



## BET 1: IN PATIENTS WITH SUSPECTED ACUTE CORONARY SYNDROME, DOES WELLENS' SIGN ON THE ELECTROCARDIOGRAPH IDENTIFY CRITICAL LEFT ANTERIOR DESCENDING ARTERY STENOSIS?

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### ABSTRACT

Wellens' syndrome consists of a history suggestive of an acute coronary syndrome and biphasic or deeply inverted T waves in ECG leads V2–V3. A shortcut review was carried out to establish whether this ECG pattern identifies patients with a critical left anterior descending artery stenosis. Six relevant papers were found. The clinical bottom line is that biphasic T-wave inversion in lead V2–V3 should alert the clinician to a probable critical stenosis of the left anterior descending artery.

### CLINICAL SCENARIO

A 34-year-old male presents to the ED with ongoing chest pain at rest over the past few days. On his ECG there are biphasic T waves in V2 and V3, characteristic of Wellens' syndrome. The patient is pain free and his troponin concentration is just above the normal reference range. You wonder whether this ECG pattern warrants urgent percutaneous coronary intervention or medical management.

### THREE-PART QUESTION

In (adults with suspected acute coronary syndrome), does (Wellens' sign) identify (critical stenosis of the left anterior descending artery)?

### SEARCH STRATEGY

EBM Reviews—Cochrane Database of Systematic Reviews 2005 to January 18, 2017, EBM Reviews—ACP Journal Club 1991 to December 2016, EBM Reviews—

Database of Abstracts of Reviews of Effects 1st Quarter 2015, Embase 1980 to 2017 Week 03, Ovid MEDLINE(R) 1946 to week 1 December 2016.

[wellens.mp or anterior t.mp or biphasic t.mp]

### OUTCOME

A total of 437 papers were identified after the removal of duplicates. Five papers were relevant to the three-part question.<sup>1–5</sup> Manual search found two further relevant papers.<sup>6,7</sup> One abstract was discarded as there was insufficient detail available for appraisal<sup>2</sup> (see [table 1](#)).

### COMMENTS

Wellens' sign is a complex syndrome that is frequently misunderstood. The patient must report a recent history of angina and demonstrate biphasic T waves or deeply inverted T waves in ECG leads V2–V3. It is not a sign of acute coronary occlusion, but rather a sign of coronary artery

reperfusion that is very likely to reocclude. Due to reperfusion, the patient is often pain free at the time of the ECG and frequently fails to demonstrate a significant troponin rise. The patient's history remains crucial as there is much pathology, such as pulmonary embolism, that can produce T-wave inversion. Specificity and positive predictive value drops from 89% and 61% to 69.2% and 51.5% when the primary outcome changes from 50% stenosis to 70% stenosis of the left anterior descending artery.<sup>2,4</sup> This syndrome is not an indication for immediate percutaneous coronary intervention but requires urgent inpatient angiography and close monitoring.

#### Clinical bottom line

Biphasic T-wave inversion in lead V2–V3 should alert the clinician to a possible critical stenosis of the left anterior descending artery.



Table 1 Relevant papers

Author, year and country of publication	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Kobayashi <i>et al.</i> , <sup>1</sup> 2015, USA	424 NSTEMI patients underwent coronary angiography within 5 days of presentation.	Retrospective, single centre, diagnostic cohort.	Culprit lesion. 30-Day major adverse cardiac event.	Wellens' sign was defined as either deeply inverted T waves (>3.0 mV) or biphasic T waves in both lead V2 and V3. Among the 18 patients, 9 had a LAD culprit lesion producing a PPV of 50%. No significant difference was found in the rate of MACE between the two groups (0% vs 4.2%, p=0.38).	Only the abstract was available. The retrospective nature of the study weakens the secondary outcome of 30-day MACE. Possibility of spontaneous reperfusion reduces the PPV.
Alderwisch <i>et al.</i> , <sup>2</sup> 2013, USA	78 patients with NSTEMI-ACS with a proximal LAD stenosis on angiography.	Retrospective, single centre, diagnostic cohort.	Culprit lesion. Defined as 70% stenosis.	Sn 65.4%, Sp 69.2%, PPV 51.5% and NPV 80%.	Only the abstract was available. Obtained angiography information from logbooks. Selection bias. No reliability calculations. Unable to say whether the patients had other aspects of Wellens' syndrome, it cannot be identified by ECG alone. Single centre study. Retrospective.
Akhtar <i>et al.</i> , <sup>3</sup> 2012, Pakistan	Convenience sample of 100 catheterisation laboratory patients with unstable angina and biphasic T-wave inversion.	Prospective, single centre, diagnostic cohort study.	Culprit lesion defined as 70% stenosis.	93/100 had lesion of LAD giving a PPV of 93%. Patients with biphasic T-wave inversion in V2-V3 had LAD stenosis in 25/25 producing a PPV of 100%. Patients with biphasic T-wave inversion in V2-V4 had LAD stenosis in 15/25 producing a PPV of 37.5%.	Single centre study. Convenience sample. No follow-up of patients. Only examined those with biphasic T waves, inverted T waves were not included. Unclear whether the remaining 50 patients had symmetrical inverted T waves in the anterior precordial leads. No control group. No comment on angiography reliability or who carried out the angiography.
Forselv and Vik-Mo, <sup>4</sup> 2007, Norway	138 consecutive patients referred to a tertiary centre for angiography following initial diagnosis of NSTEMI or unstable angina.	Retrospective, single centre, diagnostic cohort.	Culprit lesion defined as 50% stenosis.	Negative or biphasic T wave in leads V 2-V 3 without STE produced Sn 76%, Sp 89%, PPV 61% and NPV 94%.	No comment on interobserver reliability. No comment on who was reviewing the ECGs and the angiograms. Referral bias. Unclear 50% stenosis is taken to be significant. Unclear why patients aged >75 years were excluded.
de Zwaan <i>et al.</i> , <sup>5</sup> 1989, The Netherlands	180 consecutive patients with unstable angina who underwent angiography.	Prospective diagnostic cohort study	Coronary angiography.	LAD completely occluded in 33 patients. The remaining 147 demonstrated 50%–99% occlusion (mean 85%) in 81 of patients (under subjective analysis) and 75% occlusion in 66 patients who underwent quantitative analysis by the Cardiovascular Angiography Analysis System.	Only 66 patients received quantitative analysis of the stenosis. No control group. No blinding documented to ECG analysis and there are no reliability calculations.
de Zwaan <i>et al.</i> , <sup>6</sup> 1982, The Netherlands	145 patients with coronary care with uncontrolled angina.	Observational study.	90% stenosis on coronary angiography.	13 patients catheterised with biphasic or deeply inverted T waves. 12 had critical LAD stenosis. 1 patient had no evidence of CAD despite having these changes.	Change in management after study started. When the study team that such a high proportion of patients with the T-wave changes had AMI they offered everyone early angiography in the later cohort (although some did refuse/were too frail). No detail on ECG evaluation. Single centre study. Not prospective. Small population.

ACS, acute coronary syndrome; AMI, acute myocardial infarction; CAD, coronary artery disease; LAD, left anterior descending artery; MACE, major adverse cardiac event; NPV, negative predictive value; NSTEMI, non-ST-elevation myocardial infarction; PPV, positive predictive value; Sn, sensitivity; Sp, specificity; STE, ST elevation.

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*Emerg Med J* 2017;**34**:264–266.  
doi:10.1136/emj-2017-206665.1



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*Emerg Med J* 2017 34: 264-266  
doi: 10.1136/emered-2017-206665.1

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