PALPITATIONS

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OBJECTIVES

- Understand the history, physical exam and laboratory work up
- Appreciate and appropriately use the cardiac monitors required to assess palpitations
- Differentiate the utility of medical therapy versus invasive therapy in the correct patient population
PALPITATIONS

- One of the most common problems of patients presenting to internists and cardiologists
- Accounts for 16% of complaints in one study of 500 patients
- Usually benign
- May occasionally be a manifestation of a life threatening arrhythmia

Kroenke Arch Int Med 1990;150:1685
DEFINITION OF PALPITATIONS

- Sensory symptom
- Awareness of a forceful or irregular beating of the heart
- May be described as a rapid fluttering, a flip-flop, or a pounding in the chest
CAUSES OF PALPITATIONS

- Cardiac
- Psychiatric diseases
- Medications
- Habits
- Metabolic disorders
- High output states
- Catecholamine excess
CARDIAC CAUSES OF PALPITATIONS

- Any arrhythmia
- Valvular heart disease
- Cardiomyopathy
- Atrial myxoma
- Pacemaker
PSYCHIATRIC DISEASE

- Generalized anxiety disorder
- Somatization
- Depression
- Panic attack and disorder
MEDICATIONS

- Sympathomimetics
- Vasodilators
- Anticholinergic drugs
- Diet pills and supplements
- Withdrawal from beta blockers
HABITS

- Excessive caffeine or alcohol use
- Cocaine or amphetamine uses
- Nicotine use
METABOLIC DISORDERS

- Hypoglycemia
- Thyrotoxicosis
- Pheochromocytosis
- Mastocytosis
- Scombroid food poisoning - allergic reaction to high levels of histamine in fish (includes tuna, bonita and mackerel, may be seen in marlin or mahi-mahi)
- May also be seen after consumption of cheese
HIGH OUTPUT STATES

- Anemia
- Pregnancy
- Paget’s disease
- Fever
CATECHOLAMINE EXCESS

- Stress
- Exercise
DIAGNOSTIC EVALUATION OF PALPITATIONS

- History
- Physical exam
- EKG
HISTORY

- Characteristic presentation of palpitations
- Associated sensations
- Age of onset
ONSET AND OFFSET

- Random or episodic for an instant- usually indicates premature beats
- Gradual onset and offset suggests sinus tachycardia
- Sudden onset and offset (like a light switch flipping on or off)- SVT
- Termination with a Valsalva maneuver- SVT
Flip flopping in the chest or starting and stopping – usually PACS or PVCs

Sensation of heart stopping results from compensatory pause and flipping or pounding is from forceful contraction after the pause

Rapid regular fluttering – SVT or VT

Rapid irregular fluttering – atrial fibrillation

Pounding in the neck- AV dissociation- independent contraction of the atria and ventricles, resulting in atrial contraction against a closed tricuspid and mitral valve and cannon A waves may be caused by PVCS, complete heart block, VT
Actual descriptions of palpitations
AGE OF ONSET OF PALPITATIONS

- Not an independent predictor of presence or absence of a cardiac etiology
- May narrow differential diagnosis of certain arrhythmias, e.g. palpitations since childhood suggests SVT particularly one that uses a bypass tract although AVNRT is also possible
- Serious ventricular arrhythmias occur in older patients with structural heart disease
POSITIONAL PALPITATIONS

- AV nodal reentrant tachycardia- occurs with standing up straight after bending over
- Pounding while lying in bed particularly on left side- PACS or PVCS- apex of heart is closer to chest wall and patients are more aware
PALPITATIONS ASSOCIATED WITH SYNCOPE OR NEAR SYNCOPE

- Warrants prompt evaluation
- Search for VT and risk factors for VT
- May be associated with SVT resulting from acute vasodilation, rapid heart rate with low cardiac output
MEDIICATIONS AND HABITS

- All medications including over the counter ones
- Sympathomimetic drugs (ADHD)
- Vasodilators
- Anticholinergic drugs
- Withdrawal from beta blockers
- Caffeine and alcohol use
- Cocaine or amphetamine use
VARIABLES THAT PREDICT A CARDIAC ETIOLOGY OF PALPITATIONS

- Male sex
- Description of an irregular heart beat
- History of heart disease
- Event duration $> 5$ minutes

INDEPENDENT PREDICTORS OF CARDIAC ETIOLOGY

- No variable present: Zero percent chance of cardiac etiology
- One variable: 26% chance
- Two variables: 48% chance
- Three variables: 71% chance

No optimal screening tool for arrhythmias due to psychiatric illness

Study of 125 patients referred for ambulatory ECG

Patients were significantly younger, more disabled and had more hypochondriacal concerns about their health

Palpitations were likely to last longer than 15 minutes, more intense

More emergency room visits

Barsky et al Arch Intern Med 1996;156:1102
PHYSICAL EXAMINATION

- Identify potential cardiovascular abnormalities that serve as a substrate for arrhythmias or are associated with palpitations
- Mid-systolic click and murmur of mitral valve prolapse
- Harsh systolic murmur along left lower sternal border that increase with Valsalva maneuver - hypertrophic cardiomyopathy
- Clinical evidence of a cardiomyopathy and heart failure
12 LEAD ELECTROCARDIOGRAM

