

# Wellens' Syndrome: Exception to the Rule: One Referral at a Time!

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## ABSTRACT

We describe two patients with Wellens' syndrome. In these patients, the electrocardiogram changes must be recognized promptly and accurately. These cases are managed aggressively and early invasive treatment approach is recommended to avoid myocardial infarction and death.

**Key words:** Wellens's syndrome, sudden cardiac death, acute coronary syndrome, inverted T waves

## INTRODUCTION

Wellens' syndrome is seen in a subset of patients who mostly present with chest pains and is often found to have very specific precordial T-wave changes on their electrocardiograms (ECGs). Its overall incidence is expected to be in the range of 10–15% of all patients with acute coronary syndrome (ACS). These T-wave changes are characteristically seen during chest pain-free period. This is the pre-infarction stage of coronary artery disease (CAD) due to critical/tight stenosis (>90%) of the proximal left anterior descending artery (LAD) with a very high likelihood of acute myocardial infarction within few days to weeks if not treated aggressively including coronary intervention. Once Wellens' syndrome is recognized, urgent coronary angiography and not a stress test of any kind are expected with the intention of angioplasty/stenting or coronary bypass surgery.

## CASE REPORT

### Case 1

We begin our discussion with a case presentation where a 61-year-old pleasant man was admitted through the emergency room with back pains and chest pains while walking and playing with his dog. By the time, he came to the emergency room that his vitals were stable with blood pressure of 130/70

with heart rate of 65 bpm. He was given one sublingual nitro in the ambulance and by the time, he came to ER and he was chest pain free. He wanted to come home as his dog was home alone. However, due to his abnormal baseline ECG [Figure 1], he was advised to be admitted overnight for observation and treatment. His ECG changes very abnormal and impressive, and therefore, coronary angiography was arranged for the same day that showed proximal tight (>90%) stenosis of LAD requiring a stent placement. Two weeks later, his follow-up ECG [Figure 4] showed that those T-wave inversions being resolved.

### Case 2

A 68-year-old female with a history of recurrent chest pains was admitted to the hospital. Her vitals were stable. Her first troponin was normal. Due to the recurrence of her chest pains, she was admitted overnight. Her EKG next morning while she was chest pain free, revealed significant T wave inversion in precordial leads. The diagnosis of Wellens' syndrome was made and she underwent coronary angiography the same day, leading to a stent placement in her proximal LAD.

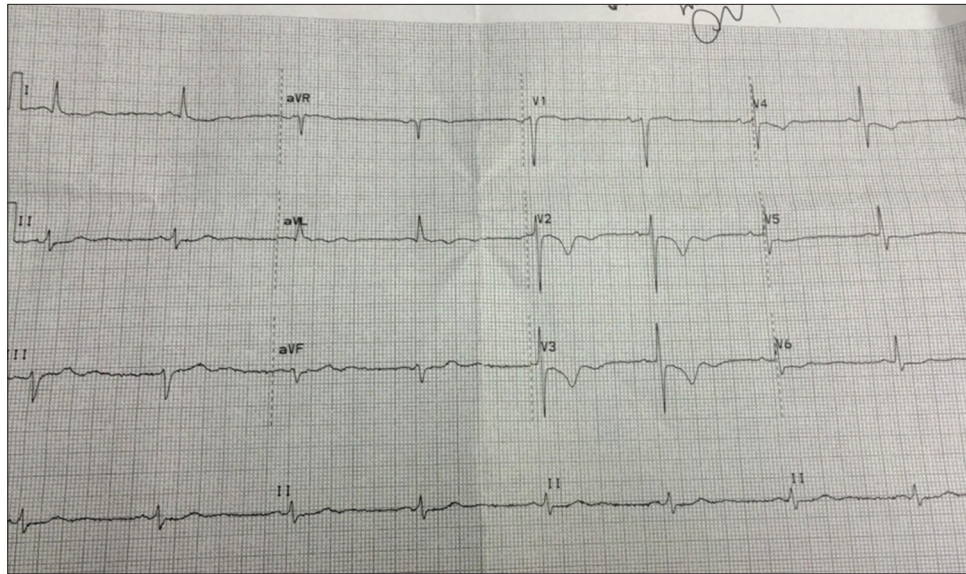
## DISCUSSION

In 1982, de Zwaan *et al.* first published the clinical and ECG changes of a subgroup of patients with ACS.<sup>[1]</sup> These changes

