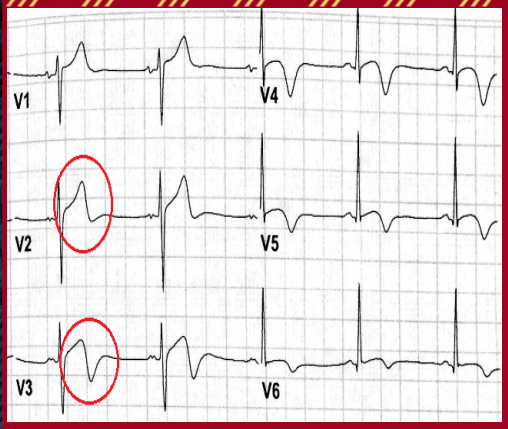
# EM CASE OF THE WEEK

## BROWARD HEALTH MEDICAL CENTER DEPARTMENT OF EMERGENCY MEDICINE




### KEEP A LOOKOUT!

The above EKG tracing is from our 27 y.o patient. This electrocardiographic manifestation of deeply inverted or biphasic T waves in V2 and V3 precordial leads has been shown to correspond to at least 50% stenosis of the left anterior descending artery (LAD).

### EM CASE OF THE MONTH

EM Case of the Month is a monthly "pop quiz" for ED staff. The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

## The Widow Maker's Warning Sign

*A 27 year old male with no significant past medical history presents to the ED with left sided chest pain occurring for the past few days. He describes the pain as dull, nonradiating, and exacerbated by physical activity. He saw his primary doctor for the pain which was diagnosed as GERD, but states that zantac and pepcid have not provided relief. He doesn't know his paternal father but no known cardiac history on mother's side. He is a current smoker but denies recent alcohol or drug use.*

*Vitals reveal slightly elevated BP but otherwise normal ranges. Physical exam reveals no abnormalities. Chest x-ray reveals no consolidation and normal heart borders. EKG tracing shows findings noted on the left.*

*Which of the following is true regarding prognosis and management of this patient?*

A. This is GERD which can cause referred pain confused to be anginal in nature. Patient will improve with dietary changes and PPI therapy.

B. This is likely Prinzmetal's angina but patient needs a stress test to rule out other cardiac pathology first.

C. Patient is having a pre-excitation syndrome such as WPW and requires cardioversion. He will need to be scheduled for catheter ablation.

D. The EKG changes put patient at high risk of anterior wall MI within the week if stenting intervention is not performed.

E. The EKG changes are hallmark of Brugada's syndrome and patient is at high risk of sudden cardiac death.

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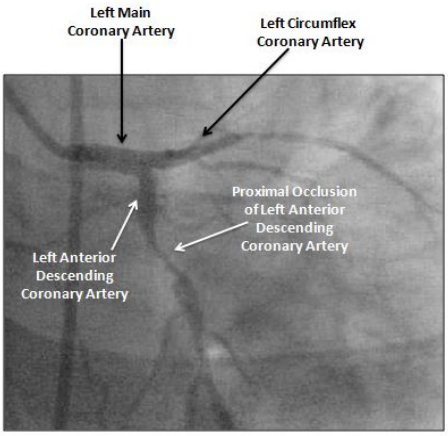



## Clinical Pearls

- Look for deeply inverted T waves or Biphasic waves in V2 and V3 (though can also occur in other precordial leads!)
- Do not put off sending patient for cath. T wave changes correspond to at least 50% stenosis, with average progression to MI occurring in 8.5 days without intervention.
- Patients may not have pain during EKG and cardiac enzymes may be normal.
- Stuttering phenomenon: cycling between biphasic/inverted T waves and ST segment elevation due to transient occlusion and opening of LAD in serial EKGs.

# Wellens Syndrome

**The correct answer is D.** Studies have noted that 75% of patient's presenting with Wellens sign will have a complete occlusion of the LAD leading to an anterior MI within 7 days of presentation. It is imperative that patient's undergo cardiac catheterization to find the site of the stenosis immediately.

**Introduction**

First described in 1980s by Dr. DeZwaan Wellens who recognized that some patients with unstable angina had very specific T-wave changes in anterior precordial leads and would go on to develop anterior wall myocardial infarctions. The characteristic T wave changes are referred to as Wellens sign and mostly occur in V2 and V3. Along with EKG changes patients present with angina symptoms and normal to mildly elevated cardiac enzyme level (see table 1 for criteria). The EKG changes represent a pre-infarction stage of the LAD and are paramount in early recognition as the syndrome inevitably progresses to full occlusion of the LAD and a often fatal anterior wall MI.

