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Society Guidelines

Canadian Cardiovascular Society Atrial Fibrillation Guidelines 2010: Prevention and Treatment of Atrial Fibrillation Following Cardiac Surgery

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ABSTRACT

Postoperative atrial fibrillation and atrial flutter (POAF) are the most common complications of cardiac surgery that require intervention or prolong intensive care unit and total hospital stay. For some patients, these tachyarrhythmias have important consequences including patient discomfort/anxiety, hemodynamic deterioration, cognitive impairment, thromboembolic events including stroke, exposure to the risks of antiarrhythmic treatments, longer hospital stay, and increased health care costs. We conclude that prevention of POAF is a worthwhile exercise and recommend that the dominant therapy for this purpose be β-blocker therapy, especially the continuation of β-blocker therapy that is already in place. When β-blocker therapy is contraindicated, amiodarone prophylaxis is recommended. If both of these therapies are contraindicated, therapy with either intravenous magnesium or biatrial pacing is suggested. Patients at high risk of POAF may be considered for first-line amiodarone therapy, first-line sotalol therapy, or combination prophylactic therapy. The treatment of POAF may follow either a rate-control approach (with the dominant therapy being β-blocking drugs) or a rhythm-control approach. Anticoagulation should be considered if persistent POAF lasts >72 hours and at the

RÉSUMÉ

La fibrillation auriculaire (FA) et le flutter auriculaire postopératoires sont les complications les plus courantes de la chirurgie cardiaque qui nécessitent une intervention et prolonge la durée de séjour de l'unité des soins intensifs ou hospitalier. Chez certains patients, ces tachyarythmies ont des conséquences importantes, citons entre autres l'inconfort et l'anxiété, la détérioration hémodynamique, les troubles cognitifs, les thromboembolies, l'accident vasculaire cérébral, l'exposition aux effets secondaires des traitements antiarythmiques, le séjour prolongé à l'hôpital et les coûts additionnels. Nous concluons que la prévention de la FA postopératoire est un exercice qui en vaut la peine et recommandons que le but premier du traitement soit le traitement par β-bloquant, particulièrement la continuation des β-bloquants déjà administrés en préopératoire. Lorsque le traitement par β-bloquants est contre-indiqué, on recommande l'amiodarone en prophylaxie. Si ces deux traitements sont contre-indiqués, on suggère le traitement soit à l'aide de magnésium intraveineux ou la stimulation biauriculaire. Les patients à haut risque de FA postopératoire peuvent être considérés pour le traitement de première intention à l'amiodarone, le traitement de première ligne par sotalol ou la combinaison de

Incidence of Postoperative Atrial Tachyarrhythmias

Given that atrial fibrillation (AF) and atrial flutter are facilitated by atrial trauma, atrial stretch, atrial ischemia, epicardial inflammation, hypoxia, acidosis, electrolyte disturbances, and the refractoriness changes that accompany sympathetic nervous system discharge and given that all of these factors are frequently present immediately after cardiac surgical procedures, it is not surprising that AF and atrial flutter are frequent complications of these procedures. Indeed, atrial tachyarrhythmias are the most common postoperative complications of cardiac surgery that require intervention or prolonged intensive care unit and total hos-

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This statement was developed following a thorough consideration of medical literature and the best available evidence and clinical experience. It represents the consensus of a Canadian panel comprised of multidisciplinary experts on this topic with a mandate to formulate disease-specific recommendations. These recommendations are aimed to provide a reasonable and practical approach to care for specialists and allied health professionals obliged with the duty of bestowing optimal care to patients and families, and can be subject to change as scientific knowledge and technology advance and as practice patterns evolve. The statement is not intended to be a substitute for physicians using their individual judgment in managing clinical care in consultation with the patient, with appropriate regard to all the individual circumstances of the patient, diagnostic and treatment options available and available resources. Adherence to these recommendations will not necessarily produce successful outcomes in every case.

