

Implications of Atrial Fibrillation after Coronary Artery Bypass Surgery

Rezvanieh Salehi, MD; Rezayat Parvizi, MD and Susan Hassanzadeh Salmasi, PhD

Abstract

Background- Postoperative atrial fibrillation (AF) is a common complication of coronary artery bypass graft surgery (CABG) and is associated with an increased incidence of other complications and an increased hospital length of stay. Prevention of AF is a reasonable clinical goal. The aim of this study is to determine the predictive value of multiple clinical, hemodynamic and operative variables for the occurrence of postoperative AF.

Methods- This research is a descriptive study. Patients scheduled for elective CABG between 1997 and 1999 were recruited. The patients underwent holter monitoring for 3 consecutive days. Information was collected by a questionnaire. Statistical analysis was based on the SPSS software and was done through the descriptive statistical method.

Results- 200 patients underwent isolated CABG between 2001 and 2003. The patients with a mean age of 55 ± 8 years old underwent holter monitoring for 3 days. AF occurred in 20% of the patients, postoperatively. 30% of the patients converted to sinus rhythm spontaneously, 60% converted with amiodarone and 10% of the patients required electric shock.

Conclusion- Beta blockers are the first line of medication for the prevention of postoperative AF. The incidence of AF during the first postoperative week after CABG varies between 5-40%; prolonged mechanical ventilation after CABG significantly increases the incidence of postoperative AF (*Iranian Heart Journal* 2005; 6 (1,2): 64-67).

Key words: atrial fibrillation Æ coronary artery bypass surgery

Cardiac arrhythmias occur in 11-40% of patients after coronary artery bypass graft surgery (CABG), atrial fibrillation (AF) being the most common supraventricular arrhythmia.¹ Postoperative AF has a negative effect in terms of perioperative morbidity (myocardial infarction, stroke), 30 days and 6 months' mortality, stays in the intensive care unit (ICU) and hospital costs.² Perioperative intravenous³ or oral amiodarone⁴ has been shown to decrease the occurrence of AF after cardiac surgery. Magnesium prophylaxis for postoperative AF has also been reported, with certificating conclusions.⁵ The aim of this study, conducted on cardiac patients, was to diagnose those suffering from AF after CABG.

Methods

This is a descriptive study, performed in Shahid Madani Heart Hospital in Tabriz, Iran, between 1997 and 1999 on 200 patients who underwent CABGs.

Data were collected through completing a questionnaire consisting of age, sex, results of angiography and echocardiography, number of grafts, duration of mechanical ventilation and the manner of the conversion of AF to normal sinus rhythm.

The statistical analysis was based on the SPSS software and was carried out through the descriptive statistical method.

Results

This prospective study was performed in Shaheed Madani Heart Hospital between 1997 and 1999 on 200 patients who underwent coronary artery bypass graft surgery.

In this study, 84.5% were male and 15.5% female. Mean age of the patients was 57.4 ± 7.8 years old. AF was identified in 20% of the patients, and it was more frequent in older patients. No difference was observed in the occurrence of AF when the patients were stratified according to sex or angiographic EF (ejection fraction).

Postoperative AF in patients with EF>30% was 24% versus 19.6% in patients with EF<30% (P=0.05). Duration of mechanical ventilation showed the strongest correlation, with 40% postoperative AF versus 16% with less than 20 hours' ventilation (P= 0.00008). There was no difference in the occurrence of post-CABG AF with the increasing numbers of grafts or grafts to the left versus right coronary systems. 30% of the patients converted to normal sinus rhythm spontaneously, 60% with intravenous amiodarone. Only 10% of the patients with hemodynamic instability required electrical cardioversion.