- May help narrow the differential diagnosis
- Short PR interval with delta wave-Wolff-Parkinson-White syndrome
- Marked left ventricular hypertrophy with deep septal Qs in I, aVL and V4- V6-Hypertrophic obstructive cardiomyopathy
- Presence of Q waves-prior MI –risk for VT
- Isolated ectopy
- Prolonged QT interval
- Presence of conduction system disease –RBBB or LBBB
M.A. - 18 YEAR OLD FOOTBALL PLAYER
MEDICATION INDUCED LONG QT
LABORATORY WORK

- Basic metabolic panel
- Magnesium
- Thyroid function tests
PATIENTS FOR FURTHER DIAGNOSTIC TESTING

- Patients whose initial evaluation suggests an arrhythmic cause—particularly important if patient has syncope or near syncope
- Patients who are a high risk for an arrhythmia—organic heart disease—prior MI, cardiomyopathy, significant Valvular disease
- Patients with a family history of arrhythmia, syncope or sudden cardiac death
- Patients who remain anxious to have a specific explanation for their symptoms
ECHOCARDIOGRAM

- Not necessary in most patients
- Appropriate in patients whose history, physical or EKG suggests structural heart disease
DIAGNOSTIC TESTS

- **24 hour monitor** - useful in patients who have daily symptoms.
- **30 day event recorder** - for patients with less frequent symptoms. Continuous recording of data but save data for a preceding programmable amount of time, can be patient-activated or automatically records slow or fast rhythms.
- **Implantable loop recorder** - for patients with less frequent symptoms or for very active patients.
HOLTER MONITORS

- Limited by short duration of monitoring time
- Arrhythmias may be identified on the recording that are unrelated to the palpitations
- One study involving 1454 patients (age 60-94 years) 8.3% complained of palpitations and arrhythmias were found in 12.6% of patients
- Arrhythmias found were conduction system abnormalities and sinus bradycardia

Lok Int J Cardiol 1996;54:231
SVT DURING HOLTER
CONTINUOUS LOOP RECORDERS VERSUS HOLTER MONITORS FOR PALPITATIONS

- Review of 6 studies: diagnostic yield for continuous loops was 66-83% compared to 33-35% for Holter monitors.
- Continuous loops more cost effective than Holter monitors in the evaluation of palpitations.

Zimetbaum Ann Int Med 1999;130:848
Fogel Am J Cardiol1997;79:207
EVENT RECORDER TRACING - RECORDER WAS DONE FOR A COMPLAINT OF PALPITATIONS AND DIZZINESS
EVENT RECORDER TRACING
TIME TO DIAGNOSIS WITH CONTINUOUS LOOP RECORDERS

- Two weeks of transtelephonic monitoring is sufficient to make diagnosis in most patients and is more cost effective than the one month monitor.
- Retrospective analysis of 5052 patients-87 percent had an initial transmission corresponding to palpitations within the first two weeks of monitoring.
- Additional 9 percent initial transmissions occurred by 4 weeks.

Reiffel J Electricardioli 1991;24:165
**ELECTROPHYSIOLOGIC TESTING OR EPS**

- Indicated in patients with a high pre-test probability of a serious arrhythmia, e.g. patients with structural heart disease
- Important for therapy of certain arrhythmias-SVT, VT and atrial fibrillation
- Regardless of the presence or absence of heart disease, if palpitations are sustained or poorly tolerated an EPS is indicated
PRE-EXCITATION
MANAGEMENT OF PALPITATIONS

- Most SVTs and some VTs can be cured by catheter ablation
- Challenging patients are those with PACs or PVCs that cause significant symptoms
- Some patients complain of palpitations and are in normal sinus rhythm
- May use beta blockers or calcium channel blockers for symptoms
- Occasionally ablation for symptomatic PACs or PVCs is performed
ARRHYTHMIAS DURING CATECHOLAMINE EXCESS

- Supraventricular tachycardia - can be induced during exercise or stress
- Idiopathic Ventricular tachycardia - usually arising from the RVOT in patients with structurally normal hearts
- Atrial fibrillation - can be induced during exercise or after exercise when there is withdrawal of catecholamines and a surge in vagal tone
- Inappropriate sinus tachycardia
CASE STUDY

- G.S. is a 65 year old man with hypertension and palpitations and dizziness over the last several months. Also had episodes of loss of balance and near syncope
- Event recorder was placed
G.S. EVENT RECORDER-
SYMPTOMS OF NEAR SYNCOPE
WORK UP FOR PATIENT G.S.