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point of hospital discharge. The ongoing need for any POAF treatment (including anticoagulation) should be reconsidered 6-12 weeks after the surgical procedure.

traitements prophylactiques. Le traitement d'une FA postopératoire peut suivre soit une méthode de ralentissement de la fréquence ventriculaire (avec les β-bloquants) ou une méthode de stabilisation du rythme. Les anticoagulants devraient être considérés si la FA postopératoire dure plus de 72 heures et si elle est encore présente au moment de prendre congé de l'hôpital. Le besoin continu de traitement d'une FA postopératoire (notamment l'anticoagulation) devra être reconsidéré pour 6 à 12 semaines suivant la procédure chirurgicale.

pital stay.[1-10] The incidence of POAF after cardiac surgery ranges from ≈30% for patients undergoing isolated coronary artery bypass graft (CABG) surgery to ≈40% for patients undergoing valve replacement or repair to ≈50% of patients undergoing both procedures.[11] Furthermore, there is evidence that the incidence of POAF is increasing as older individuals with a higher prevalence of atrial tachyarrhythmia risk factors are more commonly undergoing these procedures.[2,8]

The peak incidence of these atrial tachyarrhythmias is between postoperative days 2 and 4. Of the patients who develop an atrial tachyarrhythmia, 70% do so before the end of the fourth postoperative day and 94% do so before the end of the sixth post hospital day.[8]

Risk Factors for Postoperative Atrial Tachyarrhythmias

Independent patient characteristics that predict the occurrence of atrial tachyarrhythmias after cardiac surgery include prior AF episodes, older age, male gender, history of hypertension, requirement for an intraoperative balloon pump, requirement for prolonged ventilation (>24 hours), and withdrawal of β-blocker therapy.[2-8,12,13] As in the general population,[14] age has the highest predictive value. Operative variables reported to be atrial tachyarrhythmia risk factors include the procedure performed (isolated CABG, valve repair/replacement, or both), the number of bypass grafts, the duration of surgery, and the duration of aortic cross-clamp time.[2,15-17]

Consequences of Postoperative Atrial Tachyarrhythmias

Post cardiac surgery atrial tachyarrhythmias may be transient and cause little morbidity. However, for some patients these tachyarrhythmias have important consequences including patient discomfort/anxiety, hemodynamic deterioration, cognitive impairment, thromboembolic events including stroke, exposure to the risks of arrhythmia treatments, longer hospital stay, and increased health care costs.[2,4,8,9,18-23] Linear regression models indicate that postoperative atrial tachyarrhythmias are *independently* associated with an increase in the duration of hospitalization and in health care costs.[8,24]

Prophylaxis of Postoperative Atrial Tachyarrhythmias

Standard β-blocker drug therapy

A recent meta-analysis of randomized controlled clinical trials (RCTs) evaluating standard β-blocker drug therapy (Table 1) for the prevention of postoperative AF after cardiac surgery examined 31 RCTs involving 4452 patients.[25] β-Blocker drug therapy was associated with a reduction in the probability of postoperative AF with an odds ratio (OR) of 0.36, a 95% confidence interval (95% CI) for this point estimate of 0.28-0.47, and a statistical significance level (*P*-value) of .001. Nevertheless, this meta-analysis also revealed a highly statistically significant heterogeneity assessment *P*-value of <.001, indicating that differences between the trials preclude meaningful merging of their results. Much of the heterogeneity in the results of these trials was explained by the practice in some trials of permitting preoperative withdrawal of preexisting β-blocker drug therapy in those patients randomized not to receive study β-blocker drug therapy (β-blocker therapy withdrawal–mandated trials) versus the practice in other trials of continuing preexisting β-blocker drug therapy in those patients randomized not to receive study β-blocker drug therapy (β-blocker therapy withdrawal–not mandated trials). In the β-blocker therapy withdrawal–mandated trials, study β-blocker drug therapy was associated with a large reduction in the probability of postoperative AF (OR 0.30, 95% CI 0.22-0.40, *P*-value for effect <.001, *P*-value for heterogeneity of .06). In the β-blocker therapy withdrawal–not mandated trials, study β-blocker drug therapy was associated with a smaller reduction in the probability of postoperative AF (OR 0.69, 95% CI 0.54-0.87, *P*-value for effect of .002, *P*-value for heterogeneity of .72). This observation may relate to preoperative β-blocker therapy withdrawal increasing the control group probability of postoperative AF.[26]

