

# The EM Educator Series

The EM Educator Series: Not-your-straightforward Atrial Fibrillation

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## Cases:

#1: A 46-year-old male presents with palpitations for three hours. He is otherwise hemodynamically stable and appears well. He has known hypertension, but no other known conditions. ECG demonstrates irregularly irregular rhythm at 142 beats per minute.

#2: A 79-year-old female is brought from the nursing home for fever, cough, and altered mental status. She has a history of hypertension, diabetes, prior stroke, and hyperlipidemia. Her VS include BP 87/51, HR 132, Sats 90% on RA, Temp 101.2 oral. Her ECG reveals an irregularly irregular rhythm consistent with her known atrial fibrillation at a rate of 133 beats per minute.

## Questions for Learners:

- 1) What are triggers for atrial fibrillation? What about AF with RVR?
- 2) Is there utility for bedside ultrasound in AF with RVR?
- 3) When should you use a calcium channel blocker versus beta blocker?
- 4) What do you need to consider in the sick, hypotensive patient with AF and RVR? Doesn't the patient just need rate control?
- 5) When and how do you cardiovert these patients? Why does cardioversion fail?
- 6) Is measuring a troponin needed? If so, when?
- 7) What is concerning for WPW with AF?

## Suggested Resources:

- ✓ Articles:
  - [CORE EM – Recent-Onset Atrial Fibrillation](#)
  - [PulmCrit – Flipping the Podcast: Approach to shocky patient in AF w/ RVR](#)
  - [First 10 EM – Management of unstable atrial fibrillation in the emergency department](#)
  - [ALiEM – Atrial Fibrillation Rate Control in the ED: Calcium Channel Blockers or Beta Blockers?](#)
  - [emDOCs – More Atrial Fibrillation Management Pearls in the ED](#)
  - [emDOCs – Management of Atrial Fibrillation: Do's and Don'ts](#)
  - [LITFL – Pre-excitation Syndromes](#)
- ✓ Podcasts:
  - [EM Cases – Episode 20: Atrial Fibrillation](#)

## Answers for Learners:

### 1) What are triggers for atrial fibrillation? What about AF with RVR?

- Congestive heart failure (CHF)
- Structural causes: Valvular heart disease, Cardiomyopathy
- Endocrine disorders: Hyperthyroidism, pheochromocytoma
- Drug & Alcohol: stimulants, amphetamines, acute alcohol intoxication (aka “Holiday Heart”)
- Catecholamine excess
- Cardiac surgery
- Sick sinus syndrome
- Cardiac ischemia
- Inflammation: Myocarditis, Pericarditis

**PIRATES** – PE, Ischemia, Respiratory disease, Atrial enlargement or myxoma, Thyroid disease (check TSH and free T4 in first-time presenters), Ethanol (“Holiday heart” after binging), Sepsis or Sleep apnea

1/3 are ‘lone Afib’ with no demonstrable cause

In most cases, when the underlying cause is addressed the A.fib resolves

### 2) Is there utility for bedside ultrasound in AF with RVR?

Evaluate broadly with ultrasound for other causes of tachycardia/shock, e.g.:

- Heart: evidence of PE? MI? Tamponade? Endocarditis?
- Lungs: pneumothorax? empyema/pneumonia?
- Abdomen: aortic dissection? hemorrhage?

### 3) When should you use a calcium channel blocker versus beta blocker?

**Active wheeze in reactive airway disease** (asthma, COPD) – Although  $\beta$  1-blockers are cardioselective, studies demonstrate they decrease FEV1 and PEF. Therefore BB should be used with caution in severe or active reactive airway disease.

Clinicians should be conscious of patients with hypotension when giving calcium channel blockers and they should never be given in patients with AF with associated pre-excitation.

Contraindications:

- Decompensated heart failure as CCBs may lead to further hemodynamic compromise<sup>4, 20, 21</sup> (for more continue below)
- Known II or III degree AV block – BB or CCB may cause II or III degree AV block in 15% of patients

#### **4) What do you need to consider in the sick, hypotensive patient with AF and RVR? Doesn't the patient just need rate control?**

Managing Atrial Fibrillation Secondary to...

