Management of Atrial Fibrillation in the Emergency Department

Ref: Emergency Medicine Clinics of North America, 2005

Presenter: PGY
Supervisor: VS

Introduction
- Af is most common cardiac arrhythmia
- Sequelae: range from none to devastating: exercise intolerance, CHF, tachycardia-induced cardiomyopathy, and systemic emboli

Pathophysiology
- Af is a supraventricular rhythm disorder due to: ectopic focus, single re-entry circuit, or multiple re-entrant circuits.
- Result in decrease cardiac output especially in VHD, diastolic dysfunction, cardiomyopathy, and CAD → lead to sequelae
- S/S: palpitations, shortness of breath, chest pain, weakness, and near syncpe caused by coronary insufficiency, CHF, hypotension, and shock
- Intra-atrial stasis in atrial appendage and cause thromboembolic events

Causes
- Cardiopulmonary causes
- Systemic causes
- Primary (lone) atrial fibrillation

History Taking
- Ask for presence of chest pain or history of CAD to suggest acute ischemia
- Fevers, or other constitutional symptoms associated with sepsis, acute volume shifts, alcohol ingestion, thyroid disorders, medications, alcohol, or durg use
- Determine the chronicity of the complaint, time of onset of symptoms suggestive of Af
- Note that many episodes of Af were asymptomatic or silent episodes

Table 1
<table>
<thead>
<tr>
<th>Etiology of atrial fibrillation</th>
<th>Other causes</th>
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<tbody>
<tr>
<td>Serious cardiopulmonary causes</td>
<td>Hyperthyroidism</td>
</tr>
<tr>
<td>Acute myocardial infarction or acute coronary syndrome</td>
<td>Health history (“buddy heart”)</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>Hypertension</td>
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<tr>
<td>Cardiomyopathy</td>
<td>Hypothyroidism</td>
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<tr>
<td>Restrictive heart disease</td>
<td>Drugs (angiotensin-converting enzyme inhibitors, angiotensin receptor blockers)</td>
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<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>Metabolic causes, hypokalemia</td>
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<tr>
<td>Sleep apnea</td>
<td>Metabolic causes, hypokalemia</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Metabolic causes, hypokalemia</td>
</tr>
<tr>
<td>Valvular heart disease</td>
<td>Metabolic causes, hypokalemia</td>
</tr>
<tr>
<td>Left ventricular hypertrophy</td>
<td>Metabolic causes, hypokalemia</td>
</tr>
<tr>
<td>Left ventricular diastolic dysfunction</td>
<td>Metabolic causes, hypokalemia</td>
</tr>
<tr>
<td>Congestive heart disease</td>
<td>Metabolic causes, hypokalemia</td>
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<tr>
<td>Sick sinus syndrome</td>
<td>Metabolic causes, hypokalemia</td>
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<tr>
<td>Pacemakers</td>
<td>Metabolic causes, hypokalemia</td>
</tr>
<tr>
<td>Post-cardiac surgery</td>
<td>Metabolic causes, hypokalemia</td>
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</tbody>
</table>

* Lone atrial fibrillation is most commonly found in younger population (age ≤ 65 y), with paroxysmal atrial fibrillation. Diagnosis includes absence of known causative factors and normal left ventricular function.
Physical Examination

- Vital signs
- Cardiopulmonary examination for CHF or VHD: S3 gallop, JVE, pulmonary rales, pedal edema
- Neurologic and vascular examination to determine the possibility of embolic complications

ECG

- Undulating low-amplitude fibrillary waves in place of discrete P waves and irregular rhythm
- Wide QRS complexes due to conduction aberrancy or pre-excitation in WPW syndrome
- Avoid AV nodal blocking agents: CCB, BB, and adenosine in WPW syndrome which can lead into VF and sudden cardiac death.
- ST-T changes consistent with ischemia or infarction should be identified.

