Q and T waves in Lateral, Anterior and Inferior segments and also left anterior hemi block, left posterior hemi block, left bundle branch block and right bundle branch block.

In addition, Atrial Fibrillation, Ventricular Fibrillation, Premature Ventricular Contraction and Ventricular Tachycardia were also investigated were also taken into consideration.

RESULTS

Patient s included 145 men and 55 women. Among them 21 patients (10%) treated with off-pump surgery and 179 ones (87.6%) treated with on-pump CABG surgery.

Between our patients, 43% were suffered from HTN. Also unstable angina and Myocardial Infarction were reported respectively 42.5% and 39%. Atrial fibrillation and ventricular tachycardia before operation were not reported in patients but in post operation increased into 5% and 2% respectively. There was no sign of Atrial flutter and ventricular fibrillation both in before and post surgery evaluations. Premature ventricular contraction increased from 15.3% in preoperative examination to 48.8% in post operative ones.

In lateral leads 22 patients had T – depression in preoperative evaluations which was seen in 23 patients in immediately after operation and in 21 patients when they were discharged that it was not significant by chi-square test ($P\text{-Value} > 0.05$). Changes in T-depression also were not significant in Anterior and Inferior leads.

Pathologic Q wave changes also in lateral, anterior and inferior leads measured but the changes were not significant.

Left bundle Branch Block was respectively reported in preoperative, immediately after operation and discharged-time evaluations in 5, 20 and 7 patients.

These data showed a significant increase between immediately after operation and preoperative investigations (P-Value=0.0002) and also significant decrease between immediately after operation and discharged-time evaluations (P-Value=0.01). However Changes in Right Bundle Branch Block and Left Anterior Hemi block rates were not significant.

Prevalence of T-depression in three leads was also categorized according to gender and three age groups.

T-Depression in patients categorized into three groups according to number of involved vessels. Patients with one vessel obstruction had no T-Depression in lateral and anterior leads but 2 reported in inferior leads.

Frequency of pathologic Q wave also analyzed depended on age, gender, Ejection Fraction and number of involved vessels, 2 patients under 50 years old and 1 patient over 70 years in lateral lead had pathologic Q wave.

In anterior leads In age group under 50 reported 5 cases were reported with pathologic Q wave while in ages between 50 to 70 and more than 70 years old this wave was reported in 6 and 3 patients respectively.

Within our patients three, 10 and 34 men were diagnosed pathologic Q wave in lateral, anterior and inferior leads while we had just 4 women in anterior leads and seven ones in inferior leads.

In three categorized ejection fraction, 2 patients were found with pathologic Q wave in EF between 35 to 45% and one patient above 45%.

In lateral leads Based on numbers of involved vessels we resulted that one of 148 patients with one vessel involvement had Q wave but this was 4% for involvement of three vessels. Also anterior leads also were investigated for data which 2 and 12 patients had Q wave respectively in two and three vessels obstruction.

Pathologic Q wave were found in 13 patients with one vessel obstruction category in inferior leads while 28 patients were reported for the same wave with three vessels.

One vessel obstruction patients did not suffered from any arrhythmia, but in two vessels 1 patient with LAH, two ones with LBBB and two others with RBBB were reported. These results in three vessels were two LAH, two LPH, 5 LBBB and 13 RBBB.

In less than 35% ejection fraction group one LBBB and three RBBB were investigated whereas in more than 45% EF 2 LAH, 1 LPH, 4 LBBB and 9 RBBB were founded.

DISCUSSION

Chew JT *et al.* [11] studied 400 patients in a hospital in Singapore and resulted that 14.25% of patients had Atrial Fibrillation which it was 82.5% of all arrhythmia which reported after CABG surgery.

In the present study AF from zero in preoperative investigation increased to 0.5% at discharging-timebut this value was 3.5% after surgery. This difference depended on duration of detecting ECG and the therapeutic procedure that was done for decreasing cardiac arrhythmia before operation.

Vecht RT *et al.* [13] studied 1344 patients and found 102 patients after CABG surgery which prevalence of supra ventricular arrhythmias were 33.4% but they did not determined these arrhythmias before surgery. Ventricular fibrillation in our study was not detected in both pre and post operation situation.

Yousif H *et al.* [12] investigated supra ventricular arrhythmia among 100 patients and reported 24% with these one that 79.16% had Atrial Fibrillation and Flutter while 8.33% suffered from PSVT.

They concluded that this arrhythmia happened in first hours after CABG which 75% of them treated completely when they discharged from hospital. They suggested this was related to history of ischemia before surgery andendartherectomybefore CAB Gsurgery.

We found that Pathologic Q wave and Reversed T in lateral, anterior and inferior leads did not changed significantly in pre and post operation investigations in our study. In addition, Baratto MT *et al.* [14] investigated changes in Q and T wave and ST segment and concluded that patients who had Ventricular Fibrillation had also ST elevation and pathologic Q wave but did not pay attention to prevalence of them.

