Chapter 45 | Palpitations

Harrison's Principles of Internal Medicine (22nd Edition) | Part 2 – Cardinal Manifestations & Presentation | DETAILED EDITION

KEY CLINICAL POINTS

1. Palpitations are a common symptom with diverse etiologies ranging from benign to life-threatening
2. The first step in evaluation is to determine if palpitations are associated with syncope, chest pain, or dyspnea
3. ECG during symptomatic episodes is the most important diagnostic test
4. Structural heart disease must be ruled out before attributing palpitations to benign causes
5. Beta-blockers and calcium channel blockers are first-line for rate control in SVT
6. Ablation is indicated for recurrent symptomatic SVT or atrial flutter
7. Anxiety and panic disorders are common causes of palpitations in patients with normal cardiac structure
8. Caffeine, alcohol, and stimulants can exacerbate palpitations and should be addressed
9. Thyroid dysfunction is a reversible cause that must be excluded in all patients
10. Orthostatic hypotension and autonomic dysfunction should be considered in elderly patients

FIGURES IN THIS CHAPTER

1. DEFINITION & OVERVIEW

Palpitations are the subjective sensation of awareness of one's own heartbeat. This sensation may be described as pounding, racing, fluttering, or skipping beats. The symptom is common in both cardiac and non-cardiac conditions.

1.1 Clinical Description

- Patients describe palpitations as:
  - Pounding or thumping sensation
  - Racing or fluttering heartbeat
  - Skipped or missed beats
  - Irregular or irregularly irregular rhythm
  - Chest discomfort associated with awareness of heartbeat

- The sensation may be:
  - Intermittent or continuous
  - Triggered by specific activities or positions
  - Associated with anxiety or stress
- Duration varies from seconds to hours

1.2 Classification Systems

- Harrison's classifies palpitations by:
  - Rhythm regularity (regular vs irregular)
  - Rate (normal vs tachycardic vs bradycardic)
  - Origin (supraventricular vs ventricular)
  - Duration (paroxysmal vs continuous)
- Alternative classification:
  - Benign palpitations (sinus tachycardia, premature beats)
  - Pathologic palpitations (arrhythmias, structural disease)
  - Anxiety-related palpitations

2. EPIDEMIOLOGY

Palpitations are one of the most common reasons for primary care visits. Prevalence varies by age, sex, and comorbidities.

2.1 Age Distribution

- Prevalence increases with age
  - Common in elderly due to:
  - Increased likelihood of structural heart disease
  - Autonomic dysfunction
  - Medication side effects
  - Less common in children unless associated with:
  - Congenital heart disease
  - Hyperthyroidism
  - Anxiety disorders

2.2 Sex Differences

- Women report palpitations more frequently than men
  - Possible explanations:
  - Higher prevalence of anxiety disorders
  - Hormonal influences
  - Lower threshold for reporting symptoms
  - Men more likely to have:
  - Ischemic heart disease
  - Structural cardiomyopathy

2.3 Risk Factors

- Modifiable risk factors:
  - Caffeine intake
  - Alcohol consumption

- Nicotine use
- Stimulant medications
- Dehydration
- Electrolyte disturbances

- Non-modifiable risk factors:
  - Age
  - Sex
  - Genetic predisposition to arrhythmias
  - Family history of sudden cardiac death

3. ETIOLOGY & PATHOPHYSIOLOGY

Palpitations result from increased cardiac awareness or abnormal electrical activity. The underlying mechanism varies by etiology.

