Management of Atrial Fibrillation after Cardiac Surgery

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SUMMARY

A best evidence topic in cardiac surgery was written according to a structured protocol addressing the question “for post-cardiac surgery atrial fibrillation, do clinical outcomes differ between rate or rhythm control strategies?” Altogether, 2174 papers were found using the reported searches, of which five represented the best evidence to answer the clinical question. Hospital length of stay ranged from 5.0-13.2 days for rate control and 5.2-10.3 days for rhythm control. Freedom from AF at follow-up was achieved in 84.2-91% and 84.2-96% in rate and rhythm control groups respectively. Minimal serious adverse events were noted in all studies analysed and there was no difference between rate and rhythm control

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groups. We conclude that in the management of post-cardiac surgery atrial fibrillation, rate control and rhythm control are equivalent in terms of hospital length of stay, freedom from arrhythmia at follow-up, and complication rates.

KEY WORDS

review; atrial fibrillation; rate control; rhythm control; cardiac surgery; post-operative atrial fibrillation; post-operative complication

MANUSCRIPT

Introduction

In patients with atrial fibrillation (AF) following cardiac surgery is rate control or rhythm control superior in terms of clinical outcomes such as hospital length of stay, rates of recurrence, freedom from arrhythmia at follow-up, and rates of complications? A best evidence topic was constructed according to a structured protocol.[1]

Search strategy & outcome

A total of 604 papers were found searching Medline and Embase (498 and 106 respectively) using Ovid from 1990 to August 2018 and 1570 were found searching PubMed. The search parameters were {[Atrial Fibrillation/ or Atrial Flutter/] and [Cardiac Surgery.mp or Thoracic procedures/] and [Postoperative complications/]} on Medline, {[atrial fibrillation/ OR atrial flutter/)] and [antiarrhythmic agent/] on Embase[(Cardiac surgery OR Heart Surgery)]} and {[Heart Surgery/] and [(atrial fibrillation OR atrial flutter)] and [antiarrhythmic agent]} on PubMed. From these, five papers were identified that provided the best evidence to answer the question. Four of the papers were randomised trials and one was a retrospective cohort study. The trials were evaluated for quality using the widely-validated Jadad criteria and Newcastle-Ottawa scale for randomised and non-randomised studies respectively.[2,3]

Results

Gillinov, et al[4] conducted a multicentre randomised trial on this topic in which they evaluated rate control alone with beta-blockers or calcium-channel blockers versus rhythm control with amiodarone in 523 patients with new AF following cardiac surgery. The authors found no significant difference in terms of total days in hospital within 60 days of randomisation (5.1 v 5.0 days, $p=0.76$), hospital discharge readiness from an atrial fibrillation perspective (4.0 days for both groups, $p=0.99$), readmission rates (18.5% for both groups, $p=0.99$), and rates of serious adverse events or death (24.8 v 26.4 per 100 patient months, $p=0.61$). They found that the rhythm control group was slightly more likely to have been free from AF at 60 days for the previous 30 days (93.8% v 97.9%, $p=0.02$). The trial had high rates of non-compliance/crossover between rate and rhythm control groups (26.7% and 24% with 80% and 48% of these changing therapies in the index hospitalisation, respectively) mostly due to drug ineffectiveness in the rate-control group and drug side effects in the rhythm-control group. This hampers the trial's validity but emphasises the complexity of post-operative AF management. The trial was randomised in a sequential 1:1 fashion using a Electronic Data Capture (EDC) system after a checklist of inclusion and exclusion criteria were completed and verified. This randomisation method was rigorous and carried out by a dedicated research staff member across all sites. Treatment was unblinded due to practical limitations. There were 19 patients that withdrew consent following randomisation however they were included in the intention-to-treat analysis. The paper scores a three on the Jadad criteria and is therefore the largest and highest-quality study included in this review.

