

# The ECG in localizing the culprit lesion in acute inferior myocardial infarction: a plea for lead V4R?

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**This editorial refers to ‘Distinguishing the right coronary artery from the left circumflex coronary artery as the infarct-related artery in patients undergoing primary percutaneous coronary intervention for acute inferior myocardial infarction’ by N.J. Verouden *et al.*, on page 1517**

The electrocardiogram (ECG) is being used for decades as a reliable and inexpensive tool to diagnose acute myocardial infarction in the patient with chest pain. More recently, an emphasis has been made on ECG features that allow better identification of the coronary occlusion site and thereby better estimation of the size of the area at risk, which is important for selection of the preferred type of reperfusion.

On average the left anterior descending coronary artery supplies 50% of blood flow and the right coronary artery (RCA) and circumflex (Cx) coronary artery each supply 25% of blood flow to the left ventricular myocardium. In addition, RCA irrigates most of the right ventricle. The closer the occlusion site to the origin of the coronary artery, the larger the ischaemic area and the greater the necessity of a rapid reperfusion attempt. The ECG findings considered to be helpful to localize the occlusion site in the culprit coronary artery have been described by several authors and are summarized elsewhere.<sup>1</sup> In the current issue of the journal, Verouden *et al.* looked at the value of the standard 12-lead ECG to distinguish the RCA from the Cx coronary artery as an infarct-related vessel in a large series of patients with acute inferior MI undergoing primary percutaneous coronary intervention shortly thereafter.<sup>2</sup> ST-segment elevation in lead III more than in lead II, combined with ST-segment depression in lead I or aVL was used as a marker, suggesting that the culprit lesion was located in RCA.

The study is important because of the large number of patients and the short time interval between the 12-lead ECG and the coronary angiogram. The findings can be summarized that using this ECG algorithm a correct diagnosis as to the coronary occlusion

site did not reach a pre-specified sensitivity threshold of 90% in the whole group. Of interest is that when the authors applied algorithms published by other investigators using ST-segment deviation in the extremity leads, even lower sensitivity was observed.

Only in the case of a total 12-lead ST-segment deviation score of more than 18.5 mm, a sensitivity of more than 90% was found. We are not informed about the accuracy of the algorithm in relation to the degree of ST-segment deviation. Is there a critical threshold of ST deviation? Not surprisingly, the best predictive results were obtained in patients with a proximal RCA occlusion because of the large amount of ST-segment deviation.

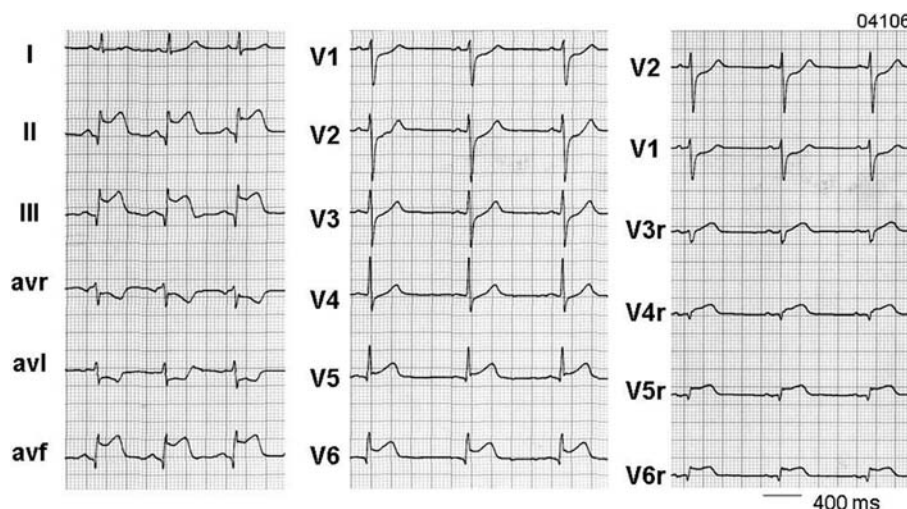
Verouden *et al.*<sup>2</sup> using the standard 12-lead ECG did not look at additional patterns of ST-segment changes in the precordial leads V1–V3 as suggested by other authors.<sup>3–6</sup> For example, Fiol *et al.* advised to determine the ratio of the sum of ST-depression in leads V1–V3 divided by the sum of ST-elevation in leads II, aVF, and III. If this ratio is greater than 1, RCA is the culprit artery. When occlusion in RCA is located proximally to the right ventricular (RV) branch, the right ventricle will be ischaemic and subsequently infarcted. That opened the possibility of using the presence of RV ischaemia and infarction as an indicator of proximal RCA occlusion. Already in 1976 Erhardt *et al.*<sup>7</sup> described that by using the right precordial lead (lead V4R) RV infarction could be diagnosed. Later it became clear that RV infarction was accompanied by a high incidence of advanced AV nodal conduction disturbances and high mortality.<sup>8–10</sup> In 1988, Braat *et al.*<sup>11</sup> described three ST-deviation patterns that could be found in lead V4R in proximal RCA, distal RCA, and Cx occlusion in acute inferior MI. An example of the value of lead V4R to make that distinction is given in Figure 1.

When using lead V4R in inferior MI, one should know that ST-segment deviation in that lead does not last as long as in the standard extremity leads.<sup>1</sup> Lead V4R should be recorded as early as possible after the start of chest pain. Unfortunately, although

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**Figure 1** The ECG of a patient with acute inferior myocardial infarction with the same amount of ST-segment elevation in leads II and III and an isoelectric ST segment with a positive T wave in lead I. The approach used by Verouden *et al.*<sup>2</sup> does not allow identification of the location of the culprit coronary occlusion. Lead V4R shows ST-segment elevation indicating a proximal RCA occlusion, which was documented by coronary angiography.

known for three decades, lead V4R is rarely recorded in the real world in patients with acute MI. As pointed out by Harju *et al.*<sup>12</sup> additional ECG leads such as lead V4R are usually not recorded by the emergency service personnel or in the emergency department. It would be very helpful to document the additional predictive power of lead V4R in a study of the size and accuracy as the one by Verouden *et al.* to make lead V4R a pre-specified recording in the patient with acute inferior MI.

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