The largest of the β-blocker therapy withdrawal–not mandated trials, the Beta Blocker Length Of Stay (BLOS) trial,[27] reported a post-hoc analysis[28] indicating that, in patients receiving preoperative nonstudy β-blocker drug therapy, study metoprolol therapy was associated with a decrease in postoperative AF (metoprolol group AF incidence 29.6%, placebo group AF incidence 40.1%, OR 0.63), while in patients not receiving preoperative nonstudy β-blocker drug therapy, study metoprolol therapy was not associated with a decrease in postoperative AF (metoprolol group AF incidence 38.5%, placebo group AF incidence 35.0%, OR 1.16) (unadjusted *P*-value for interaction of .065). Furthermore, in patients not receiving preoperative nonstudy β-blocker drug therapy, study metoprolol therapy was associated with greater acute reduction in heart rate (unadjusted *P*-value for interaction of .002), greater acute reduction in cardiac index (unadjusted *P*-value for interaction of .002), and an increase in total hospital stay (unadjusted *P*-value for interaction of .002).

Current evidence suggests that the standard β-blocker drugs are equivalent with regard to their efficacy in the prevention of postoperative AF after cardiac surgery. Nevertheless, one small, nonrandomized, retrospective comparison of carvedilol versus other β-blocker drugs (mostly metoprolol or atenolol) suggested that carvedilol prevented postoperative AF better than did the others (relative risk 0.24, 95% CI 0.11-0.51, $P < .05$).[26] This possibility will need to be assessed in a comparative clinical trial.

Thus, the evidence for continuing preoperative β-blocker drug therapy after cardiac surgery for the prevention of postoperative AF is very strong. However, initiating β-blocker drug therapy just before or after cardiac surgery in patients

Table 1. Prophylactic therapies for the prevention of postoperative atrial tachyarrhythmias

Therapy	Dosage*	Odds ratio†	Cautions	Adverse effects
Preoperative β-blocker	Any in usual therapeutic dose (ie, metoprolol 50 mg PO q12h or q8h for at least 2 preoperative d, d of surgery, and at least 6 postoperative d)	0.39 (0.28-0.52)	Reactive airways disease, decompensated CHF	Sinus bradycardia AV block Hypotension Bronchospasm
Preoperative amiodarone	10 mg/kg/d (rounded to nearest 100 mg) divided into 2 daily PO dosages for 6 preoperative d, d of surgery, and 6 postoperative d[44]	0.61 (0.50-0.74)	30%-50% reduction in the dosages of other drugs with antiarrhythmic or sinus/AV nodal effects and warfarin will be required	Sinus bradycardia AV block Hypotension Torsade de pointes VT (rare) Pulmonary toxicity (rare)
Postoperative amiodarone	900-1200 mg IV over 24 h beginning within 6 h of surgery, then 400 mg PO tid each of the next 4 d[37]	0.53 (0.39-0.71)	30%-50% reduction in the dosages of other drugs with antiarrhythmic or sinus/AV nodal effects and warfarin will be required	Sinus bradycardia AV block Hypotension Torsades de pointes VT (rare) Pulmonary toxicity (rare)
Magnesium sulfate	1.5 g IV over 4 h first preoperative d, immediately postoperatively, and next 4 postoperative d.[45] Other trials have omitted the preoperative dosage	0.83 (0.65-1.06)	Renal failure	Hypotension (rare) Sedation (very rare) Respiratory depression (very rare)
Atrial pacing	Right, left, or biatrial pacing for 3-4 d postoperatively.[46] Rate set to overdrive sinus rate either manually or using sensing algorithms	0.67 (0.54-0.84)	May increase atrial tachyarrhythmias if pacing continues in setting of sensing malfunction	Diaphragmatic stimulation, Increased myocardial oxygen requirements, ? Increased infection rate

AV, atrioventricular; CHF, congestive heart failure; VT, ventricular tachycardia.

* Dosages used in the randomized studies vary widely and the optimal dosages for this indication have not been established. The dosages provided are those used in the largest positive trial of that therapy and are referenced to that study.

† The odds ratios provided are from meta-analyses of the studies of each prophylactic approach (not for the single study referenced for dosage). Comparisons of the efficacies of various prophylactic approaches require randomized trials, which, for the most part, have not been performed. Accordingly, comparisons of the odds ratios provided in the table should be avoided.

who were not receiving preoperative β-blocker drug therapy for the purpose of preventing postoperative AF has less compelling support.

RECOMMENDATION

We recommend that patients who have been receiving a β-blocker before cardiac surgery have that therapy continued through the operative procedure in the absence of the development of a new contraindication (Strong Recommendation, High-Quality Evidence).

