

Wolff-Parkinson-White (WPW) Syndrome

Definition

Pre-excitation disorder of the cardiac conduction system, predisposing one to re-entrant tachyarrhythmias.

History and Physical Exam

Often asymptomatic, but may have history suggestive of tachyarrhythmias: palpitations, chest pain, SOB, dizziness and/or syncope.

Key 12-Lead Features

Short PR interval and characteristic Delta wave.

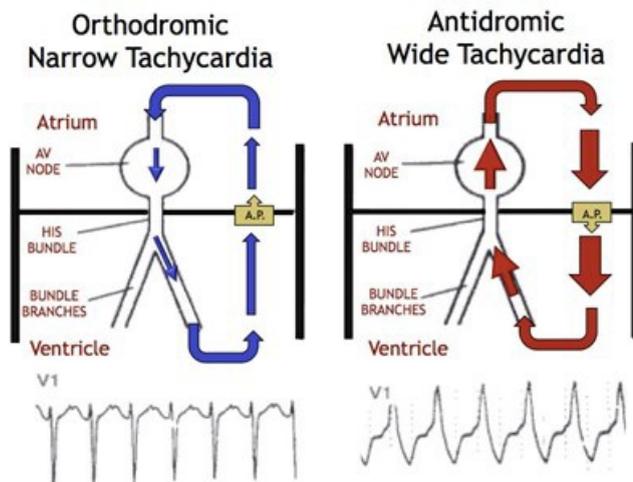
During captured AVRT episodes: orthodromic WPW is a Narrow Complex Tachycardia and looks like an SVT; antidromic WPW is a Wide Complex Tachycardia and looks like VT.

Key Treatment Points

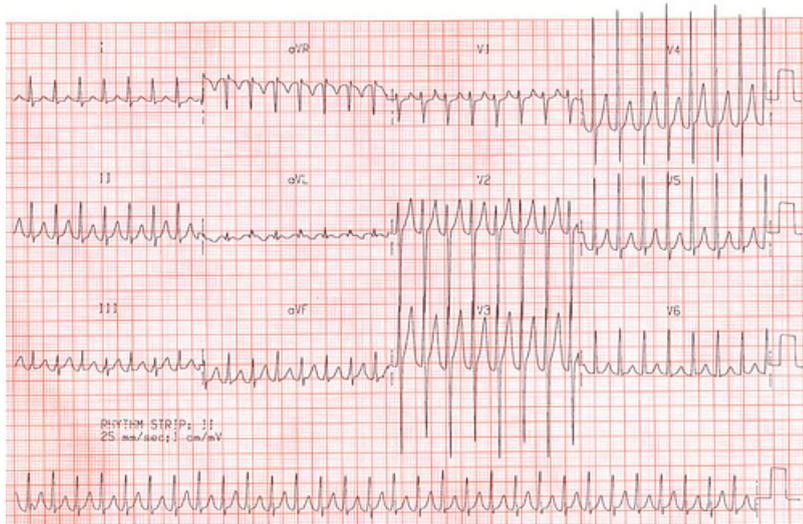
No adenosine with concurrent Atrial-Fibrillation (or any irregular rhythm)