Discussion

The incidence of AF during the first postoperative week after CABG varies between 5 and 40%.⁶ In our study, AF occurred in up to 20% of the patients, postoperatively. Previous studies⁷⁻⁹ reporting increased age as a predictor of postoperative AF in patients who had CABG found AF in 4% of patients less than 40 years of age and in 30% of those who were 70 years old or older.⁸ This is in accordance with our study, in which the mean age of the patients who had postoperative AF was greater than that of the patients who did not: 27.6% in patients more than 65 years of age versus 15% in patients less than 65 years (P=0.007). However, all of the above studies include patients with a history of preoperative antiarrhythmic drugs, atrial arrhythmia, diabetes mellitus, chronic obstructive lung disease, chronic renal failure or severely reduced ejection fraction. If we include the disorders that per se could be associated with an increased incidence of AF, age will not be a predictive factor for postoperative AF, a finding that is in accordance with other studies.¹⁰ the pathogenesis of atrial fibrillation after cardiac surgery is multifactorial. Atrial injury or intra- pericardial pneumonectomy decreases the atrial fibrillation threshold for 7-10 days operatively. Other factors such as intraoperative atrial ischemia, postoperative increases in circulating catecholamines, hypoxia and electrolytes also may contribute to increased vulnerability of atria to reentrant tachyarrhythmias.¹¹ Ormerod and coworkers also concluded that older age was not a risk

factor for postoperative arrhythmia.¹² Roffman and Fieldman found that patients with AF were older than patients who maintained sinus rhythm.¹³ It has been postulated that abrupt cessation of propranolol after surgery increases the frequency of AF because of possible hypersensitivity to adrenergic stimulation after the withdrawal of medication.¹⁴ Risk of postoperative AF increases in patients with more than 20 hours of mechanical ventilation: 40% vs. 16% (P=0.00008). It has been postulated that obstructive lung disease increases the incidence of postoperative AF.

In a study on 570 consecutive patients undergoing CABG,¹⁵ the overall incidence of AF was 33%. Multivariate logistic regression analysis identified increasing age (more than 70 years), male gender, hypertension, need for intraoperative aortic balloon pump, postoperative pneumonia, ventilation for more than 24 hours and return to the intensive care unit as independent predictors of postoperative AF; congestive heart failure and preoperative heart rate greater than 100 beats per minute were identified as risk factors. Several other factors have been associated with the development of AF following CABG. These include bypass for right coronary artery disease, the presence of pulmonary disease and sleep apnea.^{15,16}

Stephen et al. studied the efficacy of supplemental magnesium in reducing AF after CABG.¹⁷ They found that prophylactic magnesium does not significantly reduce atrial and ventricular arrhythmias.¹⁷ Amit and coworkers evaluated epicardial atrial defibrillation for the treatment of postoperative AF. They found that temporary atrial defibrillation to resynchronize patients in postoperative atrial fibrillation was safe and effective.¹⁸

Comments

Postoperative AF remains the most common complication after cardiac surgery.¹⁹ Medical management of postoperative AF using antiarrhythmic agents has shown to have

some benefits.²⁰⁻²² Postoperative AF increases hospital stays, cost and morbidity. It converts to the sinus rhythm spontaneously, by drugs or DC shock.