3.1 Cardiac Causes

- Arrhythmias:
  - Supraventricular tachycardia (SVT)
  - Atrial fibrillation
  - Atrial flutter
  - Premature atrial contractions (PACs)
  - Premature ventricular contractions (PVCs)
  - Ventricular tachycardia
  - Sinus tachycardia
- Structural heart disease:
  - Coronary artery disease
  - Cardiomyopathy
  - Valvular heart disease
  - Congenital heart defects
- Ischemia:
  - Angina with palpitations
  - Myocardial infarction

3.2 Non-Cardiac Causes

- Endocrine disorders:
  - Hyperthyroidism
  - Hypoglycemia
  - Pheochromocytoma
  - Cushing syndrome
- Autonomic dysfunction:
  - POTS (postural orthostatic tachycardia syndrome)
  - Autonomic neuropathy
  - Anxiety disorders
- Medications:
  - Beta-agonists
  - Theophylline

- Decongestants
- Antidepressants
- Caffeine-containing products

- Substance use:
  - Alcohol
  - Cocaine
  - Amphetamines
  - Cannabis

3.3 Pathophysiology of Arrhythmias

- Re-entry mechanisms:
  - AV nodal reentrant tachycardia (AVNRT)
  - AV reentrant tachycardia (AVRT)
  - Atrial flutter
  - Ventricular tachycardia
- Triggered activity:
  - Delayed afterdepolarizations
  - Early afterdepolarizations
- Automaticity:
  - Enhanced automaticity in sinus node
  - Ectopic automaticity

4. CLINICAL FEATURES

Clinical presentation varies widely based on underlying etiology. Key features help distinguish benign from serious causes.

4.1 Symptom Characteristics

- Onset:
  - Sudden onset suggests arrhythmia
  - Gradual onset suggests sinus tachycardia
  - Positional suggests POTS or carotid sinus syndrome
- Duration:
  - Seconds: PACs, PVCs
  - Minutes: SVT, atrial flutter
  - Hours to days: Atrial fibrillation
  - Continuous: Sinus tachycardia
- Triggers:
  - Exercise: sinus tachycardia, ischemia
  - Rest: arrhythmia, anxiety
  - Standing: POTS
  - Alcohol: 'holiday heart' syndrome
  - Caffeine: enhanced automaticity

4.2 Associated Symptoms

- Syncope or presyncope:

- Suggests hemodynamic compromise
- Requires urgent evaluation
- May indicate:
- Ventricular tachycardia
- High-grade AV block
- Severe bradycardia

- Chest pain:
  - Suggests ischemia
  - May accompany SVT
  - Requires cardiac workup
- Dyspnea:
  - May indicate heart failure
  - Pulmonary embolism
  - Severe arrhythmia
- Dizziness:
  - May indicate cerebral hypoperfusion
  - Autonomic dysfunction
  - Anxiety

4.3 Physical Examination Findings

- Vital signs:
  - Heart rate during palpitations
  - Blood pressure (orthostatic)
  - Temperature (thyroid)
  - Oxygen saturation
- Cardiac exam:
  - Rhythm regularity
  - S1/S2 intensity
  - Murmurs (valvular disease)
  - S3/S4 (heart failure)
- Peripheral signs:
  - Edema (heart failure)
  - JVD (right heart failure)
  - Cool extremities (shock)
- Neurologic exam:
  - Focal deficits (stroke from embolism)
  - Tremor (thyrotoxicosis)

4.4 Complications

- Early complications:
  - Syncope
  - Falls
  - Anxiety
  - Reduced quality of life
- Late complications:
  - Stroke (atrial fibrillation)

- Heart failure (tachycardia-induced)
- Sudden cardiac death (VT)
- Thromboembolism

5. DIFFERENTIAL DIAGNOSIS

Systematic approach to distinguishing cardiac from non-cardiac causes of palpitations.