If unstable, proceed directly to electrical cardioversion

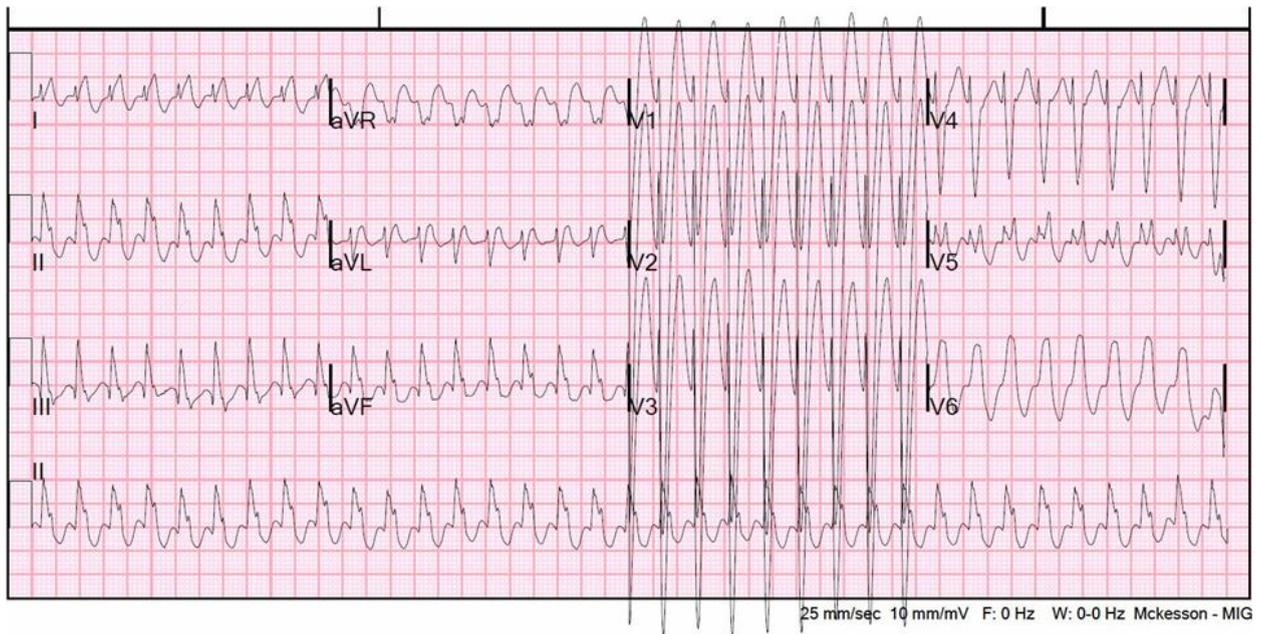
12 Lead ECG Samples



Orthodromic WPW tachycardia episode



Antidromic WPW tachycardia episode



Delta Wave



[Further Reading](#)

Reference

1. Stroobandt RX, et al. ECG from Basics to Essentials: Step by Step. 2015. [\[Link\]](#)

Pulmonary Embolism

Definition

A sudden blockage in an artery of the lung.

Wells Criteria for Suspected PE

Criterion	Points
Clinically suspected DVT (pain with palpation, unilateral edema, varicose veins)	3.0
PE Diagnosis is as likely or more likely than another differential	3.0
Tachycardia (HR > 100/min)	1.5
Immobilization/Surgery (in last 4 weeks)	1.5
Previous DVT/PE	1.5
Hemoptysis	1.0
Malignancy (treated within last 6 months)	1.0

Score	Risk	Probability of PE	% of Patients with this Score
> 6	High	66.7%	7%
3-6	Moderate	20.5%	53%
0-2	Low	3.6%	40%

Key 12-Lead Features

Sinus tachycardia (73% sensitivity)

Prominent S-wave in Lead I (73%)

"Clockwise rotation" / late precordial transition (56%)

T-wave inversion in 2+ precordial leads (50%)

Incomplete or complete RBBB (20-68%)

P-pulmonale (28-33%)

Right axis deviation (23-30%)

