

Editorial: Atrial Fibrillation After Coronary Artery Bypass Grafting

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Citation

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Abstract

Atrial fibrillation (AF) after coronary artery bypass surgery (CABG) is the most common sustained arrhythmia and the most common complication after CABG and consequently is a drain on hospital resources. Efforts to reduce the incidence of AF and the associated increased length of stay would result in substantial cost savings and decrease patient morbidity.¹ The incidence varies depending on the type of patient population involved. Age has been identified as the major independent predictor of post operative AF. Increasing age of patients accounts for the higher incidence of postoperative AF in recent years.² Incidence of AF after CABG far exceeds the reported prevalence in the general population and in patients with coronary artery disease (CAD).³ Similarly, it is significantly higher than the reported incidence of AF after major noncardiac surgery regardless of CAD status.⁴ The pathophysiological mechanisms responsible for the high incidence of AF after CABG surgery is unclear. Some of the mechanisms suggested are β -blocker withdrawal, the use of cardiopulmonary bypass, inadequate atrial protection, and overmanipulation of the right atrium¹

Amiodarone has been increasingly used as an antiarrhythmic agent to prevent the occurrence of AF after cardiac surgery.⁵ Amiodarone seems to act through a prolongation of atrial refractoriness. However, the precise mechanism of action is not well understood because amiodarone does not predictably lengthen atrial repolarization acutely.^{6,7} It has been hypothesized that its effect may stem from its nonspecific antiadrenergic effect, its class I actions, or other actions not yet identified.⁶ Moreover, amiodarone has coronary vasodilatory effects,⁸ that may benefit cardiac surgical patients. The response to amiodarone therapy for arrhythmia was found to be delayed in diabetic patients compared with that in non-diabetic patients undergoing

coronary artery bypass grafting operation.⁹ This data from the current issue of the journal suggest a less pronounced sympatholytic effect of amiodarone treatment in diabetic patients undergoing CABG when compared with non-diabetic patients undergoing the same operation. Lervasi et al¹⁰ has demonstrated that the use of intravenous amiodarone loading dose in diabetic patients with cardiac arrhythmia has a later decrease in heart rate (after 4 days from the initiation of treatment) with a later antiarrhythmic positive response when compared with the results with nondiabetic arrhythmic patients who have a very early decrease in heart rate (within 4 hours of beginning of treatment). Nondiabetic patients also have an early antiarrhythmic positive response (on average within 7 hours). Both these studies implicate the antiadrenergic effect of amiodarone in its antiarrhythmic action and the blunting of this response in diabetics, possibly due to autonomic dysfunction.

Beta-blockers are useful for prevention of atrial fibrillation following cardiothoracic surgery, in which atrial fibrillation occurs in approximately 30% of patients.¹¹ The benefit of beta-blockade is greatest in patients who have received beta-blockers previously, although a reduction in atrial fibrillation is seen also in patients not previously on beta-blockers. The efficacy of beta-blockers in this situation is probably due to the elevated sympathetic tone present postoperatively. Beta-blockers protect against adrenergically mediated shortening of the action potential duration that is thought to help precipitate and maintain atrial fibrillation.¹² Another potential mechanism for preventing atrial fibrillation is suppression of pulmonary vein ectopy that triggers atrial fibrillation.¹³

The use of magnesium in the preoperative and early postoperative periods has also been shown to be effective in reducing the incidence of AF after coronary artery bypass

grafting.¹⁴ Postoperative AF occurred in 2 (2%) patients in the magnesium group and in 21 (21%) patients in the control group ($p < 0.001$). Patients in the magnesium group received 6 mmol MgSO₄ infusion in 100 mL 0.9% NaCl solution (25 mL/h) the day before surgery, just after cardiopulmonary bypass, and once daily for 4 days after surgery.

In a recent report, a novel intraoperative treatment strategy of both mechanical (leukocyte filtration) and pharmacological (aprotinin) intervention appears to markedly reduce the incidence of postcardiopulmonary bypass atrial fibrillation.¹⁵ The proposed mechanism is that leukocyte depletion by filtration with the addition of aprotinin would reduce the systemic inflammatory effects of bypass and reduce the incidence of atrial fibrillation.

