ARRHYTHMIAS AND DYSRHYTHMIAS: PBL

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Learning Objectives
1. Practice applying new knowledge and skills gained from Arrhythmias and Dysrhythmias sessions, through collaborative learning with peers and expert faculty.
2. Identify strategies that foster optimal management of arrhythmias/dysrhythmias within the context of professional practice.
3. Formulate an action plan to implement practice changes, aimed at improving patient care.

Associated Session(s)
• Arrhythmias and Dysrhythmias
Case

Evelyn is a 73-year old woman with a history of coronary artery disease who presents to your office complaining of palpitations. The episodes come and go and last about 20 minutes. She tells you she feels short of breath during these episodes.

Case

You obtain a 12-lead ECG which shows the following:

What is your diagnosis?

Atrial Fibrillation

- Most common cardiac arrhythmia worldwide
- Disease of aging
  - 1% patients < 60
  - 8-12% patients > 80
- 450,000 admission per year in the US
- Significant cause of stroke
  - Increased mortality and morbidity from stroke from AF

Atrial Fibrillation

- Paroxysmal AF
- Persistent AF
- Long-standing AF
- Permanent AF
- Nonvalvular AF

What are you next steps? Which decisions do you and Evelyn have to make?

Treatment of Atrial Fibrillation

Rate vs. Rhythm Control
- AFFIRM and RACE trials
- Rate control equivalent to rhythm control
- Rhythm control
  - Proarrhythmic
  - Requires monitoring
  - Reoccurs in 20-60% at one year
  - Increased hospitalization rate

Rate Control
- Beta blockers
  - esmolol
  - propranolol
  - metoprolol
- Nondihydropyridine calcium channel blockers
  - diltiazem
  - verapamil
- Digoxin
- Amiodarone

Rhythm Control
- Cardioversion
- Antiarrhythmic drugs
- Catheter ablation
Cardioversion

For episodes < 48 hours duration
  – Perform cardioversion

For episodes > 48 hours
  – Anticoagulation 3 weeks before and 4 weeks after
  Or
  – TEE to rule out LA thrombus, then cardioversion

Antiarrhythmic Drugs

Medications to maintain sinus rhythm
  • Dronedarone
  • Amiodarone
  • Flecanide
  • Propafenone

Antiocoagulation

• In patients with AF, antithrombotic therapy should be individualized based on absolute and relative risks of stroke and bleeding (Class I; LOE: C)
  • Selection of antithrombotic therapy should be based on the risk of thromboembolism irrespective of whether the AF pattern is paroxysmal, persistent, or permanent (Class 1; LOE C)
  • In patients with nonvalvular AF, the CHA2DS2-VASc score is recommended for assessment of stroke risk. (Class 1: LOE B)

CHA2DS2-VASc

• Congestive heart failure
• Hypertension
• Age > 75 (2 points)
• Diabetes mellitus
• Prior stroke or TIA or thromboembolism (2 points)
• Vascular disease
• Age 65-74 years
• Sex category (female sex)
HAS-BLED Score

- Hypertension (Uncontrolled > 160 mm Hg)
- Abnormal liver/renal function
- Stroke
- Bleeding history
- Labile INR (<60% time in therapeutic range)
- Elderly (Age >65)
- Drug/alcohol use

Anticoagulation

- Warfarin
- Novel oral anticoagulants
  - dabigatran
  - rivaroxaban
  - apixaban
  - edoxaban

What is the absolute risk reduction for stroke for aspirin?

Case

Two months later, Evelyn returns to your clinic complaining of palpitations and shortness of breath. Her heart rate is 140 beats per minute at rest. What do you want to do?

Treatment of Atrial Fibrillation

Acute Management

If hemodynamically unstable
- Electrical cardioversion
If hemodynamically stable but symptomatic (with no pre-excitation)
- Metoprolol 2.5-6.0 mg IV bolus every 3 min; up to 3 doses
- Verapamil 0.075-0.15 mg/kg IV bolus over 2 min; may give an additional 10.0 mg after 30 min in no response, then 0.005 mg/kg/min infusion
- Diltiazem 0.25 mg/kg IV bolus over 2 min; then 5-15 mg/hr

Case
You admit Evelyn to the hospital and successfully rate control her. During her hospital stay, the following ECG is obtained.

What is your diagnosis?

Atrial Flutter

Acute Management
1. Hemodynamically unstable
   - Rhythm control
     - Synchronized cardioversion (Class 1)
   - Rate control
     - IV amiodarone (Class 2a)
2. Hemodynamically stable
   - Rhythm control
     - Synchronized cardioversion (Class 1)
   - Rate control
     - IV beta blockers, diltiazem, verapamil (Class 1)
     - IV amiodarone (Class 2a)

Chronic Management
1. Rate control
   - Beta blockers, diltiazem, verapamil (Class 1)
2. Rhythm control
   - Catheter ablation (Class 1)
   - Amiodarone, dofetilide or sotalol (Class 2a)
   - Flecaïnide or propafenone (Class 2b)

Atrial Flutter

- Reentrant atrial arrhythmia
- Regular atrial rate
- Constant p-wave morphology
- Similar risk factors for atrial fibrillation
- Atrial flutter and atrial fibrillation can coexist in same patient
We can't seem to keep her rate below 110 beats per minute. How important is rate control?