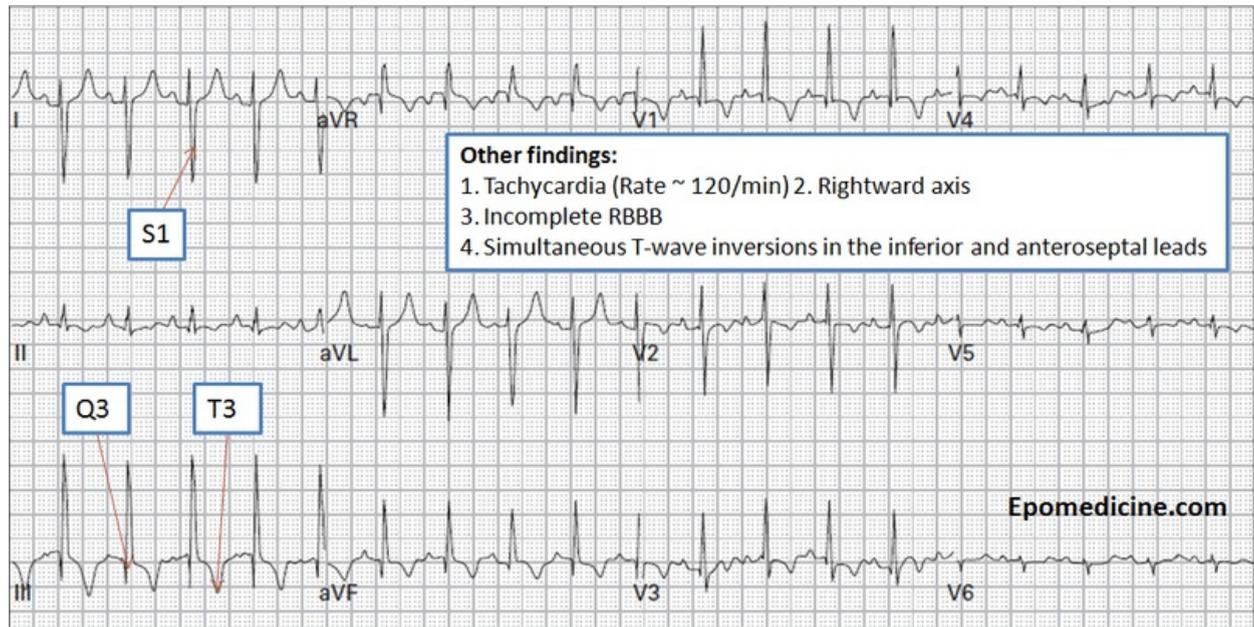
No significant findings (20-24%)

S1Q3T3 (12-25%) (pressure overload of the right ventricle)

Key Treatment Points

Rapid conveyance to hospital, including in cardiac arrest

12 Lead ECG Samples



[Further Reading](#)

Reference

Stein PD, Woodard PK, Weg JG, Wakefield TW, Tapson VF, Sostman HD, Sos TA, Quinn DA, Leeper KV, Hull RD, Hales CA, Gottschalk A, Goodman LR, Fowler SE, Buckley JD (2007). "Diagnostic pathways in acute pulmonary embolism: recommendations of the PIOPED II Investigators". *Radiology* 242 (1): 15–21.

Long QT Syndrome

Definition

Prolonged QT interval; a propensity to ventricular tachy-arrhythmias, syncope, cardiac arrest, or sudden death.

History/Physical Exam

May be congenital or due to hypomagnesemia/kalemia (diuretics, malnourished), hypothermia, Rx (amiodarone, cipralax, methadone, etc). Family history of unexplained sudden death.

Presents with syncope from adrenergic stimuli - such as exercise, emotion, loud noise, swimming.