=>Sepsis: Do use BBs

AF is an independent predictor of mortality the critically ill, AF confers 31% mortality versus patients without AF at 17% mortality ( $P < 0.001$ ).<sup>30</sup> A retrospective cohort by Walkey et al of 39,693 septic patients with AF analyzed practice patterns and mortality. CCBs were most commonly initiated in AF during sepsis (36%); however, BBs were associated with lower hospital mortality compared to CCB (RR 0.92), digoxin (R 0.79), and amiodarone (RR 0.64).

=>Hyperthyroid: Do use BBs

BBs are recommended to control AF complicating thyrotoxicosis unless contraindicated (Level C).<sup>4</sup> The rationale is two-fold, first hyperthyroidism is a state of increased  $\beta$ -adrenergic receptors thus BB reduce symptoms. Second, propranolol, atenolol, and metoprolol slowly decrease serum T3 concentrations by inhibiting the conversion from thyroxine (T4).

=>Heart Failure: Do use BBs

The AF-CHF study by Dydra et al compared rate versus rhythm control strategies in CHF. The study enrolled 1,376 patients with an EF  $< 35\%$  and recent history of AF, patients were randomized to rate control utilizing BB or rhythm control utilizing electrical cardioversion and amiodarone. Rhythm control was abandoned more frequently than rate control, 21% versus 9.1% respectively. The predominant reason to abandon rate control was worsening heart failure. Importantly, crossover from rhythm to rate control did not increase cardiovascular or all cause mortality. Although rate control is an acceptable strategy in CHF, BB therapy does not confer the same mortality benefit in AF as it does in sinus rhythm. Therefore, BB can be used in HF but does not need to be the only or first line agent.

The decrease in SVR, anti-ischemic effects, and LV relaxation of CCBs indicate theoretical benefit in CHF. However, the negative inotropic effect may impair left ventricular function. Furthermore, the MDPIT study by Goldstein et al showed post-MI patients on CCBs with early LV dysfunction (EF  $< 40\%$ ) were found to have increased late onset heart failure. Although the evidence is not overwhelming, in cases of rapid AF and CHF, particularly decompensated HF, rate control with CCBs can be detrimental.

#### **5) When and how do you cardiovert these patients? Why does cardioversion fail?**

Patients with hemodynamic instability, ongoing ischemia, or worsening heart failure should undergo direct current cardioversion. If the choice is available, biphasic waveform devices have greater efficacy than monophasic. In terms of the selection of energy level, Mittal et al provides a protocol for escalating shock energies on monophasic and biphasic devices with reported efficacy of each energy level. Some advocate starting at maximum energy to optimize success as studies have shown higher energy does not increase cardiac injury.

#### **6) Is measuring a troponin needed? If so, when?**

In an unpublished review of charts at the University Health Network, 86% of patients had troponins drawn, 14% were positive and 5% of patients were treated as ACS – most of these had hypotension, signs of heart failure, or ECG changes after conversion or rate control

Ischemia may be the result or the cause of A.fib, so consider doing troponins when there are clinical features of ACS present or risk factors for CAD.

## **7) What is concerning for WPW with AF?**

### **Atrial Fibrillation & Atrial Flutter in WPW**

- Atrial fibrillation can occur in up to 20% of patients with WPW.
- Atrial flutter can occur in up to 7% of patients with WPW.
- The accessory pathway allows for rapid conduction directly to the ventricles bypassing the AV node.
- Rapid ventricular rates may result in degeneration to VT or VF.

### **ECG features of Atrial Fibrillation in WPW are:**

- Rate > 200 bpm
- Irregular rhythm
- Wide QRS complexes due to abnormal ventricular depolarisation via accessory pathway
- QRS Complexes change in shape and morphology
- Axis remains stable unlike Polymorphic VT