We suggest that patients who have not been receiving a β-blocker before cardiac surgery have β-blocker therapy initiated just before or immediately after the operative procedure in the absence of a contraindication (Conditional Recommendation, Low-Quality Evidence).

Values and preferences. These recommendations place a high value on reducing postoperative AF and a lower value on adverse hemodynamic effects of β-blockade during or after cardiac surgery. It is also noted that inherent to a strategy of prophylaxis, a number of patients will receive β-blocker therapy without personal benefit.

Amiodarone therapy

A recent meta-analysis of RCTs evaluating amiodarone therapy (Table 1) for the prevention of postoperative AF after cardiac surgery examined 19 placebo-controlled RCTs involving 3295 patients.[29] Compared to placebo, amiodarone therapy was associated with a reduction in the probability of postoperative AF (OR 0.50, 95% CI 0.43-0.59, $P < .0001$). This meta-analysis reported that amiodarone therapy for the prevention of postoperative AF was also associated with a reduction in postoperative ventricular tachyarrhythmias (OR 0.39, 95% CI 0.26-0.58, $P < .001$), a reduction in postoperative neurologic events (OR 0.53, 95% CI 0.30-0.92, $P = .02$), a reduction in the postsurgery hospital length of stay (0.6 days: 95% CI 0.4-0.8 days, $P < .0001$), and a reduction in hospital costs (–$2527, 95% CI –$500 to –$5815, $P = .1$). Another meta-analysis that included adverse events noted that amiodarone therapy in this setting is also associated with an increase in postoperative bradycardia (OR 1.66, 95% CI 1.73-2.47).[25] A meta-analytic comparison of the effects of amiodarone therapy initiated preoperatively (6 studies, OR 0.50, 95% CI 0.30-0.63) versus that initiated intraoperatively or postoperatively (8 studies, OR 0.48, 95% CI 0.37-0.63) showed no statistically significant difference in the prevention of postoperative AF ($P = .86$).[30]

In a small, direct-comparison RCT, amiodarone was reported to be more effective for the prevention of postoperative AF after cardiac surgery than standard β-blockade (propranolol) (RR 0.53, 95% CI 0.37-0.93, $P = .05$).[31] Similarly, amiodarone therapy was suggested to be more effective than sotalol therapy for this purpose, but the difference was not statistically significant in a small trial of 160 patients (RR 0.77, 95% CI 0.54-1.12, $P = .21$).[32]

RECOMMENDATION

We recommend that patients who have a contraindication to β-blocker therapy before or after cardiac surgery be considered for prophylactic therapy with amiodarone to prevent postoperative AF (Strong Recommendation, High-Quality Evidence).

Values and preferences. This recommendation places a high value on minimizing the patient population exposed to the potential adverse effects of amiodarone and a lower value on data suggesting that amiodarone is more effective than β-blockers for this purpose.

Sotalol therapy

A recent meta-analysis of RCT evaluating sotalol therapy for the prevention of postoperative AF after cardiac surgery examined 9 placebo-controlled RCTs involving 1382 patients.[25] Compared to placebo, sotalol therapy was associated with a reduction in the probability of postoperative AF (OR 0.34, 95% CI 0.26–0.45, *P*-value <.001). More patients receiving sotalol had their therapy withdrawn because of adverse effects than did patients receiving placebo (6.0% versus 1.9%, respectively, $P = .004$).

The same meta-analysis of RCTs evaluating sotalol therapy for the prevention of postoperative AF after cardiac surgery examined 7 RCTs involving 1240 patients comparing sotalol therapy to standard β-blocker drug therapy.[25] Compared to standard β-blocker drug therapy, sotalol therapy was associated with a reduction in the probability of postoperative AF (OR 0.42, 95% CI 0.26-0.65, *P*-value <.001). More patients receiving sotalol had their therapy withdrawn because of adverse effects than did patients receiving standard β-blocker drug therapy but this difference was not statistically significant (7.2% versus 4.8%, respectively, $P = .25$).

Thus, sotalol therapy for the prevention of postoperative AF after cardiac surgery has been less well studied than has standard β-blocker drug therapy. Nevertheless, it appears that sotalol therapy has greater efficacy for this purpose than does standard β-blocker drug therapy but may also have a greater adverse effect profile in this setting.