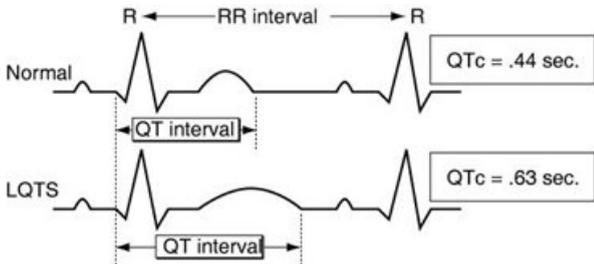
Key 12-Lead Features

- QTc > 0.46 (women)
- QTc > 0.45 (men)
- T-wave alternans

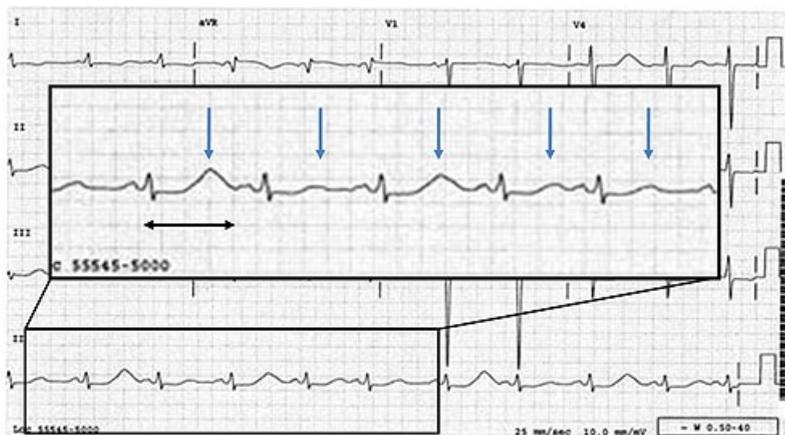
Key Treatment Points

- Watch for Torsade de Pointes
- If patient arrests, Magnesium Sulfate is indicated

12 Lead ECG Samples



Notice the T-Wave alternans below



[Further Reading](#)

References

El-Sherif, N., Turitto, G., & Boutjdir, M. (2017). Congenital Long QT syndrome and torsade de pointes. *Annals of Noninvasive Electrocardiology*. doi:10.1111/anec.12481.

Hyperkalemia

Definition

Serum potassium > 5.5mEq/L, associated with lethal arrhythmias and hemodynamic compromise.

History/Physical Exam

Hx of renal failure, rhabdomyolysis, burns, potassium-sparing diuretics, NSAIDs, β -blockers.

Often presents with fatigue, weakness, or paresthesia. May present with paralysis, dyspnea, or chest pain.

Key 12-Lead Features

Flattened P waves, prolonged PR intervals, borderline widened QRS complexes and pointed, narrow, and tall tented T waves.

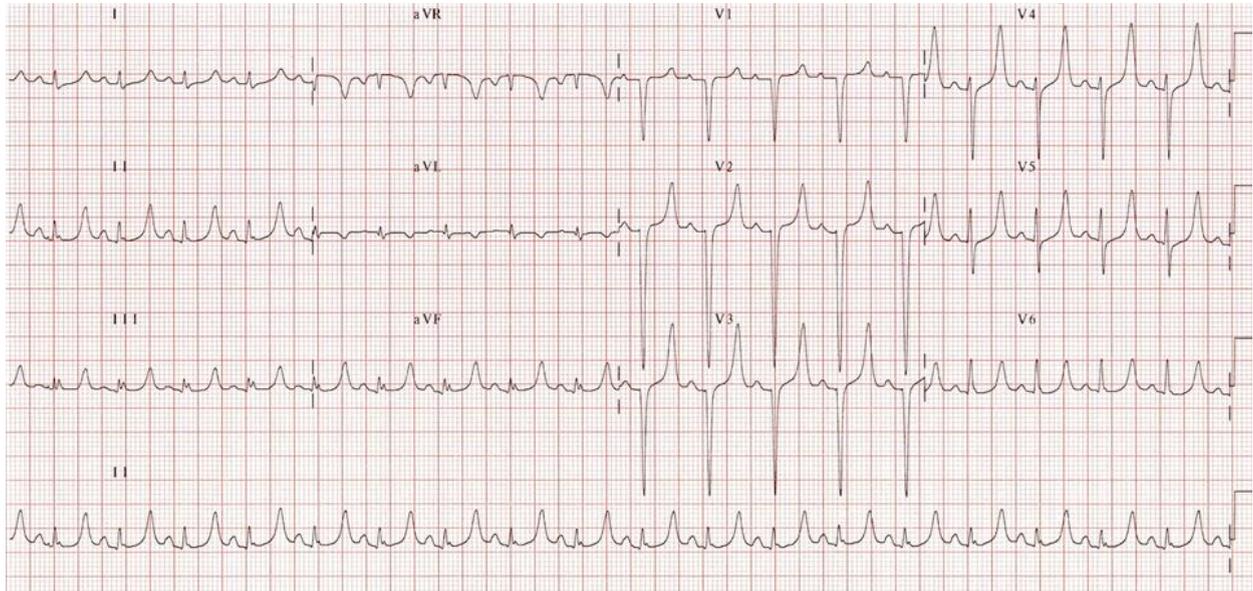
May progress to bradycardia, bizarre and wide QRS complexes, or sine waves.

