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Diffuse ST segment depression and ST segment elevation in lead aVR and V1 by left circumflex artery occlusion

Yangyi Lin, MD, Danqun Xiong, MD, Fei Wang, MD, Xiangdong Xu, MD *

Department of Cardiology, Jiading District Central Hospital Affiliated Shanghai University of Medical and Health Sciences, China

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ABSTRACT

The current guidelines for resting electrocardiograms of diffuse ST segment depression coupled with ST segment elevation in aVR and/or V1 that are otherwise unremarkable indicate multivessel or left main coronary artery obstruction. However, our case meets the above electrocardiogram changes, but involves left circumflex artery occlusion.

Case report

A 73-year-old man was admitted to the emergency department with repeated chest pain, diaphoresis, and vomiting. He had neither a history of hypertension or diabetes nor any family history of coronary artery disease. His symptoms persisted for 14 h and were aggravated for 2 h. On clinical examination, his blood pressure was 167/93 mm Hg and heart rate was 60 beats per minute; he showed normal heart sounds with no murmurs, and no jugular venous distention. The first electrocardiogram (ECG) was performed in the emergency department (Fig. 1A). His troponin I level was 0.088 ng/mL (normal value: 0.010–0.023); thus, he was diagnosed with acute coronary syndrome non-ST segment elevation myocardial infarction (non-STEMI) and underwent emergency coronary angiography that revealed acute subtotal occlusion of the proximal left circumflex artery (LCX) and 50% stenosis in the left anterior descending artery (Fig. 2). He then underwent percutaneous coronary intervention (PCI) in the LCX using a 2.75 × 23-mm stent. The ECG was recorded after the procedure (Fig. 1B).

Discussion

According to the 2017 European Society of Cardiology guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation, ST depression ≥1 mm in 8 or more surface leads, coupled with ST-segment elevation in aVR and/or V1, suggests left main coronary artery (LMCA) obstruction or severe vessel ischaemia [1]. Although, the characteristic ECG of our patient met the criteria, it involved proximal LCX acute subtotal occlusion.

Lead aVR points to the left ventricular cavity and has a frontal plane vector of −150°; diffuse subendocardial ischaemia or posterobasal infarction produces a current of injury that is directed at aVR, leading to ST segment elevation. When the LCX, which supplies the posterobasal area, is occluded, it can lead to aVR ST elevation. Due to different anatomical locations, the mean vector produced by LCX occlusion is more biased towards the reverse extension line of lead II than the LMCA. Thus, no ST depression in aVL is a clue to differentiate LCX occlusion from LMCA occlusion. A report by Thrudeep et al. also supports this view [2]. In addition, based on analysis of the precordial leads, the first ECG of our patient shows that the amplitude of R in V1 was 3.8 mm and R/S amplitude ratio was 0.52. The infarction vector of the 'posterobasal', which is due to LCX occlusion, would face the positive poles of leads V1 and V2, producing 'Q-wave-equivalent' pathologically increased R waves. A report by de Luna AB et al. suggests that an R/S amplitude ratio of 0.5 or greater and amplitude of R in V1 of >3 mm are very specific criteria for locating culprit vessels in the LCX [3].

Conclusion

With the findings of the present clinical case, we suggest that ST depression in multi-lead ECG, elevation in lead aVR > V1 with no ST depression in aVL, R/S >0.5 or amplitude of R >3 mm in V1 may be clues to differentiate LMCA occlusion from LCX occlusion.

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* Corresponding author at: No 1. Chengbei Road, Jiading District, Shanghai, China.
E-mail address: xuxiangdong8416@163.com (X. Xu).