Tachycardia-Induced Cardiomyopathy

- Cardiomyopathy secondary to sustained tachycardia
- Dilated cardiomyopathy
- Sustained tachycardia for months to years
- Reversible with control of underlying rhythm

Case

Three months after discharge, Evelyn is brought has a recurrence of her palpitations and shortness of breath. She goes to the local Emergency Department where a 12-lead ECG is obtained.

Wide Complex Tachycardia

- Ventricular tachycardia
- Supraventricular rhythm with abnormal conduction

Wide Complex Tachycardia

- VT with abnormal conduction
- Pre-existing bundle-branch block or intraventricular conduction defect
- Aberrant conduction due to tachycardia (normal QRS in sinus rhythm)
- Electrolyte or metabolic disorder
- Conduction over an accessory pathway
- Paced rhythm

Management of Wide Complex Tachycardia

If patient is unstable
• Synchronized cardioversion
If regular and monomorphic
• Consider adenosine
• Antiarrhythmic therapy
  – Procainamide
  – Amiodarone
  – Sotalol
  • Cardioversion
If irregular
• Treat as atrial fibrillation or flutter
• Defibrillation

AES POLL QUESTION
Which of the following medications are contraindicated in patients with atrial fibrillation with pre-excitation?
A. Digoxin
B. IV amiodarone
C. Beta blockers
D. Diltiazem
E. Verapamil
F. All of the above

What we’re doing doesn’t seem to be working. Should we refer her for ablation?

Catheter Ablation
• Symptomatic paroxysmal AF refractory to medication when rhythm control is desired (Class 1: LOE A)
• Recurrent symptomatic paroxysmal AF in some patients (Class 2a: LOE A)
• Reasonable for persistent AF refractory to medication (Class 2a: LOE A)

Case
While Evelyn is in the ED, the following rhythm is noted.
Case

What do we do now?

Ventricular Arrhythmias

• PVCs
• Monomorphic SVT
  – Sustained (more than 30 second)
  – Nonsustained
• Polymorphic SVT
  – Torsades de Points

Ventricular Arrhythmias

• Monomorphic ventricular tachycardia
  – May be SVT in origin
  – Result of structural heart disease
  – Idiopathic ventricular tachycardia
• Polymorphic ventricular tachycardia
  – Clinically significant structural heart disease
  • Acute myoccardial infarction
  • Cardiomyopathies
  • Genetic arrhythmia syndromes
  – ICD may be indicated
• PVCs and non-sustained ventricular tachycardia
  – Low risk in absence of structural heart disease or arrhythmia syndrome

Causes of Sudden Cardiac Death

Ventricular fibrillation (62.4%)
Bradyarrhythmias (16.5%)
Torsades de pointes (12.7%)
Ventricular tachycardia (8.3%)

Management of Ventricular Tachycardia

• Treat underlying disease
• No antiarrhythmic proven to prevent sudden cardiac death
  – metoprolol
• ICD placement in appropriate patients

Sudden Cardiac Death (SCD)

In patients with heart disease

• Older patients
  – Coronary artery disease
  – Valvular heart disease
  – Heart failure
• Predictors
  – Severity of underlying disease
  • Coronary heart disease
  • Heart failure
  – Ejection fraction strongest predictor (< 30-40%)
Sudden Cardiac Death (SCD)  
In patients without heart disease  
• 50% have undiagnosed ischemic heart disease  
• Younger patients  
  – Channelopathies  
  – Cardiomyopathy  
  – Myocarditis  
  – Substance abuse

Case  
In the Emergency Department, Evelyn is electrically cardioverted. After observation overnight, she is discharged. One week later her husband calls EMS after she has a syncopal episode at home.

What is the differential diagnosis for syncope?  
What should you consider in Evelyn’s case?

Causes of Bradycardia  
• Sinus node dysfunction (sick sinus syndrome)  
• Atrioventricular block  
• Reflex syncope  
• Toxins  
• Systemic disease  
• Electrolytes  
• Conduction disturbance  
• Medications

Atrioventricular Blocks  
• Delayed conduction through AV conduction system  
• First degree  
• Second degree type 1 (Wenkebach)  
• Second degree type 2  
• Third degree
Case

The initial evaluation in the ED is negative and Evelyn is once again admitted to the hospital for observation. Overnight, telemetry shows an episode of atrial fibrillation followed by a 6-second sinus pause, followed by sinus bradycardia at a rate of 35 beats per minutes. During this time, Evelyn reports feeling weak and near-syncopal.

What is your diagnosis?

Sinus Node Dysfunction

- Problem with the sinus node and surrounding tissue
- Disease of the elderly
- Sinus bradycardia or tachy-brady
- Indications for pacemaker placement
  - Symptomatic bradycardia
  - Chronotropic incompetence
  - Symptomatic bradycardia from required drug therapy

What do you do?
Treatment Sinus Node Dysfunction

- Permanent pacemaker placement

Treatment Bradycardia

- Atropine
- Reversible causes
- Transcutaneous pacing
- Dopamine
- Epinephrine
- Isoproterenol
- Transvenous pacing

Causes

Acute bradycardia (sinus bradycardia and AV blocks)
1. Ischemia or infarction
2. Conduction disease
3. Medication effects
   - Beta blockers
   - Calcium channel blockers
   - Tricyclic antidepressants

Case

Pacer pads are placed and Evelyn is transferred to a tertiary care center. She is evaluated by an electrophysiologist and a permanent pacemaker is placed

Questions

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