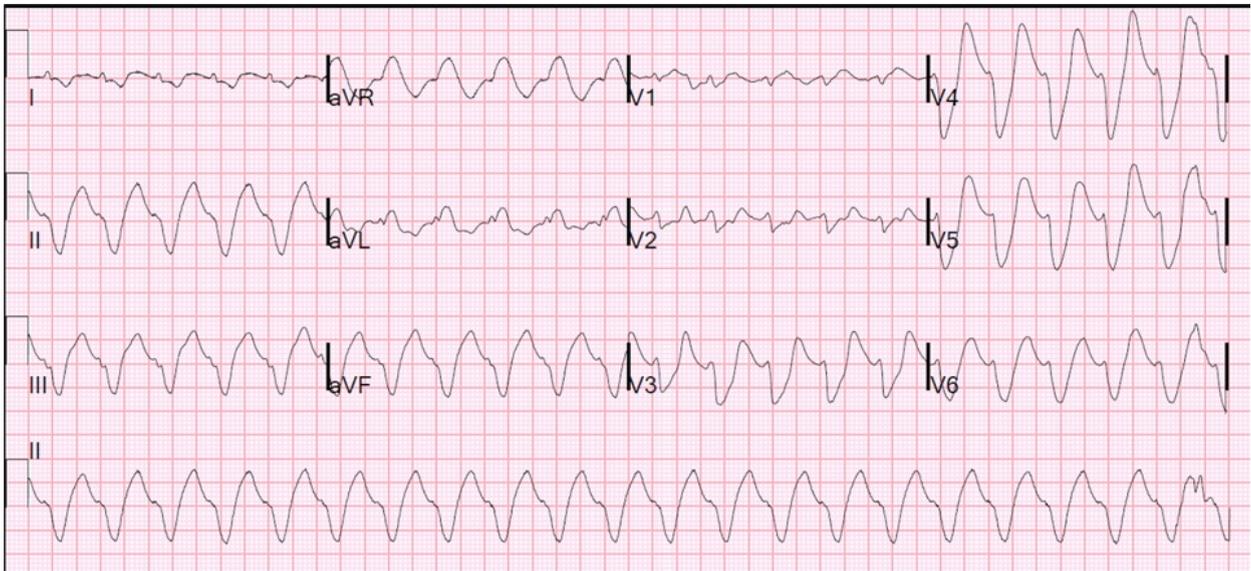
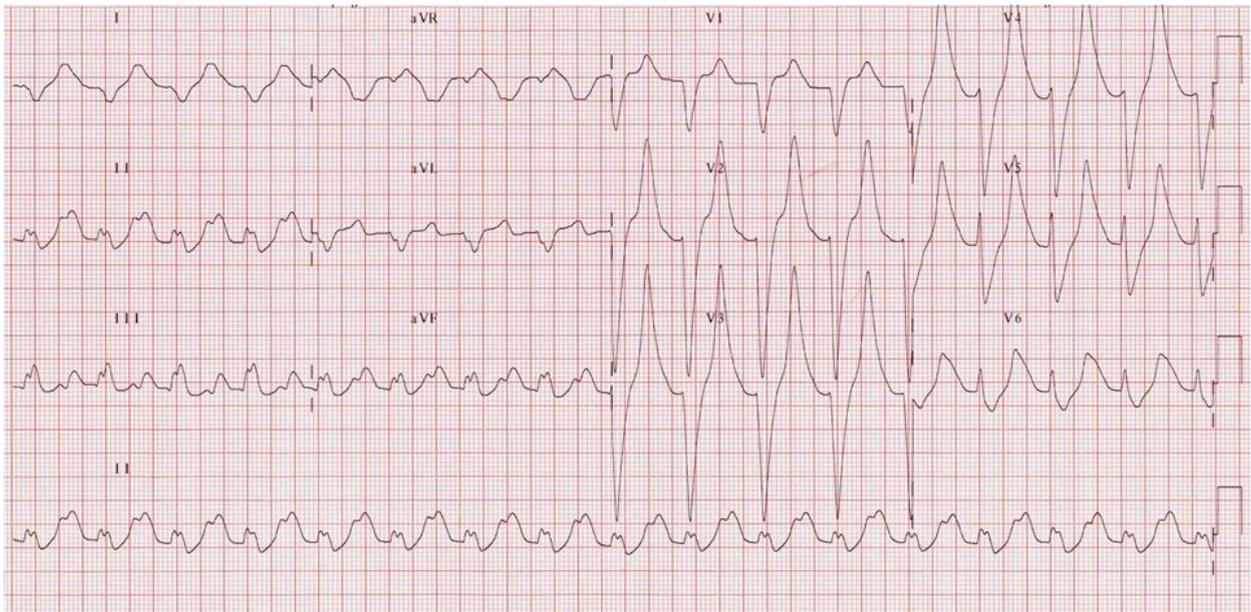
Key Treatment Points