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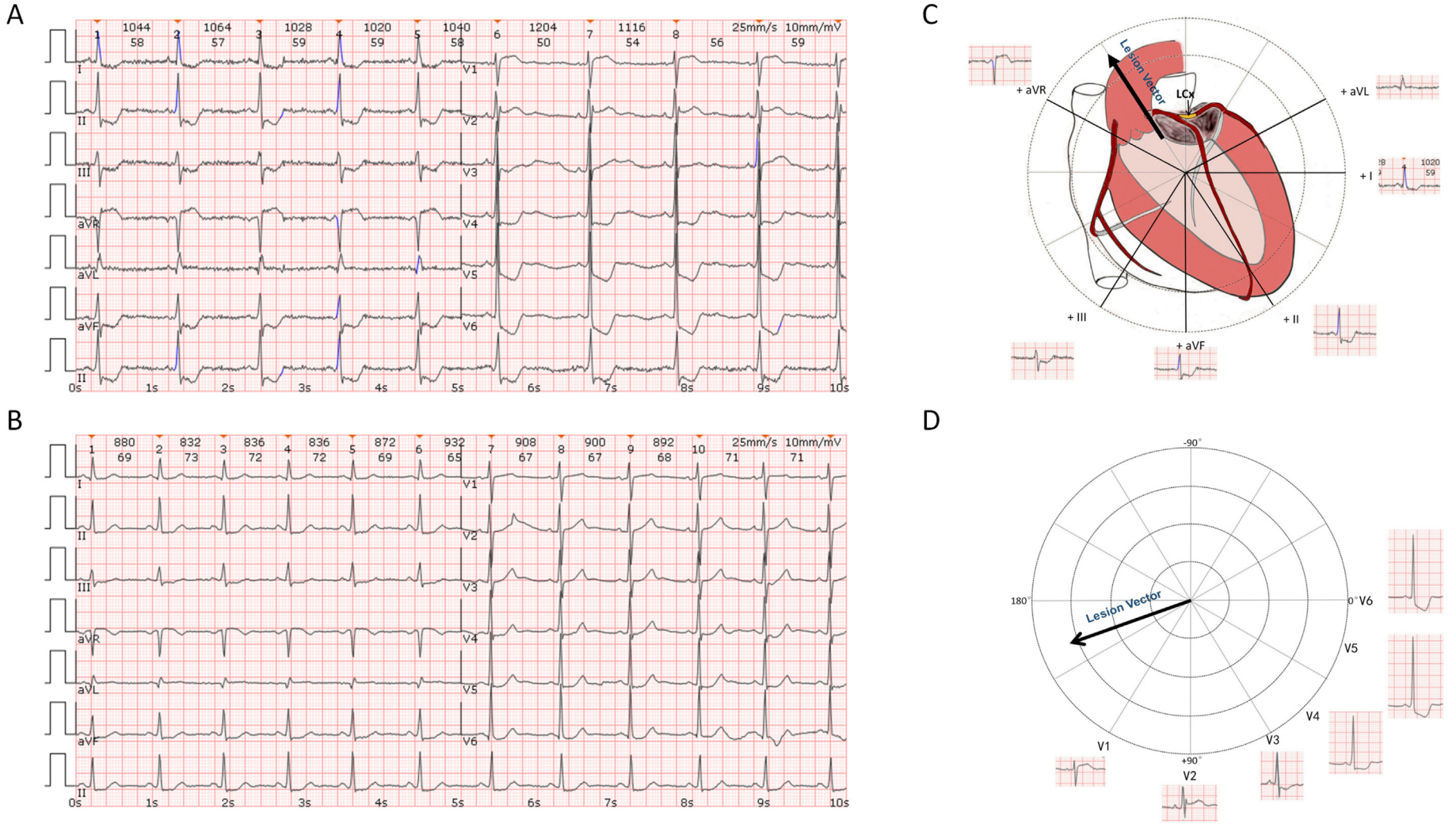

Fig. 1. (A) The first electrocardiogram shows ST elevation in aVR (2.0 mm) > V1 (1.5 mm) with ST depression >1 mm in eight leads, and no ST depression in aVL. (B) Post-procedure percutaneous coronary intervention electrocardiogram shows resolution of ST elevation. (C) The lesion vector (black arrow) in frontal, vector localization (brown zone) of high lateral infarction in isolated proximal left circumflex artery (LCX) occlusion. (D) The lesion vector (black arrow) in horizontal.

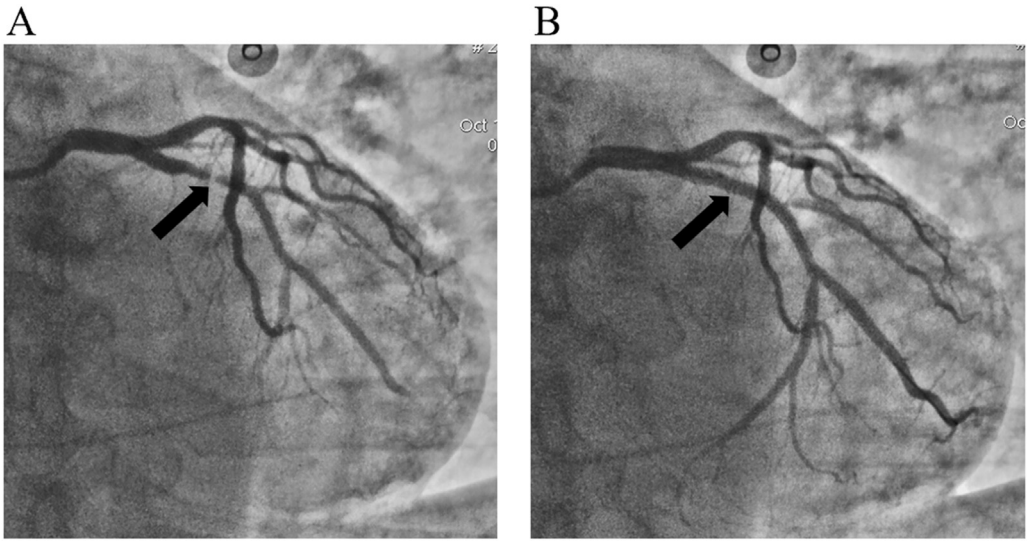

Fig. 2. (A) Coronary angiogram showing an acute subtotal occlusion of the proximal left circumflex artery (LCX). (B) Coronary angiogram after LCX stenting, showing thrombolysis in myocardial infarction (TIMI; 3-flow).

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Conflicts of interest

None.

References

[1] Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: the task force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J 2017;2018(39):119–77.

[2] Thrudeep S, Geofi G, Rupesh G, Abdulkhadar S. Dilemma of localization of culprit vessel by electrocardiography in acute myocardial infarction. Indian Heart J 2016;68 (Suppl. 2):S15–7.

[3] de Luna AB, Cino J, Goldwasser D, Kotzeva A, Elosua R, Carreras F, et al. New electrocardiographic diagnostic criteria for the pathologic R waves in leads V1 and V2 of anatomically lateral myocardial infarction. J Electrocardiol 2008;41:413–8.