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CASE REPORT

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De Winter sign combined with pronounced aVR lead ST segment elevation and left anterior fascicular block: a case report

Yan Fang[1], Mei Zhang[1], Junlin Wu[1] and Zhidan Li[1*]

Abstract

Background The de Winter electrocardiographic (ECG) pattern, characterized by upsloping ST-segment depression and tall T waves in leads V1–V6, is typically associated with proximal left anterior descending (LAD) artery occlusion. When combined with pronounced ST-segment elevation in lead aVR, it may indicate a more severe coronary artery involvement.

Case presentation A 36-year-old male smoker presented with acute chest pain for 2 h. Initial ECG showed J-point depression with upsloping ST-segment depression of 1–5 mm in leads V2–V6, accompanied by tall T waves, characteristic of the de Winter sign. Additionally, there was approximately 2.5 mm ST-segment elevation in aVR and left anterior fascicular block (LAFB). Diagnosed with acute coronary syndrome (ACS), he underwent emergency coronary angiography, revealing complete LMCA occlusion. Successful percutaneous coronary intervention (PCI) restored blood flow. Postoperatively, LAFB resolved. The patient recovered well without complications. Type 2 diabetes mellitus was diagnosed and managed. He was discharged with follow-up and lifestyle modifications.

Conclusions This case highlights the clinical significance of the de Winter sign with pronounced aVR ST segment elevation, which may suggest severe coronary artery disease. The resolution of LAFB post-PCI suggests reversibility of conduction abnormalities with improved perfusion. Early recognition and intervention are crucial for better outcomes. Clinicians should be vigilant about this rare ECG pattern.

Keywords De Winter sign, AVR ST segment elevation, Left anterior fascicular block, Left main coronary artery ** case report

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Background

The de Winter electrocardiographic (ECG) pattern is a rare presentation characterized by J-point upsloping ST-segment depression and tall, symmetric T waves in leads V1–V6, typically associated with proximal left anterior descending (LAD) artery occlusion [1]. This pattern is considered equivalent to ST-segment elevation myocardial infarction (STEMI) and requires urgent intervention. The 2018 Fourth Universal Definition of Myocardial Infarction guidelines by the European Society of Cardiology highlighted the de Winter ECG pattern as an atypical presentation of acute myocardial ischemia resulting from LAD occlusion [2].

However, recent studies have shown that the de Winter ECG pattern is not limited to LAD occlusion but may also be observed in other coronary artery branch occlusions. When combined with pronounced ST-segment elevation in lead aVR, the de Winter pattern may suggest more extensive myocardial ischemia and involvement of critical coronary arteries, including the left main coronary artery (LMCA). In our case, this combination was further complicated by the presence of left anterior fascicular block (LAFB), which resolved post-percutaneous coronary intervention (PCI), highlighting its transient nature in this specific context. The resolution of LAFB underscores the dynamic nature of conduction abnormalities in the setting of acute coronary syndromes and emphasizes the importance of timely intervention in restoring normal conduction and perfusion.

Case presentation

A 36-year-old male with a 10-year history of smoking presented to the emergency department with acute, compressive chest pain for 2 h, located retrosternally, accompanied by diaphoresis and nausea. The patient also experienced a transient episode of syncope. He had no prior history of cardiovascular disease or family history of cardiovascular disorders. On admission, his vital signs were stable, and physical examination of the heart and lungs revealed no abnormalities. Laboratory tests showed elevated cardiac biomarkers, including myoglobin at 57.117 ng/mL (normal range: 0–72 ng/mL) and high-sensitivity troponin I at 0.103 ng/mL (normal range: 0-0.014 ng/mL). The D-dimer level was within the normal range at 0.636 μg/mL (normal range: 0.1–1.0 μg/mL). The initial ECG (Fig. 1) in the emergency depart demonstrated J-point depression with upsloping ST-segment depression of 1–5 mm in leads V2–V6, accompanied by tall, symmetric T waves, characteristic of the de Winter syndrome. Additionally, there was approximately 2.5 mm ST-segment elevation in aVR and LAFB. Based on these findings, the patient was diagnosed with acute coronary syndrome (ACS), with suspicion of proximal LAD artery occlusion or LMCA disease. Emergency coronary angiography was performed, revealing complete occlusion of the LMCA with severe thrombus formation (Fig. 2A). Pre-PCI angiography showed TIMI 0 flow in the LMCA, indicating complete occlusion. Additionally, the right coronary artery (RCA) showed mild stenosis, with a narrowing of 30%–40% in the mid-segment (Fig. 2C).