In this survey among conductive disorders only LBBB changed significantly between preoperation and ICU investigation and also between ICU and discharge-time ones which it may because of cardiac inflammation and edema in CABG procedure especially in first two days after surgery and it can be better just with rest.

Mosseri M *et al.* [15] investigated 55 patients that 1% had absolute RBBB, 4% RBBB with LAH and 10% LBBB which it was approximately similar to our results.

It is suggested that more investigations must be done to increase validity of our results.

REFERENCES

1. Jain, U., C.J. Laflamme, A. Aggarwal, J.G. Ramsay, M.E. Comunale, S. Ghoshal, K. Ngo L. Ziola, M. Hollenberg and D.T. Mangano, 1997. Electrocardiographic and hemodynamic changes and their association with myocardial infarction during coronary artery bypass surgery. A multicenter study. Multicenter Study of Perioperative Ischemia (McSPI) Research Group. *Anesthesiology*. 86(3): 576-91. Pub. Med. PMID: 9066323.
2. John Webster and Kirklin and G. Brian, 1993. Barratt-Boyes. *cardiac surgery*. Churchill Livingstone, 2nd ed. 17(12): 1145-50.
3. Robert, M. Bojar and G. Kenneth, 1999. Warner. *Manual of perioperative care in Cardiac Surgery*, 3rd edition.
4. Force, T., P. Hibberd, G. Weeks, A.J. Kemper, P. Bloomfield, D. Tow, M. Josa, S. Khuri and A.F. Parisi, 1990. Perioperative myocardial infarction after coronary artery bypass surgery. Clinical significance and approach to risk stratification. *Circulation* 82(3): 903-12. Pub. Med. PMID: 2394010.
5. Mächler, H., H. Metzler, K. Sabin, M. Anelli-Monti, P. Rehak, B. Rigler and H. Gombotz, 1994. Preoperative myocardial cell damage in patients with unstable angina undergoing coronary artery bypass graft surgery. *Anesthesiology*, 81(6): 1324-31. Pub. Med. PMID: 7992899.
6. Smith, R.C., J.M. Leung and D.T. Mangano, 1991. Postoperative myocardial ischemia in patients undergoing coronary artery bypass graft surgery. S.P.I. Research Group *Anesthesiology*, 74(3): 464-73. Pub. Med. PMID: 2001026.
7. Maisel, W.H., J.D. Rawn and W.G. Stevenson, 2001. Atrial fibrillation after cardiac surgery. *Ann Intern Med.*, 135(12): 1061-73. Review. Pub. Med. PMID: 11747385.
8. Mathew, J.P., M.L. Fontes, I.C. Tudor, J. Ramsay, P. Duke, C.D. Mazer, P.G. Barash, P.H. Hsu and D.T. Mangano, 2004. Investigators of the Ischemia Research and Education Foundation; Multicenter Study of Perioperative Ischemia Research Group. A multicenter risk index for atrial fibrillation after cardiac surgery. *JAMA*, 291(14): 1720-9. Pub. Med. PMID: 15082699.
9. Villareal, R.P., R. Hariharan, B.C. Liu, B. Kar, V.V. Lee, M. Elayda, J.A. Lopez, A. Rasekh, J.M. Wilson and A. Massumi, 2004. Postoperative atrial fibrillation and mortality after coronary artery bypass surgery. *J. Am. Coll Cardiol.*, 43(5): 742-8. Pub. Med. PMID: 14998610.
10. Creswell, L.L., R.B. Schuessler, M. Rosenbloom and J.L. Cox, 1993. Hazards of postoperative atrial arrhythmias. *Ann Thorac Surg.*, 56(3): 539-49. Pub. Med. PMID: 8379728.
11. Chew, J.T. and K.K. Ong, 1993. Atrial arrhythmias post coronary bypass grafting. *Singapore Med. J.* 34(5): 430-4. Pub. Med. PMID: 8153692.
12. Yousif, H., G. Davies and C.M. Oakley, 1990. Peri-operative supraventricular arrhythmias in coronary bypass surgery. *Int. J. Cardiol.* 26(3): 313-8. Pub. Med. PMID: 2312199.
13. Vecht, R.J., E.P. Nicolaidis, J.K. Ikweuke, C. Liassides, J. Cleary and W.B. Cooper, 1986. Incidence and prevention of supraventricular tachyarrhythmias after coronary bypass surgery. *Int. J. Cardiol.* 13(2): 125-34. Pub. Med. PMID: 3539826.
14. Baratto, M.T., A. Pozzolini, G. Buzzigoli, C. Boni, L. Salvatore and C. Contini, 1987. Ambulatory ECG in the perioperative period. *G Ital Cardiol.*, 17(12): 1145-50. Italian. Pub. Med. PMID: 3509748.
15. Mosseri, M., G. Meir, C. Lotan, Y. Hasin, A. Applebaum, S. Rosenheck, D. Shimon and M.S. Gotsman, 1989. Coronary pathology predicts conduction disturbances after coronary artery bypass grafting. *Ann. Thorac. Surg.*, 1991 51(2): 248-52. Pub. Med. PMID: 541.