Postoperative Atrial Fibrillation: Prophylaxis and Treatment

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Disclosure

- None
Postoperative Atrial Fibrillation

- Remains the most common complication following cardiac surgery, the incidence is unchanged despite decades of basic and clinical research

- Significant cause of morbidity leading to increased utilization of healthcare resources
Incidence

- Meta-analysis of 24 randomized controlled trials found an incidence of 26%  

- Higher incidence after valve surgery and combined valve surgery and coronary artery bypass grafting  
  - Lowest rates seen after transplantation  

- The incidence at Washington University has been 30% over the last 20 years.  
  - No change in incidence despite widespread use of beta blockers and statins.
Predictors of Postoperative AF

- Numerous risk factors have been identified for the development of atrial fibrillation.
  - Age ( >70, OR=5.6)
  - Male gender
  - Hypertension (OR=1.2)
  - History of previous AF
  - Redo surgery
  - Congestive heart failure (OR=1.3)
  - Valvular heart disease (AoV OR=1.5, MitV OR=1.9)
  - Left atrial enlargement
Age and Incidence of Postoperative AF

Shen J et al
J Thorac Cardiovasc Surg 2011;141:559-570
Influence of LA Volume and Age on the Incidence of Postoperative AF

Osranek M, et al
J Am Coll Cardiol 2006;48:779-798
Predictors of Postoperative AF

- Numerous other preoperative risk factors have been identified for the development of atrial fibrillation including:
  - Chronic obstructive pulmonary disease (OR=1.4)
  - Peripheral vascular disease (OR=1.3)
  - Renal insufficiency (OR=1.3)
  - Obesity
  - Left ventricular hypertrophy
  - Right coronary disease
Timing of Postoperative AF

- Atrial fibrillation was most common on postoperative day 2
- Recurrence was most common on postoperative day 3
  - More than 60% of initial recurrence occurring within 2 days of first onset
  - Only 22% of patients (326/1503) experienced more than 2 episodes.

Postoperative Atrial Fibrillation: Morbidity and Mortality

- Often thought of as a benign arrhythmia, however, this is not true.
- Studies have shown increased early and late mortality, stroke, and prolonged hospital length of stay.

- Increased hospital and healthcare costs
Postoperative AFib: Morbidity and Mortality

- 6,475 patients undergoing CABG
- In-hospital mortality was increased in pts with POAF from 3.4 to 7.4% (p=.0007)
- POAF was an independent predictor of late mortality (OR 3.4, p=.0018, case-matched group)
- Stroke was increased in pts with POAF from 1.7% to 5.2% (p<.0001)

Villareal et. al.
J Am Coll Cardiol 2004;43:742-48
Preventing Postoperative AF

- Many studies have been conducted examining effective preventative strategies for AF.
  - A meta-analysis demonstrated that prophylactic treatment to decrease postoperative AF reduced hospital stay and cost, but had no effect on stroke or mortality.

- Numerous drugs studied
  - Beta-blockers, Amiodarone, Sotalol, Magnesium
  - Other non-antiarrhythmics
    - Statins, N-3 polyunsaturated fatty acids, anti-inflammatory drugs
Beta-blockers

- Meta-analyses have shown positive effect.
  - Reduced the incidence of postoperative AF from 33% to 19%.

- Added benefit of reducing perioperative mortality

- Current AHA guidelines strongly recommend preoperative and postoperative beta-blocker therapy for patients undergoing coronary artery bypass grafting to prevent atrial fibrillation.
Amiodarone

- Largest trial of amiodarone prophylaxis showed that it was effective and safe, and had a benefit over the use of beta-blockers alone.

- Benefit of combined oral and intravenous amiodarone versus placebo alone (22% vs. 39% of patients) demonstrated in AFIST II trial

- Only drug shown to have effect on reducing incidence of postoperative stroke
Amiodarone

- Well studied in multiple meta-analyses
  - Effective despite a wide variation in dosing, scheduling, and route.

- No significant difference found between high and low dose regimens or between preop and postop initiation of treatment
Numerous other treatments have been tested for the prevention of postoperative AF:

- sotalol, magnesium, statins, N-3 polyunsaturated fatty acids, anti-inflammatory drugs, temporary pacing

None of these treatments have been proven to be effective with the same robustness of amiodarone or beta-blockers and the data have been sometimes conflicting.
Management of Postoperative Atrial Fibrillation

**Goals**

- Assess for hemodynamic instability
- Differentiate atrial fibrillation from atrial flutter
- Rate versus rhythm control
Hemodynamically Unstable Patients

- Electrical cardioversion is the mainstay of treatment
  - Semi-elective cardioversion protocol at Washington University
    - Contact the critical care physician or electrophysiologist
    - NPO for 4-6 hours
    - Consider IV midazolam or anesthetic agent
    - Check K⁺, Mg²⁺
Atrial Flutter

- Diagnosis of atrial flutter is best made by obtaining an atrial electrogram.
Atrial epicardial pacing wires
Atrial Flutter
Atrial Flutter

- In patients that have atrial flutter, consider rapid atrial pacing.
  - Begin burst pacing at twice diastolic threshold and a rate 10% above the flutter cycle length. Increase in increments of 10% until flutter is terminated.