Given the critical nature of the LMCA occlusion, PCI was immediately initiated. The procedure successfully

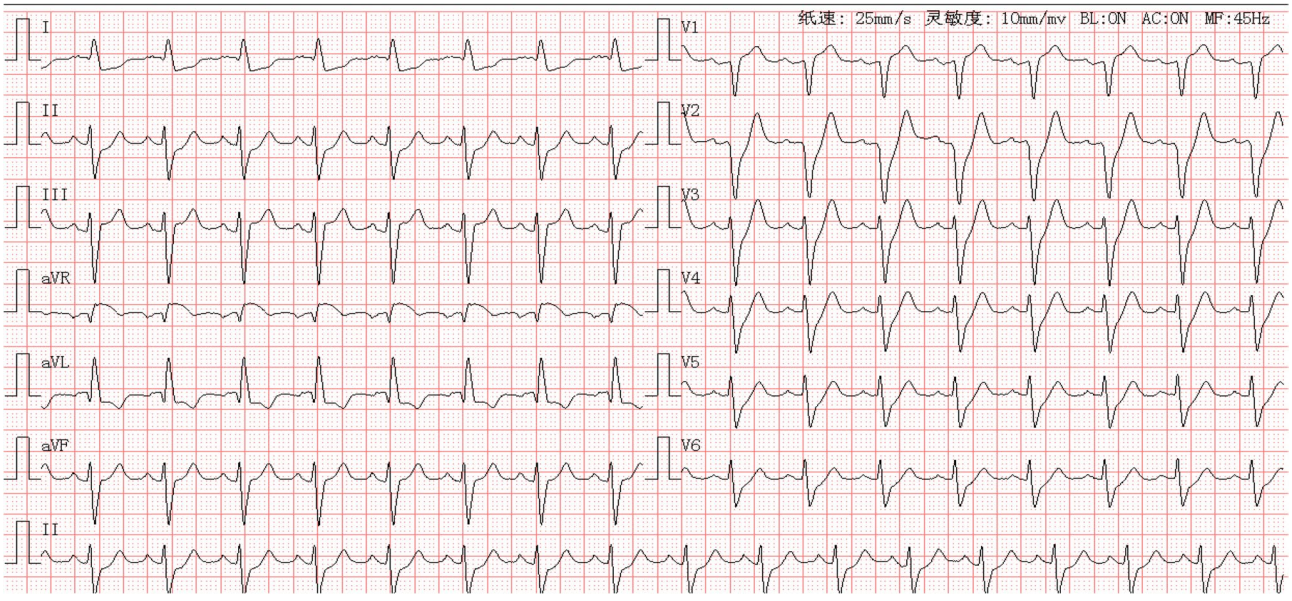

Fig. 1 The patient's initial electrocardiogram in the emergency department showing de Winter sign with ST-segment depression in V2-V6 and pronounced ST-segment elevation in aVR (approximately 2.5 mm). Mild ST elevation in V1 (1 mm) also noted

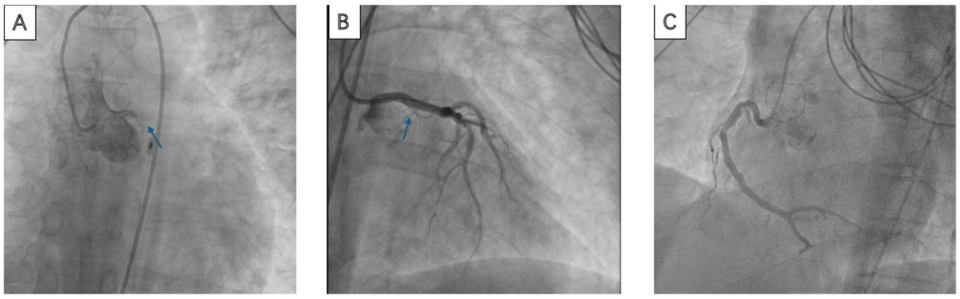

Fig. 2 **A** Arrow indicates occlusion of the left main coronary artery. (**B**) Arrow indicates the site of the left main coronary artery occlusion post-stent deployment. (**C**) Shows the angiographic appearance of the right coronary artery