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**Figure 1:** Sinus rhythm. Deeply inverted T waves V2-4 (Likely type I/A Wellens' syndrome)



**Figure 2:** Coronary angiography revealing a tight proximal left anterior descending artery stenosis



**Figure 3:** Coronary angiography after a stent placement

were called Wellens' syndrome. Of the initial subjects, 145 consecutive patients were admitted for unstable angina, 26 (18%) showed typical Wellens' ECG changes, 50% on presentation, and 50% within the next 24 h. In another prospective study,<sup>[2]</sup> 180 of 1260 patients (14%) had the typical ECG pattern with 108 of 180 (60%) within 24 h.

Wellens noted that 75% of these patients had an anterior myocardial infarction usually within a few days despite the relief of symptoms with medical management. Therefore, early coronary angiography followed by angioplasty/stenting or coronary bypass surgery is recommended treatment of choice for these patients.

There are two kinds of ECG changes noted in Wellens' syndrome:

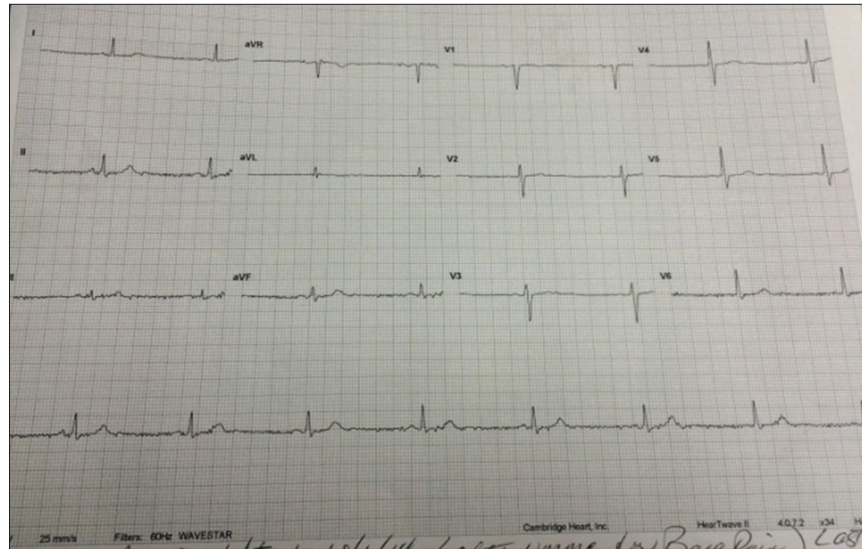
**Type I or A**

Less common but more malignant with higher mortality, 24% of cases with biphasic T waves in V2-3.

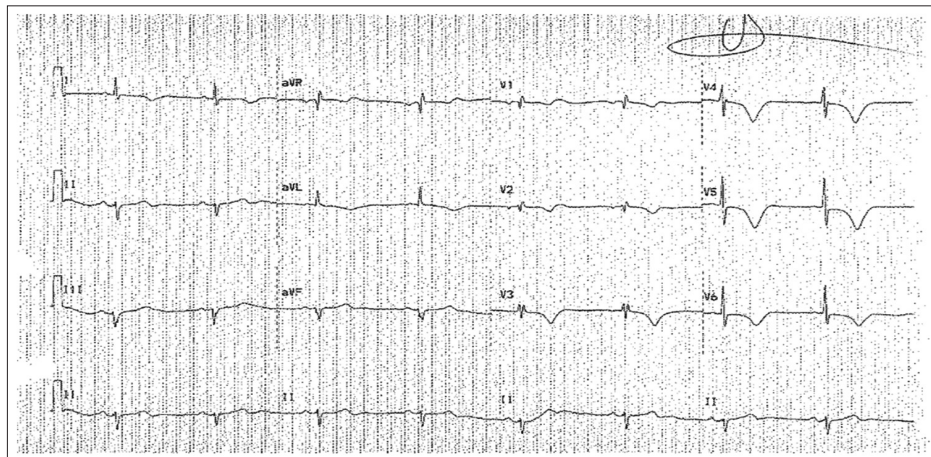
**Type II or B**

More common, 76% of cases with deeply inverted, symmetrical T waves in V2-3, often in V4-5, and at times in V6. This group is also called LAD T-wave syndrome.