If patient is in arrest, front-load with Calcium Chloride and Sodium Bicarbonate

Salbutamol - 10-20mg nebulized may reduce serum K+ 0.5-1.5mEq

12 Lead ECG Samples





[Further Reading](#)

References

Heidari, S. F. (2016). Life-Threatening Severe Hyperkalemia Presenting Electrocardiographic Changes. *Journal of Intensive and Critical Care*, 02(03). doi:10.21767/2471-8505.100045.

Brugada Syndrome

Definition

Patients prone to developing arrhythmias and sudden death.

History/Physical Exam

Young, healthy patients - often males. May be of South Asian descent.

Family Hx of sudden cardiac death, often while sleeping. Syncope Hx, generally at rest without prodrome. Night terrors.

Normal Physical Exam.

Key 12-Lead Features

Incomplete right bundle-branch block and ST elevations in the anterior precordial leads.

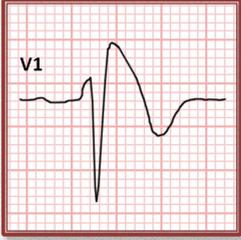
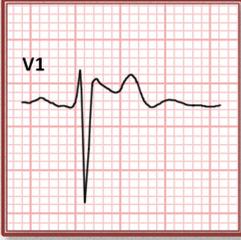
Key Treatment Points

Patient advocacy for a cardiology consult

12 Lead ECG Samples

Brugada Syndrome EKG Characteristics

Patients with Brugada have a pseudo-RBBB and persistent ST elevations in V1-V2.

 <p>Type 1 ST elevations $\geq 2\text{mm}$ Downsloping ST segment Inverted T wave</p>	 <p>Type 2 ST elevations $\geq 2\text{mm}$ "Saddle back" ST-T wave configuration Upright or biphasic T wave</p>
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[Further Reading](#)

References

Tse, G., Liu, T., Li, K. H. C., Laxton, V., Chan, Y. W. F., Keung, W., Yan, B. P. (2016). Electrophysiological Mechanisms of Brugada Syndrome: Insights from Pre-clinical and Clinical Studies. *Frontiers in Physiology*, 7, 467. <http://doi.org/10.3389/fphys.2016.00467>.

Hypertrophic Obstructive Cardiomyopathy

Definition

Inherited genetic condition in which the heart muscle becomes abnormally thick and prone to tachy-arrhythmias.

History/Physical Exam

Often presents in young, athletic patients.

May present with dyspnea, syncope/presyncope, angina, palpitations, orthopnea, paroxysmal nocturnal dyspnea (PND), CHF, and sudden cardiac death. Additionally, systolic crescendo-decrescendo murmur, decreasing on standing.