5.1 Cardiac Differential

- Arrhythmias:
  - Sinus tachycardia
  - Atrial fibrillation
  - Atrial flutter
  - SVT (AVNRT, AVRT)
  - PVCs
  - PACs
  - Ventricular tachycardia
  - Bradycardia
- Structural disease:
  - Ischemic heart disease
  - Cardiomyopathy
  - Valvular disease
  - Congenital defects
- Pericardial disease:
  - Pericarditis
  - Pericardial effusion

5.2 Non-Cardiac Differential

- Endocrine:
  - Hyperthyroidism
  - Hypoglycemia
  - Pheochromocytoma
  - Cushing syndrome
- Autonomic:
  - POTS
  - Autonomic neuropathy
  - Carotid sinus syndrome
- Psychiatric:
  - Anxiety disorder
  - Panic disorder
  - Depression
- Medication-induced:
  - Beta-agonists
  - Theophylline
  - Decongestants
  - Antidepressants

- Substance-induced:
  - Alcohol
  - Caffeine
  - Cocaine
  - Amphetamines

5.3 Distinguishing Features

- Arrhythmia vs sinus tachycardia:
  - Arrhythmia: sudden onset, irregular rhythm
  - Sinus tachycardia: gradual onset, regular rhythm
- Cardiac vs anxiety:
  - Cardiac: associated with structural disease
  - Anxiety: no structural disease, stress-related
- Benign vs serious:
  - Benign: PACs, PVCs, sinus tachycardia
  - Serious: VT, high-grade block, ischemia

6. INVESTIGATIONS & DIAGNOSIS

Comprehensive workup to identify etiology and guide management.

6.1 Initial Evaluation

- History:
  - Characterize palpitations
  - Identify triggers
  - Assess associated symptoms
  - Review medications
  - Family history
- Physical exam:
  - Vital signs
  - Cardiac exam
  - Neurologic exam
- 12-lead ECG:
  - Baseline rhythm
  - Conduction abnormalities
  - Ischemia
  - Structural changes

6.2 Diagnostic Testing

- Ambulatory monitoring:
  - Holter monitor (24-48 hours)
  - Event recorder (1-4 weeks)
  - Implantable loop recorder (long-term)
- Echocardiography:
  - Structural assessment
  - Ejection fraction

- Valvular function
- Pericardial disease

- Stress testing:
  - Exercise ECG
  - Stress echocardiography
  - Nuclear stress imaging
- Electrophysiology study:
  - Arrhythmia mechanism
  - Ablation planning
- Laboratory tests:
  - CBC (anemia)
  - Electrolytes
  - TSH (thyroid)
  - Cardiac biomarkers
  - Drug levels

Table 1 Diagnostic Testing for Palpitations

Test	Indication	Sensitivity	Specificity	Comments
12-lead ECG	Initial evaluation	Variable	Variable	Baseline rhythm, ischemia, conduction abnormalities
Holter monitor	Intermittent symptoms	High for frequent events	High	24-48 hour monitoring
Event recorder	Infrequent symptoms	Moderate	Moderate	Patient-activated recording
Implantable loop recorder	Cryptogenic syncope	High	High	Long-term monitoring
Echocardiography	Structural assessment	High	High	Structural heart disease
Stress testing	Exercise-induced symptoms	Moderate	Moderate	Ischemia, arrhythmia
TSH	Thyroid dysfunction	High	High	Screening test
CBC	Anemia	High	High	Common reversible cause

6.3 Diagnostic Criteria

- Atrial fibrillation:
  - Irregularly irregular rhythm
  - Absent P waves
  - Variable R-R intervals
  - Fibrillatory waves in atria
- Atrial flutter:
  - Regular atrial rate (250-350 bpm)

- Sawtooth pattern in leads II, III, aVF
- Variable AV conduction

- SVT:
  - Sudden onset and termination
  - Narrow QRS complexes
  - Regular rhythm
  - Rate 150-250 bpm
- Ventricular tachycardia:
  - Wide QRS complexes
  - Rate >100 bpm
  - AV dissociation
  - Capture beats

6.4 Diagnostic Algorithm

Stepwise approach to palpitations:

1. Obtain 12-lead ECG during symptoms if possible
2. If ECG normal, obtain echocardiogram
3. Assess for structural heart disease
4. If no structural disease, consider ambulatory monitoring
5. Evaluate for non-cardiac causes (thyroid, medications, anxiety)
6. If symptoms persist, consider electrophysiology study
7. Treat underlying cause or arrhythmia

7. MANAGEMENT & TREATMENT

Management depends on etiology, severity, and patient preferences.