- Echocardiogram – normal EF of 60%, stage I diastolic dysfunction, no significant Valvular disease
- Cardiac catheterization revealed no significant CAD, possible mild focal segmental wall motion abnormality
- Electrophysiology study recommended based upon event recorder and Cath results
No evidence of pre-excitation
No SVT or VT induced at baseline
With isoproterenol challenge at 2mcg/min patient had multiple spontaneous episodes of ventricular tachycardia
VT was mapped to the right ventricular outflow tract
VT was successfully ablated using radiofrequency energy
Symptom free 2 years later
INAPPROPRIATE SINUS TACHYCARDIA

- Occurs in patients without apparent heart disease or other cause for sinus tachycardia
- Generally a diagnosis of exclusion-need to rule out thyroid disease and anemia
- Defined as a resting heart rate of > 100 BPM (with a mean of > 90 BPM over 24 hours) associated with highly symptomatic palpitations
- Most patients are young and female
- Elevated resting heart rate and/or an exaggerated response to exercise that is out of proportion to the body’s physiological needs
CRITERIA FOR INAPPROPRIATE SINUS TACHYCARDIA

- P wave axis similar or identical to sinus rhythm
- Resting heart rate of 100 BPM or greater or with activity heart rates of 100 BPM or greater but in excess of what one would expect for the level of exertion
- Palpitations, presyncope, or both related to the tachycardia. Syncope is rare
- Exclusion of identifiable causes of sinus tachycardia
- Exclusion of atrial tachycardia
TREATMENT OF INAPPROPRIATE SINUS TACHYCARDIA

- Beta blockers may be effective if cause is overactivity of the sympathetic nervous system but not if sinus tachycardia results from depressed vagal activity.
- Ivabradine (5 to 7.5mg BID) with or without a beta blocker.
IVABRADINE

- Selective blocker of the If sodium channel or funny channel that regulates sinus node automaticity.
- Decreases the depolarizing funny current and decreases the heart rate.
- Labeled by the FDA for use in patients with systolic heart failure (EF< 35%) with a resting heart rate above 70 BPM.
DOUBLE BLIND STUDY OF 21 PATIENTS WITH INAPPROPRIATE SINUS TACHYCARDIA

- Ivabradine 5 mg PO BID versus placebo for 6 weeks
- Followed by washout period and cross over treatment to other treatment for 6 weeks
- Symptom evaluation and heart assessment was done by using supine, standing and exercise ECGs at beginning and end of each phase

Cappato et al JACC 2012;60:1233
OUTCOMES OF DOUBLE BLIND STUDY

- Improvement in symptoms in all patients
- 14 patients (67%) had elimination of >70% of symptoms
- 9 patients (43%) had complete resolution of symptoms while on Ivabradine
- Significant reductions in resting heart rate from 88 to 76 BPM, standing heart rate from 108 to 92 BPM and heart rate during exercise from 176 to 158 BPM
- Significant increases in exercise time from 7.2 to 8.9 minutes

Cappato et al JACC 2012;60:1323
SINUS NODE MODIFICATION FOR INAPPROPRIATE SINUS TACHYCARDIA

- Modestly effective
- Technically difficult because the sinus node is a complex of cells lying along the right atrial wall
- Not effective in patients who have postural orthostatic tachycardia syndrome, sinus rate is slowed but symptoms persist
- Risk of need for pacemaker if node is completely destroyed or phrenic nerve paralysis
- Prospective registry of 40 patients, acute success achieved in 71.4% but 10% of patients had recurrent symptoms

Scheinman PACE 2000;23:1020
T. A. is a 66 year old man with history of an apical hypertrophic cardiomyopathy, atrial flutter and atrial fibrillation.

- Underwent ablation for atrial flutter in 2010
- Underwent Radiofrequency ablation for atrial fibrillation in 2012
- Had recurrent atrial fibrillation and underwent a cryoablation for atrial fibrillation in July 2013
- Complained of a little bit of an irregular heart beat and some right sided chest pressure in October 2013
T.A. EVENT MONITOR

Strip Summary

02/14/2014

Time: 02/14/2014 19:26:00 EST
HR: 62
Symptoms: None indicated
Findings: Baseline - Normal Sinus Rhythm

Report Day 02/15/2014

Time: 02/15/2014 23:59:18 EST
HR: 51
Automatic Trigger
Findings: Sinus Bradycardia with PVC

Report Day 02/17/2014

Time: 02/17/2014 09:03:11 EST
HR: 62
Automatic Trigger
Findings: Sinus Rhythm with IVCD and Ventricular Tachycardia 5 beats, Rate 135 BPM
WORK UP FOR PATIENT T.A.

- Nuclear stress test read as normal EF of 53%, cannot rule out small area of mild inferior wall ischemia
- Cardiac catheterization- no significant occlusive coronary disease. LV gram showed cavity obliteration at the apex consistent with apical hypertrophic cardiomyopathy
- Event monitor ordered because of palpitations and to rule out recurrent atrial fibrillation or flutter
Electrophysiology study revealed inducible ventricular fibrillation
Defibrillator implantation recommended and was implanted
SUMMARY

- Most causes of palpitations are benign
- Some palpitations can be treated with behavior modification alone
- Presence of structural heart disease increases the likelihood of a potentially life-threatening arrhythmia
- Many arrhythmias are curable with ablation procedures