Laboratory

- Complete blood count
- Electrolyte panel
- Glucose and thyroid function testing
- CXR
- Cardiac biomarkers if ACS suspected
- CT scan for suspicious of pulmonary embolism
- 2-D Echo: LV function, wall motion, chamber size, valvular function, pericardial fluid
- TEE for intra-atrial thrombus in elective cardioversion later at ward

Management of Af

- Associated symptoms
- Stability of vital signs
- Duration of dysrythmia
- Categorize into:
  - Hemodynamically unstable patient
  - Af of less than 48 hours
  - Af of more than 48 hours

Hemodynamically Unstable Patient

- ABCs
- Urgent rate and rhythm control in RVR: emergent synchronized cardioversion
- MVR or SVR: treat underlying causes and require admission for further cardiovascular evaluation
Hemodynamically Stable Patient: Rate Control

- **Adequate rate control by agents that depress AV node conduction: BB, CCB, Digoxin**
- **BB:** metoprolol, propranolol, esmolol → benefit in IHD, contraindication in COPD and asthma
- **CCB:** diltiazem, verapamil → use cautiously in CHF for hypotension
- **Digoxin:** limited role in acute rate control for long onset of action: hours
- Avoid above in WPW, may use procainamide and amiodarone in WPW

**Hemodynamically Stable Patient: Rhythm Control**

- **RACE trial:** rate control was not inferior to rhythm control at the end of 12 months with primary endpoint of CV death, CHF, TIA/CVA, bleeding. Women and hypertensive pts had worse outcomes with rhythm control
- **AFFIRM trial:** 65 yrs pts of Af for at least 6 hrs in the past 6 months who had risk factors for stroke/death → increase in mortality in rhythm control (p = .07), higher cost in rhythm control
- Conclusion: if ventricular rate and symptoms could be controlled, rate control is preferred.

**Hemodynamically Stable Patient: Rhythm Control**

- **New onset Af < 48 hr** (low likelihood of atrial thrombus, <1%) → CARDOVERSION
- Timing of cardioversion: ?, immediately in ED or after period of observation; 50% of pts spontaneously cardiovert rhythm within 24 hrs
**Cardioversion: chemical vs Electrical**

- **Chemical:** no need sedation, but take longer for onset, has proarrhythmic potential (3%–5%), monitor up to 12 hrs, lower success rate (50%).
- **Electrical:**
  - high success rate (89%)
  - need sedation
  - Aborted if failure to convert despite max energy settings
  - Biphasic better than monophasic
  - Complications are rare: failure to convert, cardiac damage, anesthetic complications
  - Effectiveness increased by pretreatment with ibutilide

**Anticoagulation**

- Increase risk for thromboembolism and stroke in pts > 48 hrs, hence, tx with anticoagulant therapy for at least 3 to 4 weeks before cardioversion or TEE before cardioversion.

**CHADS 2 Scoring System for pts Requiring Chronic Anticoagulation**

<table>
<thead>
<tr>
<th>CHADS 2 score</th>
<th>95% CI</th>
<th>Yearly risk of stroke (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&lt;1.2-3.0&gt;</td>
<td>1.9</td>
</tr>
<tr>
<td>1</td>
<td>&lt;1.3-3.0&gt;</td>
<td>2.8</td>
</tr>
<tr>
<td>2</td>
<td>&lt;1.3-2.5&gt;</td>
<td>4.0</td>
</tr>
<tr>
<td>3</td>
<td>&lt;1.3-7.3&gt;</td>
<td>5.9</td>
</tr>
<tr>
<td>4</td>
<td>&lt;1.3-13.1&gt;</td>
<td>8.5</td>
</tr>
<tr>
<td>5</td>
<td>&lt;1.2-17.5&gt;</td>
<td>12.5</td>
</tr>
<tr>
<td>6</td>
<td>&lt;1.0-27.4&gt;</td>
<td>16.2</td>
</tr>
</tbody>
</table>

Yearly risk of stroke in patients with chronic atrial fibrillation without antithrombotic therapy. 

**CHADS 2 scoring system**

- Score 0: low risk → aspirin
- Score 1–2: intermediate risk → aspirin or warfarin
- Score > = 3: high risk → warfarin

**Other Treatment Options**

- Radiofrequency ablation (circumferential pul. Vein isolation)
- Surgical maze ablation
Disposition

- Pts with significant comorbidities, hemodynamic instability, or ACS will require admission to the hospital
- Pts who respond well to therapy or converts to normal sinus rhythm without above complications → OBS for few hrs → MBD and OPD follow up

Summary

- > 50% of acute Af pts will convert spontaneously to sinus rhythm within a 24 hr period
- Identifying the time of onset is critical to initiation of anticoagulation and decision of cardioversion
- Chronic Af: rate control and anticoagulation
- Hemodynamic unstable → immediate cardioversion

Rate control VS rhythm control


- Several clinical trial trials shown no significant differences between the two strategies with respect to mortality, major bleeding, and thromboembolic events

Carlsson J, Miketic J. Am Coll Cardiol 2003; 41: 1690–96

- Restoration and maintenance of sinus rhythm in patients with persistent atrial fibrillation was associated with improvements in quality-of-life measures and exercise performance.