7.1 Lifestyle Modifications

- Reduce caffeine intake
  - Limit alcohol consumption
  - Avoid nicotine
  - Manage stress
  - Regular exercise
  - Adequate sleep
  - Hydration

7.2 Pharmacologic Therapy

- Beta-blockers:
  - Metoprolol: 25-100 mg BID
  - Atenolol: 25-100 mg daily
  - Propranolol: 10-40 mg BID
  - Monitoring: heart rate, blood pressure
  - Side effects: fatigue, bradycardia, hypotension
  - Contraindications: asthma, severe bradycardia

- Calcium channel blockers:
  - Diltiazem: 120-360 mg daily
  - Verapamil: 120-480 mg daily
  - Monitoring: heart rate, blood pressure
  - Side effects: constipation, edema
  - Contraindications: heart failure, severe bradycardia
- Antiarrhythmics:
  - Amiodarone: 200-400 mg daily
  - Sotalol: 80-160 mg BID
  - Flecainide: 50-100 mg BID
  - Propafenone: 150-300 mg BID
  - Monitoring: QT interval, thyroid, liver function
  - Side effects: pulmonary fibrosis, bradycardia, proarrhythmia
  - Contraindications: structural heart disease

Table 2 Antiarrhythmic Drug Therapy for Palpitations

Drug	Class	Dose	Frequency	Monitoring	Key Side Effects	Contraindications
Metoprolol	Beta-blocker	25-100 mg	BID	HR, BP	Fatigue, bradycardia	Asthma, severe bradycardia
Diltiazem	Non-DHP CCB	120-360 mg	Daily	HR, BP	Constipation, edema	Heart failure, bradycardia
Amiodarone	Class III	200-400 mg	Daily	TSH, LFT, CXR	Pulmonary fibrosis, thyroid dysfunction	Structural heart disease
Sotalol	Class III	80-160 mg	BID	QT interval	Torsades de pointes	Structural heart disease
Flecainide	Class IC	50-100 mg	BID	ECG	Proarrhythmia	Structural heart disease

7.3 Non-Pharmacologic Therapy

- Vagal maneuvers:
  - Valsalva maneuver
  - Carotid sinus massage
  - Diving reflex
- Cardioversion:
  - Electrical cardioversion
  - Chemical cardioversion
- Ablation:
  - Radiofrequency ablation
  - Cryoablation
  - Indications:

- Recurrent SVT
- Atrial flutter
- Symptomatic PVCs
- Pacemaker:
- Indications:
- Symptomatic bradycardia
- High-grade AV block

7.4 Treatment of Underlying Conditions

- Hyperthyroidism:
  - Antithyroid medications
  - Radioactive iodine
  - Thyroidectomy
- Anxiety disorders:
  - Cognitive behavioral therapy
  - Antidepressants
  - Benzodiazepines (short-term)
- Medication review:
  - Discontinue offending agents
  - Switch to alternatives
- Substance cessation:
  - Alcohol reduction
  - Nicotine cessation
  - Stimulant avoidance

7.5 Monitoring & Follow-up

- Initial follow-up:
  - 1-2 weeks after starting therapy
  - Assess symptom control
  - Monitor for side effects
- Long-term follow-up:
  - Every 3-6 months
  - Repeat ECG as needed
  - Ambulatory monitoring if indicated
- Treatment response criteria:
  - Symptom resolution
  - Reduced arrhythmia burden
  - Improved quality of life

8. PROGNOSIS & COMPLICATIONS

Prognosis depends on underlying etiology and treatment response.