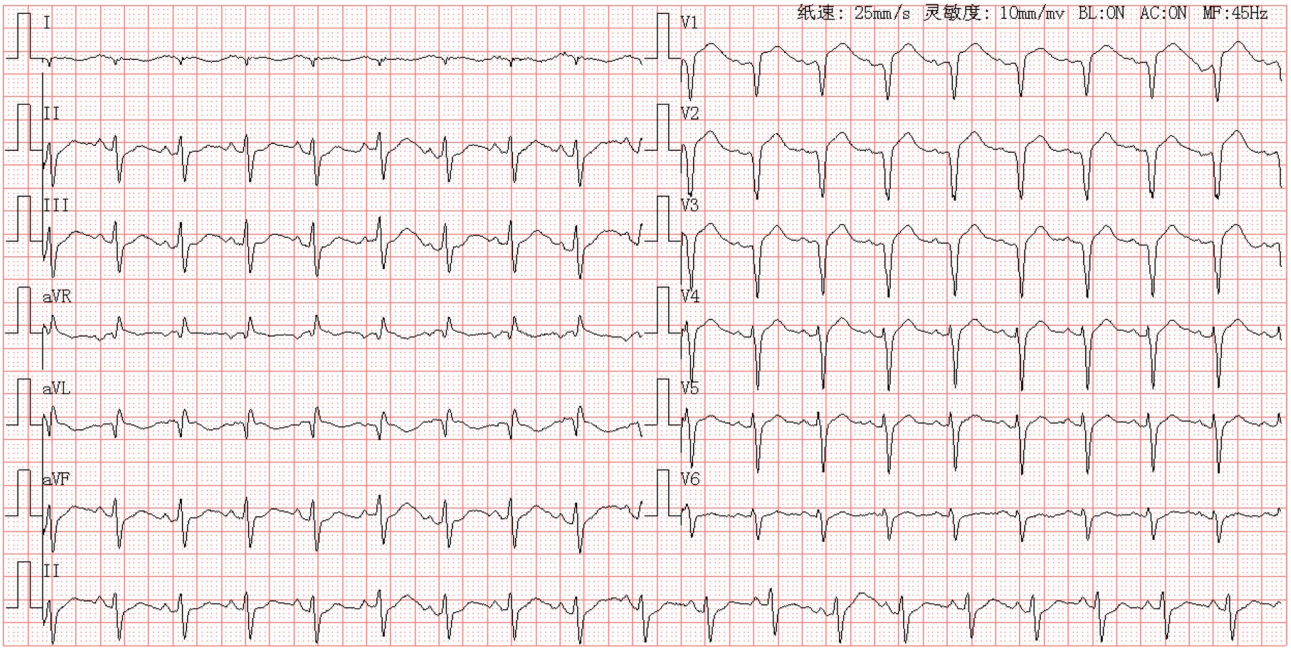

Fig. 3 Electrocardiogram of the patient one day after PCI. The main ECG findings include resolution of ST-segment depression in V2-V6, disappearance of LAFB, mild ST elevation in V1-V3, and the emergence of abnormal Q waves in leads I and aVL."

restored blood flow to the affected coronary arteries, achieving TIMI flow grade III (Fig. 2B). Postoperatively, the patient's condition improved significantly, with resolution of LAFB (Fig. 3). He was managed with a comprehensive medical regimen, including antiplatelet therapy, antihyperlipidemic agents, and antidiabetic therapy after the diagnosis of type 2 diabetes mellitus. The patient was discharged with regular follow-up and lifestyle modifications, including smoking cessation. During follow-up, he remained asymptomatic.