Lee, et al[5] randomised 50 patients with new-onset AF following cardiac surgery to receive either rate or rhythm control and found no significant difference between strategies in terms of time to conversion to sinus rhythm (11.8 ± 3.9 v 11.2 ± 3.2 hours, $p=0.8$), maintenance of sinus rhythm at 2-month follow-up (91% v 96%), and recurrence of AF in hospital (57% v 30%, $p=0.24$). They found a significant reduction in hospital length of stay for patients in the rhythm control arm (13.2 ± 2.0 v 9.0 ± 0.7 days, $p=0.05$). 12 of the 27 patients in the rhythm-control group received propafenone, an agent that promotes 1:1 atrioventricular node conduction, and thus were also commenced on rate control. Rate control was allowed in the rhythm-control group if heart rate exceeded 110 beats per minute. Finally, five of the patients in the rate-control arm crossed over to rhythm-control due to relapsing AF (three), contraindication to anticoagulation (one), and failure of rate-control (one). Again the trial was randomised

but unblinded due to logistical reasons and there is no description of the randomisation method. There were no withdrawals or dropouts and all randomised patients were included in the analysis garnering a Jadad score of two.

Cochrane, et al compared digoxin to amiodarone for new-onset post-cardiac surgery atrial fibrillation or flutter in a randomised trial of 30 patients.[6] They found no significant difference in terms of how many patients remained in AF 24 hour after initiation of therapy (20% v 6.67%, 3 v 1 patient, $p>0.05$) and noted that both agents were effective in reducing heart rate (144 to 95 v 146 to 89, $p>0.05$), especially within the first 6 hours of therapy, and detected no major adverse reactions in either group. Digoxin is no longer standard of care rate-control and this trial only evaluated short-term (24-hour) outcomes but suggests both methods were equiefficacious in the initial management of post-cardiac surgery AF. The patients were randomised “on the basis of their hospital record number” and the trial was unblinded due to logistics. No patients withdrew and there was only one crossover (one patient in the rate-control group who failed to revert to sinus rhythm), thus the trial scores a two according to the Jadad criteria.

Hjelms compared procainamide to digoxin in terms of time to conversion of new post-cardiac surgery atrial fibrillation in a randomised trial of 30 patients and found significantly reduced time to conversion with procainamide versus digoxin (40 v 540 minutes, $p<0.002$).[7] They also noted higher rate of successful conversion to sinus rhythm within 12 hours of treatment in the procainamide group (60% v 93%, $p<0.05$). No difference in recurrence of AF after conversion was found (22.2% v 36%, not significant). There were no appreciable differences in rates of serious complications. The use of digoxin for rate-control is outdated thus limiting the generalisability of these results to modern practice and, like Cochrane’s study, this trial evaluated only very short term outcomes. The trial was randomised by undisclosed means and was unblinded. No patients withdrew and there were no crossover during the study period, thus earning this trial a score of two according to the Jadad criteria.

Kowey, et al conducted a single-centre retrospective cohort study of 112 AF-naïve patients who developed paroxysmal AF following coronary artery bypass grafting (CABG).[8] They compared rate control alone to rate control plus rhythm control with Class I or III antiarrhythmic agent (most commonly procainamide). They found no significant difference between the two groups in terms of length of hospital stay (9.8 ± 2.9 v 10.3 ± 3.1 , $p<0.05$) or rates of AF at 6 weeks post-discharge (1.32 v 2.78, $p>0.05$).

This cohort was somewhat representative of typical cardiac surgery cases with selection limited by the single-centre nature of the study and cohorts were drawn from the same community. The outcome was not present at study outset and ascertainment of exposure was based on secure data file review and record linkage (operation reports and clinical notes). Length (six weeks post-operative) and adequacy of follow-up were appropriate and complete respectively with all patients accounted for at six week follow-up aside from the seven in-hospital deaths that occurred during the study period. This trial scores seven stars according to the Newcastle-Ottawa scale, indicating a high-quality cohort study.

Clinical bottom line

AF is common following cardiac surgery with reported rates in the referenced studies >30%. Rate and rhythm control strategies are effective approaches with similar rates of adverse effects resulting in similar outcomes, importantly recurrence of arrhythmia and freedom from arrhythmia at follow-up. These findings are in line with findings from the much larger The Atrial Fibrillation Follow-up Investigation of Rhythm Management (AFFIRM) trial conducted among non-surgical patients with paroxysmal AF which show no clear advantage of one strategy over the other.[9] Choice of strategy in post-cardiac surgery patients does not greatly affect length of hospital stay but may be slightly shorter with rhythm control as time to conversion to sinus rhythm may be shorter in this group. Adverse events are similar between the groups as well. Trial design in this context clearly presents several major challenges in particular surrounding the issues of blinding and crossover. Choice of strategy should ultimately depend on patient characteristics, concurrent management issues, and physician expertise.

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