Intravenous magnesium therapy

A recent meta-analysis of 7 RTCs involving 1234 patients evaluating intravenous magnesium therapy (Table 1) for the prevention of postoperative AF after cardiac surgery reported that intravenous magnesium therapy was associated with a reduction in the incidence of postoperative AF from 26.7% to 20.0% (OR 0.66, 95% CI 0.51-0.87, $P = .003$) and with a reduction of the postoperative length of hospital stay in 6 trials involving 1136 patients by 0.29 days (95% CI 0.05-0.54 days, $P = .02$).[33] However, this meta-analysis also found significant heterogeneity among the intravenous magnesium trials ($P = .02$) with patients receiving preoperative intravenous magnesium (as opposed to intraoperative or postoperative therapy initiation) and patients receiving lower dosages of intravenous magnesium (as opposed to moderate or higher dosages of magnesium) apparently receiving all of the benefit of therapy with respect to a reduction in the postoperative incidence of AF. Most intravenous magnesium trials report no evident adverse effects of magnesium therapy in properly selected patients. Nevertheless, one trial reported a higher probability of postoperative hypotension with combination intravenous magnesium and propranolol therapy than with propranolol therapy alone.[34]

Intravenous magnesium therapy has been compared to a standard β-blocker (propranolol) in a trial involving 134 patients.[35] Propranolol was more effective for the prevention of postoperative AF than was intravenous magnesium (RR 0.53, 95% CI 0.36-0.80, $P = .01$). Another small trial of 105 patients found no significant difference in the efficacy of intravenous magnesium therapy versus sotalol therapy for this purpose (RR 0.87, 95% CI 0.48-1.55).[36]

Thus, there is moderate evidence that intravenous magnesium therapy, particularly lower-dose therapy initiated before cardiac surgery, will reduce the postoperative incidence of AF after cardiac surgery. The major advantage of this approach is that the therapy has a very low probability of being associated with adverse effects in patients without renal dysfunction.

Overdrive atrial pacing

Trials of overdrive atrial pacing (Table 1) for the prevention of postoperative AF have used multiple pacing configurations: right atrial pacing, left atrial pacing, biatrial pacing, and Bachmann's bundle pacing. Overall, a meta-analysis of 14 RCTs involving 1885 patients showed that overdrive atrial pacing was associated with a reduction in the incidence of postoperative AF from 35.3% to 17.7% (OR 0.60, 95% CI 0.47-0.77, $P < .001$).[25] Although the *P*-value for heterogeneity was not statistically significant, there was a trend to heterogeneity ($P = .13$) and the majority of the benefit was seen in 10 trials involving 754 patients wherein biatrial pacing was associated with a statistically significant reduction in the incidence of postoperative AF (OR 0.44, 95% CI 0.31-0.64, $P < .001$). Individual assessment of right atrial and of left atrial or Bachmann's bundle overdrive atrial pacing did not show a statistically significant result.

The Atrial Fibrillation Suppression Trial II (AFIST-II) compared overdrive atrial septal pacing to amiodarone therapy for the prevention of postoperative AF and reported that amiodarone therapy prevented AF better than did overdrive atrial pacing (RR 0.50, 95% CI 0.30-0.82, $P < .05$).[37]

Accordingly, the quality of evidence to recommend overdrive atrial pacing, in the absence of other prophylactic therapy, for the prevention of postoperative AF after cardiac surgery is low but, when used, the evidence favours biatrial overdrive pacing.

RECOMMENDATION

We suggest that patients who have a contraindication to β-blocker therapy and to amiodarone therapy before or after cardiac surgery be considered for prophylactic therapy to prevent postoperative AF with intravenous magnesium (Conditional Recommendation, Moderate-Quality Evidence) or with biatrial pacing (Conditional Recommendation, Low-Quality Evidence).

Values and preferences. This recommendation places a high value on preventing postoperative AF using more novel therapies that are supported by lower quality data. A high value is placed on the low probability of adverse effects from magnesium. The use of biatrial pacing needs to be individualized by patient and institution, as the potential for adverse effects may outweigh potential benefit based on local expertise.