The beneficial effects of the reduction of atrial fibrillation include reduced risk of embolism and lesser incidence of ischemia in the heart, lung and brain. In addition, there is a decrease in length of hospital stay, recovery time and overall cost. Hence more research into the mechanisms and treatment modalities of this most common postoperative arrhythmia is needed.

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References

1. Aranki SF, Shaw DP, Adams DH, Rizzo RJ, Couper GS, VanderVliet M, Collins JJ Jr, Cohn LH, Burstin HR. Predictors of atrial fibrillation after coronary artery surgery. Current trends and impact on hospital resources. *Circulation*. 1996 Aug 1;94(3):390-7.
2. 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;100:338-342
3. Creswell LL, Schuessler RB, Rosenbloom M, Cox JL. Hazards of postoperative atrial arrhythmias. *Ann Thorac Surg*. 1993;56:539-549
4. Goldman L. Supraventricular tachyarrhythmia in hospitalized adults after surgery: clinical correlates in patients over 40 years of age after major noncardiac surgery. *Chest*. 1978;73:450-454.
5. Daoud, EG, Strickberger, A, Man, KC, et al (1997) Postoperative amiodarone as a prophylaxis against atrial fibrillation after heart surgery. *N Engl J Med* 337,1785-1791
6. Guarnieri, T (1999) Intravenous antiarrhythmic regimens with focus on amiodarone for prophylaxis of atrial fibrillation after open heart surgery. *Am J Cardiol* 84,152R-155R
7. Guarnieri, T, Nolan, S, Gottlieb, S, et al (1999) Intravenous amiodarone for the prevention of atrial fibrillation after open heart surgery: the Amiodarone Reduction in Coronary Heart (ARCH) trial. *J Am Coll Cardiol* 34,343-347
8. Cote, P, Bourassa, MG, Delays, J, et al (1979) Effects of amiodarone on cardiac and coronary hemodynamics and on myocardial metabolism in patients with coronary artery disease. *Circulation* 59,1165-1172
9. Mohammed Tamim, Nevzat Erdil, Ufuk Demirkilic, Levent Cetin, Erol Sener, Harun Tatar. The Response to Antiarrhythmia Therapy with Amiodarone in Diabetic Patients Undergoing Coronary Artery Bypass Grafting *IJC REF*
10. Lervasi G, Clerico A, Bonini R, et al. Effect of antiarrhythmic therapy with intravenous loading dose of amiodarone: evidence for altered response in diabetic patients. *Int J Clin Pharm Res* 1998;18(3):109-120.
11. Prystowsky E.N., Benson D.W. and Fuster V. et al. (1996) AHA Medical/Scientific Statement Special Report: management of patients with atrial fibrillation: a statement for healthcare professionals from the subcommittee on Electrocardiography and Electrophysiology, American Heart Association. *Circulation* 93:1262-1277
12. Kuhlkamp V, Schirdewan A, Stangl K, Homberg M, Matthias P, Beck OA. Use of metoprolol CR/XL to maintain sinus rhythm after conversion from persistent atrial fibrillation: a randomized double blind placebo controlled study. *J Am Coll Cardiol* 2000;36:139-46
13. Chen S.-A. , Hsieh M.-H. and Tai C.-T. et al. (1999) Initiation of atrial fibrillation by ectopic beats originating from the pulmonary veins: electrophysiological characteristics, pharmacological responses, and effects of radiofrequency ablation. *Circulation* 100:1879-1886
14. Toraman F, Karabulut EH, Alhan HC, Dagdelen S, Tarcan S. Magnesium infusion dramatically decreases the incidence of atrial fibrillation after coronary artery bypass grafting. *Ann Thorac Surg* 2001 Oct;72(4):1256-61; discussion 1261-2.
15. Olivencia-Yurvati AH, Wallace WE, Wallace N, Dimitrijevic D, Knust JK, Haas L, Raven PB. Intraoperative treatment strategy to reduce the incidence of postcardiopulmonary bypass atrial fibrillation. *Perfusion* 2002 May;17 Suppl:35-9

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