ECG Interpretation for the WACHS Chest Pain Pathway

Symptoms of Myocardial Ischaemia

Pain or tightness in chest, jaw, neck, left arm, right arm or epigastrium and / or symptoms of dyspnoea, diaphoresis, syncope or fatigue.

Groups associated with atypical presentation

Female, people with diabetes, elderly.

High risk conditions

Central obesity, diabetes, autoimmune conditions, chronic kidney disease, HIV, Aboriginal peoples and Torres Strait Islander peoples.

Australian clinical guideline for diagnosing and managing acute coronary syndromes 2025.

The Heart Foundation guideline adopts the new term acute coronary occlusion myocardial infarction (ACOMI) to acknowledge ECG patterns that have been found to reflect acute coronary occlusion without ST-segment elevation (STE) such as posterior MI and De Winters T waves. It also includes STE patterns often under recognised in acute settings such as right ventricular or high lateral infarction.

Coronary occlusion can result from both atherosclerotic and non-atherosclerotic causes, referred to in the 2016 guideline as 'type 1 MI' and 'type 2 MI' respectively.

Conditions such as spontaneous coronary artery dissection (SCAD), coronary embolism and coronary spasm or microvascular dysfunction can present identically to atherosclerotic causes of AMI and may require urgent angiography to diagnose and treat appropriately. For this reason, these conditions have been classified as MI with acute coronary occlusion.

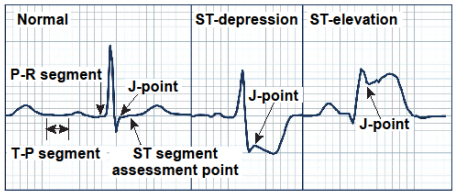
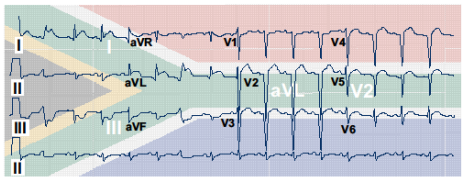
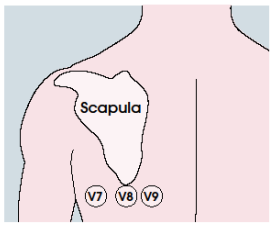
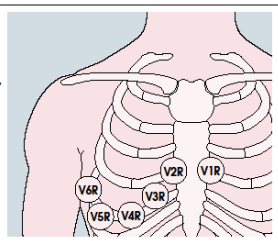
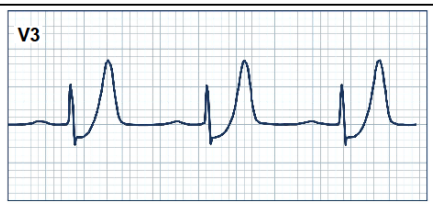
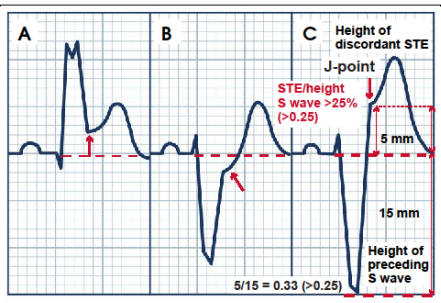
For ECG findings consistent with ACOMI – Refer to Table 1 on next page.

Alternative cardiac and non-cardiac causes of ST elevation

- (Myo)Pericarditis
- Left ventricular hypertrophy (LVH)
- Left ventricular aneurysm
- Left bundle branch block (LBBB)
- Right ventricular pacing
- Takotsubo or other cardiomyopathies
- Brugada patterns Normal variant STE (early repolarisation)
- Pulmonary embolism
- Hypokalaemia
- Hypothermia
- Raised intracranial pressure

Table 1: ECG findings consistent with acute coronary occlusion myocardial infarction (ACOMI).[1]

Abbreviations used: Electrocardiogram (ECG); left bundle branch block (LBBB); myocardial infarction (MI); ST-segment depression (STD); ST-segment elevation (STE).