**Pathophysiology**

Wellens syndrome corresponds to the pre-infarction stage of coronary artery disease. The T wave changes are due to a physiological sequence:

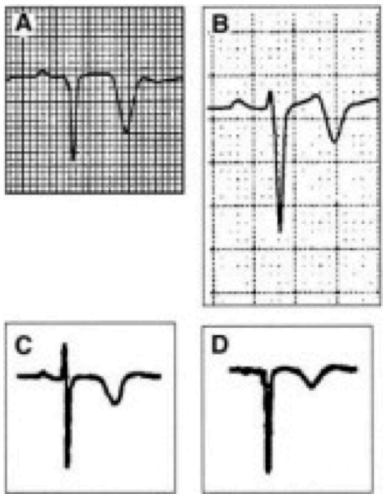
1. Transient ischemia of anterior wall due to sudden occlusion of LAD and ST elevation of anterior leads. This stage corresponds to angina symptoms and may not always be present during EKG exam.
2. Reperfusion of LAD results in chest pain resolution, ST elevation improvement, and transformation of T waves to biphasic or inverted forms.
3. Since the coronary perfusion is unstable, re-occlusion can occur at any time with subsequent occlusion causing pseudo-normalization of T waves that cause them to become upright from biphasic form. If the artery continues to remain open the T waves progress to becoming deeply inverted.
4. Occlusion and resolution can lead to variances in subsequent EKGs between Wellens pattern and evolving anterior STEMI.

**Pathophysiology (contd).**
The LAD artery originates from the left coronary and runs along the interventricular space of the anterior wall of the heart between the right and left ventricles. It divides into branches that provide supply to anterior wall through both ventricles and the interventricular septum. An occlusion in the artery leads to ischemia of both ventricles and subsequent wall and thus causes devastating ventricular dysfunction and high risk of death.

**Risk Factors**
Since the pathophysiology follows the same sequence as other forms of CAD, Wellens syndrome shares the same risk factors involving atherosclerotic plaque rupture.
-Smoking
-Hypertension
-Diabetes
-Hyperlipidemia
-Metabolic derangements

**Diagnosis**
Wellens syndrome requires a high degree of suspicion and can be missed if not always kept in the differential. The patient presentation is not as typical as a STEMI (patient may not have any pain or symptoms at the time of EKG). Diagnosis based on characteristic T wave changes on EKG with appropriate history.

| Electrocardiographic Criteria for Wellens Syndrome |
|---|
| **Symmetric and deeply inverted T waves in leads V2 and V3, Occasionally V1, V4, V5 and V6** |
| **Or** |
| **Biphasic T waves in leads V2 and V3** |
| **Plus** |
| **Isoelectric or minimally elevated (<1mm) ST segment**<br>**No precordial Q waves**<br>**History of angina**<br>**Pattern present in pain-free state**<br>**Normal or slightly elevated cardiac serum markers** |



A comparison of abnormal T-wave inversions in acute ischemic heart disease. (A) Deeply inverted T wave of Wellens syndrome. (B) Biphasic T wave of Wellens syndrome. (C) Non-Wellens ischemic T-wave inversion. (D) Non-Wellens ischemic T-wave inversion. The common feature that is useful in distinguishing between these 2 types of inverted T waves and the related clinical syndrome is the depth of the inverted T wave—considerably more so in Wellens syndrome.

**Treatment / Prognosis**
Wellen's sign is a "cannot miss" finding. Prognosis is poor if the EKG changes are missed as stenosis on presentation is advanced and patients are likely to progress to an MI within 8.5 days on average. The only acceptable treatment would be cardiac catheterization to find the stenosed thrombus followed by stenting.

**Back to our Patient…**
Due to the rarity of the condition and it's atypical presentation, the patient initially received a GI cocktail ordered by cardiology which did not provide relief. He also underwent CT Chest angio, which did not reveal any evidence of pulmonary embolism. The patient underwent catheterization that evening which revealed a large thrombus in the proximal portion of the **LAD** with **90% stenosis!**


**Sources**

de Zwaan C, Bar FW, Wellens HJ. Characteristic electrocardiographic pattern indicating a critical stenosis high in left anterior descending coronary artery in patients admitted because of impending myocardial infarction. *Am Heart J*. Apr 1982;103(4 Pt 2):730-6.

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

Tatli E, Aktoz M, Buyuklu M, Altun A. Wellens' syndrome: the electrocardiographic finding that is seen as unimportant. *Cardiol J*. 2009;16(1):73-5.



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