Discussion and conclusions

In 2008, de Winter et al. first reported the de Winter syndrome, a rare ECG pattern associated with proximal LAD artery occlusion, indicating acute occlusion of the proximal LAD [1]. The ECG characteristics of de Winter syndrome include J-point depression with upsloping ST-segment depression of 1–3 mm in leads V1–V6, followed by tall, symmetric T waves. Additionally, most patients exhibit poor R-wave progression in the precordial leads, and the majority have 1–2 mm ST-segment elevation in aVR [1]. However, recent studies have shown that the de Winter pattern is not limited to LAD occlusion but may also be observed in other coronary artery branch occlusions, such as the RCA, left circumflex (LCX), first diagonal branch occlusion, second diagonal branch occlusion, and non-occlusive LAD lesions [3–7]. Additionally, the de Winter pattern has been linked to more severe coronary artery disease, such as LMCA disease [8, 9].

From a differential diagnostic perspective, identifying the unique features of de Winter syndrome associated with LMCA occlusion is crucial. Specifically, when patients present with the ECG features of de Winter syndrome, which additional characteristics may suggest more severe coronary artery disease, such as LMCA involvement? In the present case, the patient exhibited

de Winter syndrome with significant ST-segment elevation in aVR (2–3 mm) and mild elevation in V1. Coronary angiography ultimately confirmed complete LMCA occlusion. The marked ST-segment elevation in aVR highlights the importance of this ECG finding, suggesting more severe coronary artery involvement, such as LMCA occlusion. Similar observations have been made by Chun-Wei Liu et al., who reported significant aVR elevation in cases of LMCA occlusion presenting with de Winter syndrome [8]. Therefore, clinicians should be highly vigilant about this ECG pattern and promptly conduct further examinations to clarify the coronary artery disease status, enabling early intervention to improve patient outcomes.

In this case, the patient's ECG not only showed de Winter syndrome and ST-segment elevation in aVR but also exhibited LAFB. LAFB is typically associated with ischemia of the left anterior fascicle, which is primarily supplied by the septal perforator arteries originating from the LAD [10]. When the proximal LAD is occluded, it may lead to insufficient blood supply to the left anterior fascicle, resulting in conduction block. Interestingly, the LAFB resolved after successful PCI. This resolution is likely due to the restoration of blood flow in the LAD following PCI, which improved the perfusion of the left anterior fascicle and normalized the conduction system function, leading to the disappearance of LAFB. This phenomenon indicates that LAFB may be a reversible conduction abnormality closely related to the severity of myocardial ischemia. Additionally, studies have suggested that LAFB, as well as LAFB combined with right bundle branch block, may serve as potential ECG markers for predicting acute LMCA occlusion [11]. Clinicians should enhance their awareness of this ECG feature to facilitate early identification and intervention, thereby improving patient outcomes. Future studies should further explore the underlying mechanisms and clinical implications of these dynamic ECG changes.

In summary, this case highlights the clinical significance of the coexistence of de Winter syndrome, pronounced ST-segment elevation in aVR, and LAFB, which may suggest a more severe coronary artery disease and necessitate urgent intervention. The resolution of LAFB following PCI underscores the reversibility of conduction abnormalities with improved myocardial perfusion. Clinicians should be vigilant about this rare ECG pattern to facilitate timely diagnosis and treatment.

Abbreviations

ECG	Electrocardiogram
LAD	Left anterior descending artery
STEMI	ST-segment elevation myocardial infarction
LMCA	Left main coronary artery
LAFB	Left anterior fascicular block
ACS	Acute coronary syndrome
PCI	Percutaneous coronary intervention
RCA	Right coronary artery
LCX	Left circumflex

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Clinical trial number
not applicable.

Authors' contributions
FY drafted the manuscript, LZD reviewed and edited the paper, ZM performed the PCI, WJL participated in the analysis and interpretation of the data. All authors read and approved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Ethical approval for this study was obtained from the Ethics Review Committee of Yibin First People's Hospital (Approval No. 2023-70) and was conducted in accordance with the guidelines laid down in the Declaration of Helsinki in 2013.

Consent for publication
Written informed consent was obtained from the patient himself for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing interests
The authors declare no competing interests.

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