The presence of sinus rhythm (with or without AADs) was associated with a significant reduction in the risk for death, but AAD use was associated with increased mortality. A strategy to maintain sinus rhythm without the adverse effects of antiarrhythmic medications may confer a survival advantage.


The reasons for the lack of advantage of sinus rhythm maintenance in clinical trials are not clear but could relate to the toxicity associated with antiarrhythmic medications, negating the advantages of sinus rhythm.

A group of younger patients (eg, age <40 years) with valvular heart disease and atrial fibrillation showed a significant benefit of rhythm control with respect to reduction in mortality and improvement in functional class, quality of life, and exercise time.

Vora A. Curr Opin Cardiol 2006; 21: 47–50

Rate-control strategy preferred in
- older than 65 years with coronary artery disease
- with contraindications to AADs
- with no congestive heart failure
- unsuitable for cardioversion

NICE guidelines

Rhythm-control strategy preferred in
- Symptomatic patients
- younger patients (eg, age <65 years)
- presenting for the first time with lone atrial fibrillation
- those with the disorder that is secondary to a treated or corrected precipitant.
Objective

► To compare the success rates and short-term complications of three treatment approaches, pharmacological and direct-current cardioversion (DCC), or wait-and-watch among stable atrial fibrillation (AF) patients in the emergency department (ED).

Study design

► Retrospectively compare the outcomes of the three optional treatment approaches in stable AF patients who were cardioversion compatible in ED within one year.

► Success of chemical or electrical cardioversion interventions was defined as a return to sinus rhythm, as demonstrated on a 12-lead ECG and sustained through ED discharge.

Patient selection

► AF duration < 48 h, or, for longer-lasting AF, with an international normalized ratio (INR) of 2–5.

► Patients who underwent emergency DCC for clinically hemodynamic instability AF were excluded.

Cardioversion Treatments

► DCC protocol in the ED included short-acting sedation with benzodiazepines, and optionally with morphine or pethidine.

► The initial shock was synchronized monophasic 50 J, followed by 100, 150, 200, 300 and 360 J, as necessary.

Pharmacological cardioversion

► Propafenone (300 mg x 2 p.o. at 2- to 3-hour intervals)

► Procainamide (100 mg i.v. bolus over 5 min up to a total dose of 1 g and then followed by continuous i.v. 2–4 mg/min)

► Amiodarone (300 mg continuous i.v. for 30–60 min, followed by 1,200 mg/24 h continuous i.v.)

Rate control

► Digoxin (0.25 mg i.v. at 2- to 3-hour intervals up to a total dose of up to 1.5 mg)

► Verapamil (5–10 mg i.v. bolus during 3–5 min)

► Beta Blockers (metoprolol – 2.5–5.0 mg i.v. bolus during 2 min, which could be repeated at a 15- to 30-min interval for up to a total dose of 15 mg)
Discussion

- DCC was 2.43 times more successful than pharmacological treatment in converting AF patients to sinus rhythm (95% CI 1.36-4.33, p = 0.003).
- A significantly higher rate of DCC patients in our study were also discharged to their home (53%) compared with pharmacologically treated patients (48%) or those of the wait-and-watch approach (32%), p < 0.01.
The rate of re-admission to the hospital within 14 days of discharge due to probable AF-treatment-related complications was extremely low, with only 5 patients (3.4%), and none of them from the DCC group.

A total of 3 patients died during hospitalization, all 3 from the wait-and-watch group.

Underuse of DCC

Senior physicians are probably more self-confident and less hesitant on performing what may be perceived as an aggressive therapy.

During night shifts, the ED staff consists of junior physicians who may prefer to take the wait-and-watch approach and finally to hospitalize patients.

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Conclusion

Successfulness of treatment depends strongly on the type of cardioversion (DCC or pharmacological cardioversion), and also on the seniority of the treating physician, while age, gender or the existence of comorbidities are weak predictors for the successfulness of treatment.

DCC was found to be the most effective treatment, with few short-term complications following conversion of stable AF patients to sinus rhythm in the ED.

Thank you for your attention.