Other interventions

Meta-analyses have not shown a potential role for the use of digoxin (OR 0.97, 0.62-1.49, $P = .88$), calcium channel blocker drugs (OR 0.73, 95% CI 0.48-1.12, $P = .15$),

propafenone (OR 0.73, 0.39-1.38, $P = .97$), or procainamide (OR 0.51, 95% CI 0.25-1.04, $P = .07$) for the prevention of postoperative AF after cardiac surgery.[25]

Newer interventions with promising preliminary results not yet tested in larger patient populations include glucose/insulin/potassium, preservation of the anterior cardiac fat pad, N-3 fatty acids, HMG CoA reductase inhibitors, and systemic steroids.

Combination therapy

Two small trials[36,37] directly compared 2 apparently effective treatments for the prevention of POAF after cardiac surgery using a 2×2 factorial trial design to evaluate the utility of combination prophylactic therapy.

Forlani et al[36] randomized 207 patients to receive prophylactic sotalol, prophylactic intravenous magnesium, both therapies, or neither therapy. The incidence of postoperative AF was statistically significantly reduced from 38.0% in the neither-therapy group to 14.8% in the magnesium therapy–alone group and to 11.8% in the sotalol therapy–alone group. The incidence of postoperative AF was statistically significantly reduced even further by combined magnesium and sotalol to an astonishing 1.9%.

The AFIST-II[37] randomized 160 patients to receive prophylactic atrial septal pacing, prophylactic amiodarone, both therapies, or neither therapy. The incidence of postoperative AF was 37.5% in the neither-therapy group. The incidence of postoperative AF was not reduced by atrial septal pacing (40.0%). The incidence of postoperative AF was reduced to 28.5% in the amiodarone-treated group but this difference was not statistically significant (RR 0.79, 95% CI 0.48-1.29). Although the incidence of postoperative AF was further reduced by combined amiodarone and atrial septal pacing to 15.8%, this difference was not statistically significant relative to that achieved with amiodarone therapy alone (RR 0.77, 95% CI, 0.49-1.22). These suggestions of no difference are, of course, power-limited.

RECOMMENDATION

We suggest that patients at high risk of postoperative AF receive prophylactic therapy to prevent postoperative AF such as sotalol or combination therapy including ≥ 2 of a β-blocker, amiodarone, intravenous magnesium, or biatrial pacing (Conditional Recommendation, Low- to Moderate-Quality Evidence).

Values and preferences. This recommendation recognizes that data confirming the superiority of combinations of prophylactic therapies are sparse.

Treatment of postoperative atrial fibrillation

The treatment goals for AF and flutter that occur after cardiac surgery are identical to those of AF and atrial flutter that occur in other settings. These goals include prevention of thromboembolic events, slowing of the ventricular response rate, and consideration of conversion to and maintenance of sinus rhythm. Nevertheless, postoperative physiology does have features that favour some therapeutic strategies over others. The natural history of POAF after cardiac surgery is dominated by self-terminating but frequently recurrent atrial tachyarrhythmia episodes and resolution of this propensity in 6-12 weeks regardless of the therapy used.[38-40] Furthermore, the adrenergic discharge state after cardiac surgery lessens the effectiveness of therapies that do not include β-blockade.

There is an association between POAF and postoperative cerebrovascular events[2,3,8,20,21] and cognitive impairment[19] after cardiac surgery. On the other hand, early anticoagulation therapy in this setting may predispose the postoperative patient to delayed pericardial bleeding and cardiac tamponade.[41] In recognition of this risk and in the absence of controlled trials of the optimum timing for the initiation of anticoagulation therapy for patients with AF after cardiac surgery, anticoagulation is recommended for patients with prolonged (>72 hours) AF. Once initiated, anticoagulation is usually continued for ≥ 6 weeks.

RECOMMENDATION

We suggest that consideration be given to anticoagulation therapy if postoperative continuous AF persists for >72 hours. This consideration will include individualized assessment of the risks of a thromboembolic event and the risk of postoperative bleeding (Conditional Recommendation, Low-Quality Evidence).

Values and preferences. This recommendation places a higher value on minimizing the risk of thromboembolic events and a lower value on the potential for postoperative bleeding. Because the risk of postoperative bleeding decreases with time, the benefit-to-risk ratio favours a longer period without anticoagulation in the postoperative setting than that suggested in other settings.