- If unsuccessful, treat according to atrial fibrillation protocol.
Atrial Fibrillation
Atrial Fibrillation Treatment Guidelines

- In the hemodynamically stable patient, there is no urgency or reason to electrically cardiovert.
  - Ensure $S_pO_2 > 92%$
  - Correct profound anemia
  - Supplement $K^+, Mg^{2+}$

- First goal is to control the heart rate.
  - Goal to decrease the heart rate below 100
Atrial Fibrillation Rate Control

- For patients with preserved EF (>30%)
  - Diltiazem 5mg IV test dose
  - If tolerated, give 0.25mg/kg IV over 3 minutes
  - If effective, begin 5-10mg/hr IV infusion
    - May increase in 5mg/hr increments to 10-20mg/hr

- For patients with poor EF (<30%)
  - Digoxin load
    - 0.5mg IV, followed by 0.25mg IV q4h x 2 doses
  - Maintenance dose based on renal function
  - Consider early cardioversion
Rhythm Control

- For patients that persist in AF for greater than one hour despite adequate rate control, consider initiation of rhythm control.

- Amiodarone load
  - For patients able to take po or absorb via NG
    - 400mg po t.i.d loading dose x 3-5 days
    - Reassess for maintenance dose
  - For patients unable to utilize their GI tract
    - 150mg IV over 10 minutes, then 1mg/min infusion x 6 hours, followed by 0.5mg/min

- Monitoring
  - Initial assessment of LFT’s, and TFT’s
  - Follow QT interval
Contraindications to Amiodarone

- **Contraindications**
  - Allergy
  - History of toxicity
  - Severe pulmonary disease
  - 2\(^{nd}\) degree Type 2 or 3\(^{rd}\) degree heart block
  - Junctional rhythm
  - Severe bradycardia
  - Untreated/uncontrolled thyroid disease
  - Pregnancy
Amiodarone

- **Precautions**
  - Decrease (50%) digoxin dose
  - Decrease (50%) warfarin dose
  - Beware additive bradycardia and AV block with beta-blockers and calcium channel blockers
Persistent Atrial Fibrillation

- For patients that persist in AF >8 hours despite amiodarone therapy, consideration must be given to anticoagulation to prevent the complication of stroke.
  - Continue oral amiodarone

- Anticoagulation
  - Coumadin therapy with intravenous heparin bridge
  - Goal INR 2.0-3.0
  - If conversion with stable sinus rhythm, +/- coumadin
**Ensure SpO₂ > 92% with supplemental O₂**
Check K⁺ and Mg²⁺. Supplement if necessary.

- **Is the HR > 100 bpm?**
  - Yes
  - **Is ejection fraction > 30%?**
    - Yes
    - **Rate Control for EF >30**
      - Diltiazem load and maintenance
    - No
    - **Rate Control for EF <30**
      - Digoxin load and maintenance
  - No

- **Is the arrhythmia persisting for 1 hour or recurrent?**
  - Yes
  - **Amiodarone load and maintenance**
    - **Is atrial fibrillation present for >8 hrs?**
      - Yes
      - Continue amiodarone PO. Consider anticoagulation (target INR 2.0-3.0)
      - No
      - Continue amiodarone PO at the discretion of the attending MD.
    - No
  - No

- **Is atrial fibrillation present for >8 hrs?**
  - Yes
  - Continue amiodarone PO at the discretion of the attending MD.
  - No

- **Contact Surgical MD + Intensivist.**
Postoperative Atrial Fibrillation: Conclusions

- Postoperative atrial fibrillation is a common complication following cardiac surgery.

- Postoperative atrial fibrillation can be associated with significant morbidity and mortality.

- Prevention of postoperative atrial fibrillation is difficult despite multiple positive clinical trials with a variety of drugs.
Postoperative Atrial Fibrillation: Conclusions

- Successful treatment of postoperative atrial fibrillation requires both rate and rhythm control.

- Further research is needed to define the mechanism of postoperative atrial fibrillation to more effectively prevent it.
Question

What is the most important risk factor for developing postoperative atrial fibrillation?

- A. Aortic valve disease
- B. Male gender
- C. Advanced age
- D. Enlarged left atrium
- E. Hypertension