Wellens' syndrome is classically associated with critical stenosis of proximal LAD. However, sometimes the location of the lesion in LAD, proximal, mid or distal location may produce ECG changes accordingly: a tight proximal LAD lesion could potentially cause widespread T wave changes while tight mid-LAD lesion might affect smaller area of myocardium and therefore the ECG changes might be manifested in leads V2-3 only.<sup>[3]</sup>



**Figure 4:** Electrocardiogram 2 weeks after the left anterior descending artery stenting: Normal sinus rhythm. Resolved T-wave inversions from Figure 1



**Figure 5:** Sinus rhythm. Marked deeply inverted T waves in V2-6 with small inverted T waves in lead I and aVL (type II/B Wellens' syndrome)



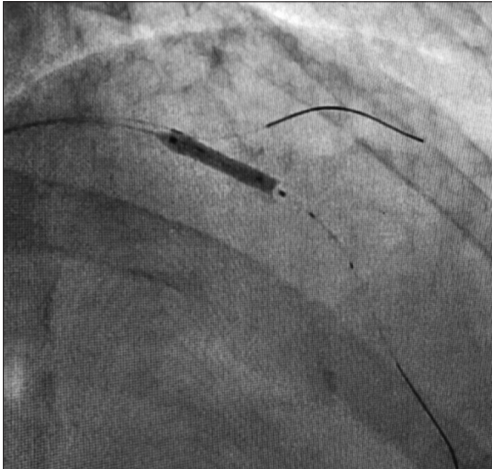
**Figure 6:** Coronary angiography showing a tight proximal left anterior descending artery stenosis

T-wave inversion in precordial leads could be from causes including coronary ischemia, electrolyte imbalance, pulmonary embolism, myocarditis, pericarditis, digitalis effect, bundle branch block, and various cardiomyopathies. Therefore, in this setting, the criteria proposed by Rhinehardt *et al.* can be useful to differentiate Wellens' syndrome from other causes of the T wave Inversion.<sup>[4]</sup>

1. History of angina
2. Biphasic or deeply inverted T waves in leads V2-3, occasionally V4-6
3. No or minimal ST elevation (<1 mm)
4. No or minimal elevation of cardiac enzymes
5. No loss of precordial R-wave progression
6. No pathologic precordial Q waves.

One study has shown similar T-wave changes in takotsubo cardiomyopathy as seen in Wellens' syndrome.<sup>[5]</sup> No significant difference was seen in two groups except for more number of leads with the T-wave inversion in takotsubo cardiomyopathy.

ECG changes in Wellens' syndrome are typically seen during chest pain-free period. During the chest pain period, those inverted T waves could become upright (pseudonormalization) and these kinds of ECG changes could likely be due to myocardial stunning and reperfusion of myocardium.<sup>[6]</sup>