	Criteria	Supporting information and illustration	Recommendation for clinical action
A. Regional STE with reciprocal STD	STE ≥1 mm at the J-point in two contiguous leads in all leads other than V2-4. V2-4 STE criteria: ≥1.5 mm in women ≥2 mm in men ≥40 years ≥2.5 mm in men <40 years		Activate reperfusion pathway
B. High lateral MI	STE I, aVL, V2 STD III (+/- II, aVF) Subtle STE V5, V6 and reciprocal changes in aVF may be seen.		Activate reperfusion pathway
C. Posterior MI	Precordial STD ≥0.5 mm V1-3 Confirm with posterior leads (V7,8,9) with findings of STE: • ≥0.5 mm in women and men ≥40 years • ≥1 mm in men <40 years	V7, 8, 9 supplementary lead placement 	Activate reperfusion pathway
D. Right ventricular MI	STE ≥0.5 mm in any right-sided chest lead (V3R-V6R), but particularly V4R. STE ≥1 mm in men <30 years	Right precordial supplementary lead placement 	Activate reperfusion pathway
E. De Winter T waves	J-point depression with up-sloping ST segments and tall, prominent, symmetric T waves in precordial leads, with STE (≥0.5 mm) in aVR and an absence of STE in precordial leads.		Activate reperfusion pathway
F. Modified Sgarbossa criteria **(LBBB or paced rhythm)**	Any of the following: A) Concordant STE >1 mm in leads with positive QRS complex B) Concordant STD ≥1 mm V1-3 C) STE ≥1 mm in one or more leads at the J-point which is proportionally discordant to the preceding S wave by >25%.		Activate reperfusion pathway

ECG features considered high risk for progression to ACOMI:

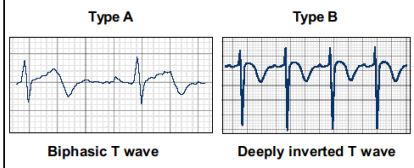
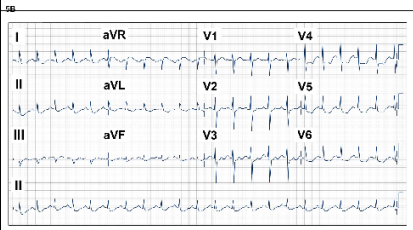
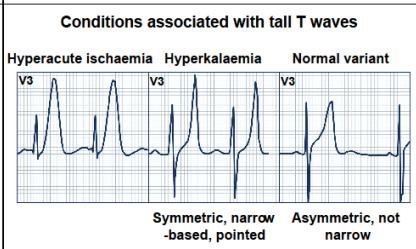
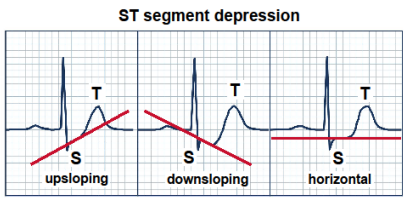
- Wellens T waves (characteristic inferior T wave inversion)
- Diffuse ST depression with STE in avR
- Hyperacute T waves.

Other ECG features which may indicate myocardial ischaemia:

- Persistent or transient ST depression ≥ 0.5 mm ≥ 2 contiguous leads (NB: consider RV or posterior ACOMI)
- T wave abnormalities – new or dynamic
- Transient (dynamic) ST elevation ≥ 0.5 mm in 2 contiguous leads.

Table 2: High-risk ECG findings for ACS and findings suggestive of cardiac ischaemia.[1]

Abbreviations: Electrocardiogram (ECG); non-ST-segment elevation acute coronary syndromes NSTEACS); ST-segment depression (STD); ST-segment elevation (STE); T wave inversion (TWI).

	Criteria	Supporting information and illustration	Recommendation for clinical action
A. Wellens criteria	Isoelectric or minimally elevated J-point <1 mm AND either biphasic T waves V2, V3 (Type A) or symmetric TWI V2, V3 (sometimes V1, V4, V5, V6) (Type B).	 Pattern appears when pain free. "Pseudonormalisation" of ECG changes with symptoms of isch-aemia (e.g. chest pain).	Urgent consultation with cardiology. Continuous cardiac monitoring and serial ECGs. No functional testing. Low threshold for invasive angiography.
B. Diffuse STD in multiple leads and STE in aVR	STE aVR >1 mm Multi-lead STD I, II, aVL and V1-6 Absence of STE in other leads.		Consider early reperfusion if ECG findings persist de-spite management of symptoms or seek alternative cause. Correct hypotension, hypoxia, anaemia.
C. Hyperacute T waves	Large, symmetrical, broad-based T waves. Regional distribution.		Continuous cardiac monitoring and serial ECGs.
D. STD	Horizontal or down-sloping STD ≥0.5 mm at the J-point in ≥2 leads is suggestive of subendocardial ischaemia. STD which is sustained for ≥0.08 s in ≥1 lead (except aVR) is most significant.		Continuous cardiac monitoring and serial ECGs. If persists or worsens treat as per NSTEACS recommendations.
E. TWI	Significant for ischaemia if ≥1 mm deep; present in ≥2 contiguous leads or changing acutely in leads with a normally upright T wave (all except lead III, aVR and V1). Wide differential. If new or dynamic, consistent with ischaemia.		Continuous cardiac monitoring and serial ECGs.

Reference

1. National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand Australian clinical guideline for diagnosing and managing acute coronary syndromes 2025.