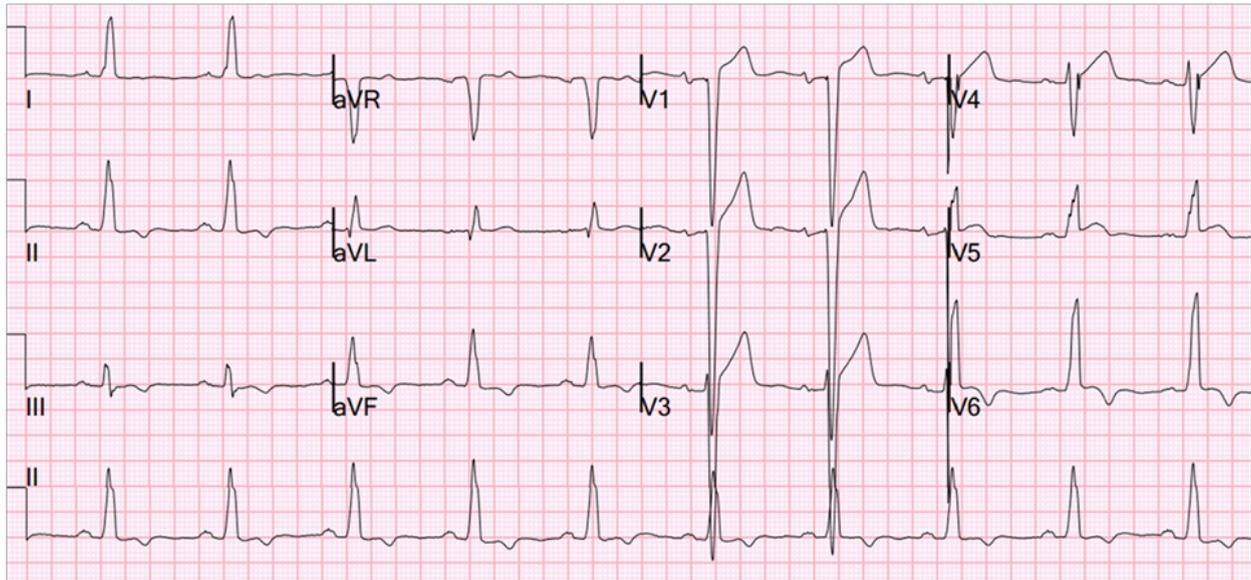
Key 12-Lead Features

High Left Ventricular Volume, possibly w/ pathological Q-waves in lateral/anterior leads, ST changes and/or T wave inversions.

Key Treatment Points

Patient advocacy for a cardiology consult

12 Lead ECG Samples



[Further Reading](#)

References

Helmy, S. M., Maaouf, G. F., Shaaban, A. A., ElMaghraby, A. M., Anilkumar, S., Shawky, A. H. H., & Hajar, R. (2011). Hypertrophic Cardiomyopathy: Prevalence, Hypertrophy Patterns, and Their Clinical and ECG Findings in a Hospital at Qatar. *Heart Views : The Official Journal of the Gulf Heart Association*, 12(4), 143-149. <http://doi.org/10.4103/1995-705X.90900>.

Wellens Syndrome

Definition

Pre-infarction stage of coronary artery disease suggesting 80-90% LAD occlusion that often progresses to a devastating anterior wall MI.

History/Physical Exam

Following an ischemic event suggestive of unstable angina. ECG findings are generally only visible once patient is pain free.

Key 12-Lead Features

TYPE A: Biphasic T waves, most commonly in leads V2 and V3. Presents with upstroke/down-stroke. Approximately 25% of the time.

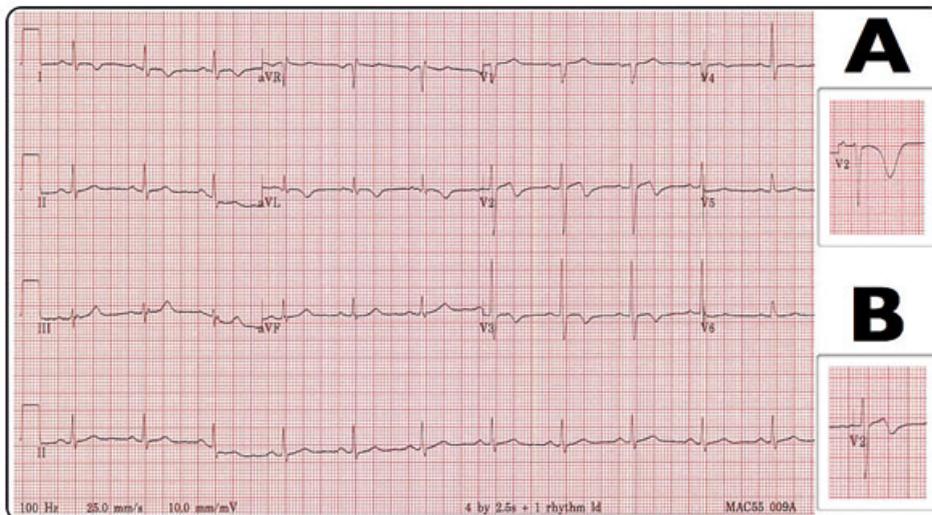
TYPE B: Deep inversion of the T-wave segment in the precordial leads, V1-V4. Approximately 75% of the time.