**Figure 7:** Left anterior descending artery stenting

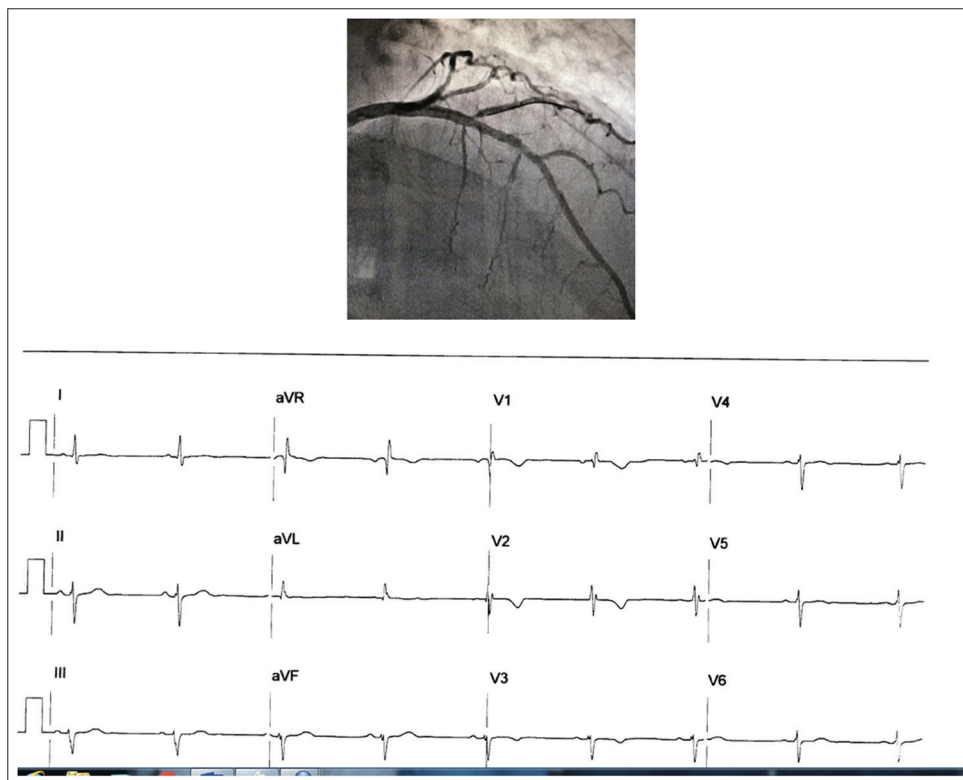
## PERPLEXING QUESTIONS

Some questions remain puzzling and so far unanswered:

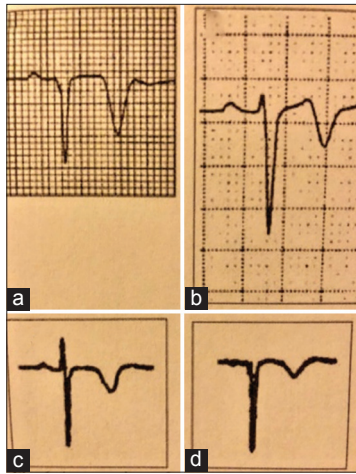
1. This is a single vessel (critical LAD) disease. Why is there no ECG equivalent of this in relation to critical left circumflex disease or right CAD (RCA)?
2. Many studies (ORBITA<sup>[7]</sup> and COURAGE<sup>[8]</sup>) and most of the guidelines tell us that the patients with CAD having stable angina should be managed with optimal medical therapy. However, one caveat, here in case of Wellens' syndrome, we are calling them being a subgroup of patients with unstable angina that takes me to think about the next question
3. Most unstable patients will manifest ST changes (mostly ST depression) during these episodes while in the case of Wellens', it is the T wave that changes and not ST depression. Why so? As a matter of fact, T-wave changes are related to repolarization and not depolarization of myocardium (Exception to the rule?)
4. Deep T-wave inversion in this condition is seen only during chest pain-free intervals: Why? And during recurrence of chest pains, these inverted T waves might become upright (pseudonormalization). Why?

## CONCLUSION

While we ponder over the perplexing questions, I would like to conclude the following:



**Figure 8:** Follow-up electrocardiogram a month later



**Figure 9:** (a and b) Wellens' syndrome T-wave changes. (c and d) Non-Wellens' syndrome ischemic T-wave changes

1. Wellens' ECG changes are very useful and highly specific for diagnosing critical proximal LAD stenosis
2. Patients with this kind of ECG changes need not go for any form of stress testing as the stress test might lead to a large anterior myocardial infarction or sudden cardiac death
3. If these patients remain unrecognized or only medically treated, they likely end up having an extensive anterior myocardial infarction and subsequent complications
4. Since these ECG changes occur during the chest pain-free intervals, serial ECGs are recommended
5. This diagnosis needs early invasive approach with coronary angiography to consider revascularization (stenting or coronary artery bypass grafting)
6. From the cardiac perspective, it is considered pre-infarction CAD. From the oncology perspective, I will consider this condition being "pre-malignant" stage and if not treated aggressively, this syndrome can lead to "malignancy" (myocardial infarction); if not treated aggressively, it can be fatal (sudden cardiac death)!

## ONE REFERRAL AT A TIME

When I started my cardiology practice many years back, I needed more and more internists to refer their patients to me. There was one internist from whom I had not had many referrals. One day, I saw his one consult in the hospital with ECG findings suggestive of Wellens' syndrome.

I knew this diagnosis from my training during cardiology fellowship.

Same day, coronary angiography confirmed the diagnosis and stenting was placed.

That diagnosis impressed the internist so much that I have not missed any cardiology consult from him since!

Then and there I said, "one referral at a time!"

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