References

1. Treggiari M, Venzi J, Waeber L, et al.: Intravenous amiodarone or magnesium sulphate is not cost beneficial prophylaxis for atrial fibrillation after coronary artery bypass surgery, *British Journal of Anesthesia* 2000; 85 (5): 690-695.
2. Almassi GH, Schowalter T, Nicolosi AC, et al.: Atrial fibrillation after cardiac surgery; a major morbid event? *Ann Surg* 1997; 226: 501 – 11.
3. Butler J, Harriss DR, Sinclair M, Westaby S: Amiodarone prophylaxis for tachycardia after coronary artery surgery. A randomized, double-blind placebo-controlled trial. *Br Heart J* 1993; 70: 56-60.
4. Daoud EG, Strickberger SA, Man KC, et al.: Preoperative amiodarone as prophylaxis against AF after heart surgery. *N England J Med* 1997; 337: 1785-9.
5. Casthely PA, Yoganathan T, Komer C, et al.: Magnesium and arrhythmias after coronary artery bypass surgery. *J Cardiothorac Vasc Anesth* 1994; 8: 188-91.
6. Larer MS, Eagle KA, Buckley MJ, DeSanctis RW. Atrial fibrillation following coronary artery bypass surgery. *Prog Cardiovasc Dis* 1989, 31:367-78.
7. Leitch JW, Thomson D, Baird DK, Harris PJ. The importance of age as a predictor of atrial fibrillation and flutter after coronary artery surgery. Current trends and impact on hospital resources. *Circulation* 1996, 94: 390-70.
8. Leitch JW, Thomson D, Baird DK, Harris PJ. The importance of age as a predictor of atrial fibrillation and flutter after coronary artery bypass grafting. *J Thorac Cardiovasc Surg* 1990; 100: 338-420.
9. Andrews TC, Berlin JA, Atman EM. Prevention of supraventricular arrhythmias after coronary artery bypass surgery. A meta analysis of randomized control trials. *Circulation* 1991; 84: III 236-44.
10. Frost L, Molgaard H, Christiansen EG, Jacobsen CJ, Pilegaard H, Thomsen PG. Atrial ectopic activity and atrial fibrillation/flutter after coronary artery surgery. A case-based study controlling for confounding from age, beta blocker treatment and time distance from operation. *Int J Cardiol* 1995, 50: 153-62.
11. Torres EJ, McCarthy PM, Schaff HV, Trastek VF, Pairloero PC. Atrial trauma during venous cannulation or pneumonectomy decreases atrial fibrillation threshold. *Surgery Forum* 1987; 38: 223-5.
12. Ormedo JM, McGregor CGA, Stone DL, Wisbey C, Petch MC. Arrhythmias after coronary bypass surgery. *Br Heart J* 1984; 51: 618-21.
13. Roffman JA, Fieldman A. Digoxin and propranolol in the prophylaxis of supraventricular tachydysrhythmias after coronary artery bypass surgery. *Ann. Thorac Surg* 1981; 31: 4 96-510.
14. Fuller JA, Adams GG, Bunton B. Atrial fibrillation after coronary artery bypass grafting: is it a disorder of elderly? *J Thorac Cardiovascular Surg* 1989; 97: 821-5.
15. Dixon FE, Reed GE, Vacek JL, Moore CB, Landry J. Factors predisposing to supraventricular tachyarrhythmias after coronary artery bypass grafting. *Am J Cardiol* 1986; 58: 476-8.
16. Silverman NA, Wright R, Levitsky S. Efficacy of low-dose propranolol in preventing postoperative supraventricular tachyarrhythmias: a prospective, randomized study. *Ann Thorac Surg* 1982; 34: 435-8.
17. Stephen R, Hazelrigg MD, Theresa M, Boley NSN, Ibrahim B, et al.: The efficacy of supplemental magnesium in reducing atrial

- fibrillation after coronary artery bypass grafting. *Ann Thorac Surg* 2004; 77: 824-30.
18. Amit N, Patel MD, Baron L, Hannan MD, et al.: Epicardial atrial defibrillation: successful treatment of postoperative atrial fibrillation. *Ann Thorac Surg* 2004; 77: 831-7.
19. Zaman G, Archbold RA, Helft G, Paul EA, Curzen NP, Mills PG. Atrial fibrillation after coronary artery bypass surgery: a model for preoperative risk stratification. *Circulation* 2000; 101: 1403-8.
20. Creswell LL, Damiano FJ, Jr. Postoperative atrial fibrillation: an old problem crying for new solutions. *J. Thorac. Cardiovasc. Surg.* 2001; 121: 638-41.
21. Odell JA, Blackshear JL, Hodge D, Bailey KR. Stroke after coronary artery bypass grafting: are we forgetting atrial fibrillation? *Ann Thorac Surg* 2001; 71: 400-1.
22. Ascione R, Caputo M, Calori G, Lloyd CT, Underwood MJ, Angilini GD. Predictors of atrial fibrillation after conventional and beating heart coronary surgery: a prospective, randomized study. *Circulation* 2000; 102: 1530-5.