8.1 Prognostic Factors

- Favorable prognosis:
  - Benign arrhythmias (PACs, PVCs)

- Anxiety-related palpitations
- Well-controlled thyroid disease
- No structural heart disease

- Poor prognosis:
  - Ventricular tachycardia
  - Structural heart disease
  - Uncontrolled arrhythmia
  - Syncope with palpitations

8.2 Complication Rates

- Stroke in atrial fibrillation:
  - 1.5-2% per year without anticoagulation
  - Reduced with anticoagulation
- Heart failure from tachycardia:
  - 10-20% develop HF with sustained tachycardia
  - Reversible with rate control
- Sudden cardiac death:
  - Rare in benign arrhythmias
  - Higher in structural disease

8.3 Long-term Follow-up

- Frequency:
  - Every 3-6 months initially
  - Every 6-12 months if stable
  - More frequent if on antiarrhythmics
- Tests:
  - ECG
  - Echocardiogram (periodic)
  - Ambulatory monitoring (as needed)
- Medication review:
  - Every 3-6 months
  - Adjust as needed

9. SPECIAL CONSIDERATIONS

Management considerations for specific patient populations.

9.1 Pregnancy

- Safety considerations:
  - Beta-blockers: preferred
  - Avoid amiodarone
  - Avoid sotalol
  - Avoid flecainide
- Delivery planning:
  - Consider cardioversion if unstable
  - Anticoagulation if indicated

- Postpartum:
  - Monitor for postpartum cardiomyopathy
  - Address anxiety

9.2 Elderly Patients

- Consider:
  - Autonomic dysfunction
  - Polypharmacy
  - Reduced renal function
  - Fall risk
- Medication adjustments:
  - Lower doses
  - Avoid inotropes
  - Monitor for orthostasis
- Fall prevention:
  - Address syncope
  - Home safety

9.3 Renal Impairment

- Drug adjustments:
  - Metoprolol: no adjustment needed
  - Sotalol: reduce dose
  - Amiodarone: no adjustment
  - Diltiazem: no adjustment
- Monitor:
  - Electrolytes
  - Drug levels (sotalol)
  - Renal function

9.4 Hepatic Impairment

- Drug adjustments:
  - Amiodarone: reduce dose
  - Sotalol: no adjustment
  - Beta-blockers: no adjustment
- Monitor:
  - Liver function
  - Drug levels
  - Side effects

10. KEY PEARLS & CLINICAL TRAPS

Important clinical considerations for board examinations and practice.

10.1 Board-Favorite Pearls

- Always obtain ECG during palpitations
  - Rule out structural heart disease
  - Consider anxiety as common cause

- Beta-blockers first-line for rate control
- Amiodarone has most side effects
- Valsalva for SVT termination
- Anticoagulate for AFib per CHA2DS2-VASc

10.2 Common Diagnostic Pitfalls

- Attributing palpitations to anxiety without ruling out structural disease
  - Missing ischemia in elderly
  - Overlooking medication side effects
  - Not checking thyroid function
  - Assuming benign cause without ECG

10.3 Must-Not-Miss Diagnoses

- Ventricular tachycardia
  - Atrial fibrillation with rapid ventricular response
  - Ischemic heart disease
  - Thyrotoxicosis
  - Pheochromocytoma

10.4 Useful Mnemonics

- PALPITATIONS:
  - P - Panic/anxiety
  - A - Alcohol
  - L - Lung disease
  - P - Pheochromocytoma
  - I - Ischemia
  - T - Thyroid
  - I - Infection
  - T - Tachycardia (sinus)
  - A - Anxiety
  - T - Theophylline
  - I - Inotropes
  - O - Other medications
  - N - Neurologic causes
  - S - Structural heart disease

FIGURES & ILLUSTRATIONS — FROM HARRISON'S

Harrison's 22e · Figure 1

Figure 45-1: Representative ECG tracings showing common arrhythmias causing palpitations including sinus tachycardia, atrial fibrillation, atrial flutter, and supraventricular tachycardia