CASE REPORT

De Winter Electrocardiographic Pattern Related with a Non-Left Anterior Descending Coronary Artery Occlusion

José M. Montero Cabezas, M.D., Ioannis Karalis, M.D., and Martin J. Schalij, M.D., Ph.D.

From the Department of Cardiology, Leiden University Medical Center, Leiden, The Netherlands

The electrocardiographic pattern consisting of ST-segment depression and hyperacute T waves in patients with acute chest pain, known as “De Winter pattern,” has been related with the occlusion of the proximal left anterior descending artery (LAD). The association of these findings with the involvement of a different coronary artery has not been described. We present a 53-year-old patient with an occlusion of the first diagonal branch and an electrocardiogram showing a “De Winter pattern.” The reported case demonstrates that “De Winter pattern” is not exclusively associated with the occlusion of the proximal segment of the LAD.

Ann Noninvasive Electrocardiol 2016;21(5):526–528

cardiac anatomy; clinical; noninvasive techniques—electrocardiography; clinical

The electrocardiographic (ECG) pattern consisting of ST-segment depression and hyperacute T waves in patients with acute chest pain, known as “De Winter pattern,” has been related with the occlusion of the proximal left anterior descending artery (LAD).^{1,2} The association of these ECG findings with the involvement of a different coronary artery has not been described. We present a case in which a “De Winter pattern” was related with a non-LAD coronary occlusion.

A 53-year-old man, known with hypercholesterolemia and no previous cardiac history, presented sudden chest discomfort at rest. Twenty minutes after the onset of the pain, an electrocardiogram (ECG) was performed by the emergency services, showing upsloping ST-segment depression at the J-point up to 3 mm with tall and symmetrical T waves from V₂ to V₅ (Fig. 1, upper panel). Due to the strong suspicion of an occlusion of the proximal LAD, the cath-lab was activated and the patient was transferred for urgent catheterization. Coronary angiography of

the left coronary artery revealed a patent LAD, and no lesions were observed at the circumflex artery or the left main. After careful evaluation of the angiogram, the stump of an occluded first diagonal branch (D1) arising very proximal from the LAD was detected (Fig. 1A, B). The occlusion was crossed with a BMW coronary guidewire (Abbot Vascular), and predilatation with a 2.0 × 15-mm semicompliant balloon was performed, revealing a well-developed artery with multiple side branches along the anterolateral aspect of the left ventricle (Fig. 2A, B). A 2.5 × 20 mm drug-eluting stent was successfully implanted. Postprocedural ECG showed persistent ST elevation from V₂ to V₆, with negative T waves and marked Q waves in I and aVL, compatible with evolved anterolateral ischemia (Fig. 2, lower panel). Maximum troponin T and CK levels were 6.05 mcg/l and 2036 U/l, respectively. An echocardiogram showed a slightly depressed left ventricle ejection fraction with akinesia limited to the mid-anterior wall and apico-lateral segments.

Address for correspondence: José M. Montero Cabezas, M.D., Department of Cardiology, Leiden University Medical Center, Albinusdreef 2, 2333 ZA Leiden, The Netherlands. Fax: 0031 0715266359; E-mail: J.M.Montero_Cabezas@lumc.nl

Conflict of interests: None

Figure 1. Upper panel: ECG 20 minutes after onset of pain: “De Winter complexes” are present in leads V₂-V₄. (A, B) left and right oblique cranial projections showing the patency of the LAD and the proximal occlusion of the first diagonal branch.

One day later, the patient was discharged without complications.

The association of ST-segment depression and hyperacute T waves with anterior myocardial infarction was firstly established by Dressler et al.³ Sixty years later, De Winter et al.^{1,2} founded this ECG pattern (upsloping ST-segment depression after the J point, prominent positive and symmetric T waves, loss of R wave progression and, eventually, ST elevation of 1–2 mm in aVR) in 2% of the cases of a series of 1532 patients with anterior myocardial infarctions. In all of them, the culprit lesion was invariably the proximal LAD, which was completely occluded in most of the cases. Characteristically, the pattern was detected around 90 minutes after the onset of the pain and remained unchanged until the aperture of the artery without progressing toward ST elevation. Large infarcted areas have been linked to this ECG pattern.

No prior description of the “De Winter pattern” associated with the occlusion of a vessel different

from the LAD has been reported. Classically, leads aVL and I are associated with the territory irrigated by the D1, and the presence of ST elevation in these leads is frequently used to discriminate the level of the occlusion of the LAD in the presence of an anterior infarction. Despite the unusual ECG presentation during the acute phase, the electrical evolution after reperfusion presents the typical pattern of a standard D1 infarction. Bayés et al.⁴ determined that, in patients after acute myocardial infarction, Q (qr or r) waves in I and aVL and eventually V₂-V₃ and/or RS pattern in V₁ were associated with an occlusion of the D1 (sensitivity of 70% and a specificity of 100%).

Specific anatomical characteristics of this particular case should be addressed. First, the D1 arises from the LAD at a very proximal level. Second, it presents an unusually well development with several subsidiary branches, covering an extended area of the anterolateral aspect of the left ventricle. In this scenario, the extension of

Figure 2. (A, B) Coronary angiography after the angioplasty; a very well-developed first diagonal branch is observed. (Lower panel) ECG after the procedure, showing Q waves I and aVL with negative T waves, persistent slight ST elevation with negative T waves in V₅ and V₆ and biphasic in V₄, correlating with an evolved anterolateral infarction.

the jeopardized myocardium probably determined the observed ECG pattern despite the LAD patency. However, and as expected, the infarcted area was smaller than reported in cases with proximal LAD occlusion. A prompt revascularization might have also played a role in this sense.

The reported case demonstrates that "De Winter pattern" is not exclusively associated with the occlusion of the proximal segment of the LAD. Due to the presumably large area of myocardium at risk when detected, the patency of the LAD should lead the interventional cardiologist to exclude the involvement of other coronary artery branches.

REFERENCES

1. De Winter RJ, Verouden NJ, Wellens HJ, et al. A new ECG sign of proximal LAD occlusion. *N Engl J Med* 2008;359:2071-2073.
2. Verouden NJ, Kock KT, Peters RJ, et al. Persistent precordial "hyperacute" T-waves signify proximal left anterior descending artery occlusion. *Heart* 2009;95:1701-1706.
3. Dressler W, Roesler H. High T waves in the earliest stage of myocardial infarction. *Am Heart J* 1947;34:627-646.
4. Bayés de Luna A, Cino JM, Pujadas S, et al. Concordance of electrocardiographic patterns and healed myocardial infarction location detected by cardiovascular magnetic resonance. *Am J Cardiol* 2006;97:443-451.