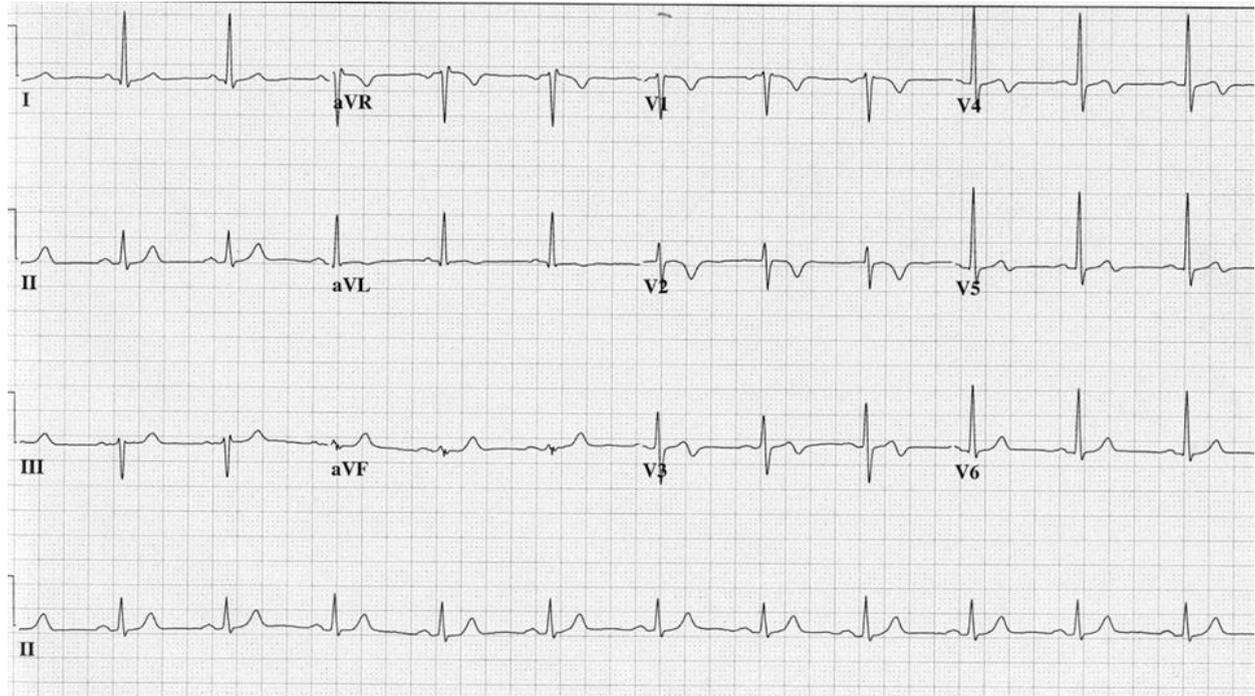
Key Treatment Points

Patient advocacy for a cardiology consult

Monitor for potential emerging STEMI

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[Further Reading](#)

References

Rhinehardt J, Brady WJ, Perron AD, Mattu A. Electrocardiographic manifestations of Wellens' syndrome. *Am J Emerg Med.* 2002 Nov;20(7):638-43. PubMed PMID: 12442245.