Therapy for ventricular rate control for atrial tachyarrhythmias is usually required for patients who experience AF after cardiac surgery. Nevertheless, cardiac surgery may also predispose such patients to bradyarrhythmias after conversion of AF or atrial flutter secondary to sinus nodal, AV nodal, or His-Purkinje system dysfunction. Accordingly, the availability of back-up ventricular pacing is important.

As the postsurgical state includes adrenergic discharge, β-blocker therapy is often very effective for slowing of the ventricular response rate to AF and flutter. Other therapeutic alternatives, used when β-blocker therapy is ineffective, poorly-tolerated, or contra-indicated, include a non-dihydropyridine calcium antagonist (diltiazem, verapamil) or amiodarone. In this setting, therapy with digoxin is usually insufficient.

RECOMMENDATION

We recommend that temporary ventricular epicardial pacing electrode wires be placed at the time of cardiac surgery to allow for backup ventricular pacing as necessary (Strong Recommendation, Low-Quality Evidence).

Values and preferences. This recommendation reflects the relative ease of placement of epicardial temporary pacing wires at the time of surgery as well as the potential for significant morbidity associated with postoperative bradycardia.

RECOMMENDATION

We recommend that postoperative AF with a rapid ventricular response be treated with a β-blocker, a non–dihydropyridine calcium antagonist, or amiodarone to establish ventricular rate control. In the absence of a specific contraindication, the order of choice is as listed (Strong Recommendation, High-Quality Evidence).

Values and preferences. This recommendation places a high value on the randomized controlled trials investigating rate control as an alternative to rhythm control for AF, recognizing that these trials did not specifically address the postoperative period.

Considerations related to the advantages, disadvantages, and risks of conversion to and maintenance of sinus rhythm for patients with sustained atrial tachyarrhythmias after cardiac surgery are similar to those in other settings. Nevertheless, because early recurrence of the atrial tachyarrhythmia is common, ongoing antiarrhythmic drug therapy to prevent atrial tachyarrhythmia recurrences is preferred over isolated DC cardioversion provided that the patient is sufficiently stable to proceed. Although intravenous ibutilide has been proposed as a rapid-acting approach to pharmacologic cardioversion of atrial tachyarrhythmias after cardiac surgery, this intervention was effective in <50% of patients (with the highest success rates in patients with atrial flutter) and was associated with the precipitation of Torsades de pointes ventricular tachycardia in ≈2%-5% of postoperative patients.[42] In addition, the short half-life of this agent also translates into the absence of ongoing therapy to prevent atrial tachyarrhythmia recurrences.

The overwhelming majority of patients with postoperative atrial tachyarrhythmias will no longer be susceptible to atrial tachyarrhythmia recurrences within 6-12 weeks after cardiac surgery. Accordingly, a rate-control strategy, as opposed to a rhythm-control strategy, has the advantage of not exposing the patient, who by definition has structural heart disease, to the risks of Class I or Class III antiarrhythmic drugs. No large randomized clinical trial has evaluated the advantages, disadvantages, and risks of the rate-control strategy versus the rhythm-control strategy for POAF. One small randomized pilot study[39] reported a statistically significant reduction in the duration of the postsurgical hospital stay in patients developing postoperative AF who were assigned to a rhythm-control approach versus a rate-control approach to treatment. Nevertheless, a retrospective evaluation[43] suggested a statistically significant reduction in the duration of postsurgical hospital stay in patients discharged in AF (after ventricular response rate control and anticoagulation) compared to patients discharged in sinus rhythm. Accordingly, the preferred approach remains unknown. Regardless of the approach chosen, therapy provided for POAF can usually be withdrawn 6-12 weeks later.

RECOMMENDATION

We suggest that postoperative AF may be appropriately treated with either a ventricular response rate-control strategy or a rhythm-control strategy (Conditional Recommendation, Low-Quality Evidence).

Values and preferences. This recommendation places a high value on the randomized controlled trials investigating rate control as an alternative to rhythm control for AF, recognizing that these trials did not specifically address the postoperative period.

RECOMMENDATION

We recommend that, when anticoagulation therapy, rate-control therapy, and/or rhythm-control therapy has been prescribed for postoperative AF, formal reconsideration of the ongoing need for such therapy should be undertaken 6-12 weeks later (Strong Recommendation, Moderate-Quality Evidence).

Values and preferences. This recommendation reflects the high probability that postoperative AF will be a self-limiting process that does not require long-term therapy.

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