

Recording lead V₄R is associated to enhanced use of fibrinolytic therapy in acute myocardial infarction[☆]

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Abstract

Background: ST-segment elevation in the right-sided chest lead V₄R in inferior wall myocardial infarction is recognized as a sign of proximal occlusion of the right coronary artery with evolving right ventricular myocardial infarction. Our objective is to study how often lead V₄R is recorded in clinical practice and how this might be associated with use of reperfusion therapy and outcome of patients.

Methods: Recording of lead V₄R in 814 consecutive patients with acute myocardial infarction, administration of therapy, and outcome of the patients during a median follow-up of 285 days (174–313 days) were studied.

Results: V₄R was recorded in 52% of patients with inferior ST-elevation myocardial infarction. Patients with V₄R recorded were more likely to receive fibrinolytic therapy compared with patients without recording (65% vs 51%; $P = .035$). In multivariate analysis, recording of lead V₄R (odds ratio [OR] 1.6, 95% confidence interval [CI] 1.1–2.2; $P = .006$), along with age ($P < .001$), previous myocardial infarction (OR 2.2, 95% CI 1.3–3.5; $P = .002$), and diabetes (OR 3.9, 95% CI 1.1–2.4; $P = .03$) correlated to the use of reperfusion therapy. Patients with lead V₄R recorded had less ($P = .055$) reinfarction, unstable angina, stroke, and/or death during follow-up.

Conclusions: Lead V₄R was recorded in only half of patients with inferior ST-elevation myocardial infarction. Patients with V₄R recorded were more likely to receive thrombolytic therapy than those without recording of the additional chest lead.

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Keywords:

Lead V₄R; Fibrinolytic therapy; Acute myocardial infarction; Right ventricular infarction

Introduction

Electrocardiography (ECG) recorded during the acute phase of an ST-elevation myocardial infarction contains clinically important diagnostic and prognostic information. When Sanders¹ published the first case report of a right ventricular myocardial infarction in 1930, it was not possible to make the diagnosis by ECG. Cohn et al² first described the clinical importance of right ventricular myocardial infarction in 1974. Acute myocardial infarction involving only the right ventricle is a rare event, but acute inferior wall myocardial infarction is much more common

(24%–52%) resulting in higher mortality.^{3–6} Proximal right coronary artery occlusion also seems to be a significant risk factor for prehospital sudden cardiac death.⁷ In the ECG, ST elevation in lead V₁ indicates right ventricular myocardial infarction in relation with inferior myocardial infarction. However, absence of this finding does not exclude infarction in the right ventricle.⁸ Placing additional chest leads V₃R to V₅R improves diagnostic accuracy. Studies have shown that ST-segment elevation in the additional chest lead V₄R is a sign of an occlusion of the right coronary artery proximal to the right ventricular branches (Fig. 1).⁹

Guidelines for the management of myocardial infarction include a 13-lead ECG measurement including lead V₄R in patients with inferior ST-segment elevation, but it is not known how often this is implemented in real life.¹⁰ It is not known how often lead V₄R is recorded in routine practice.

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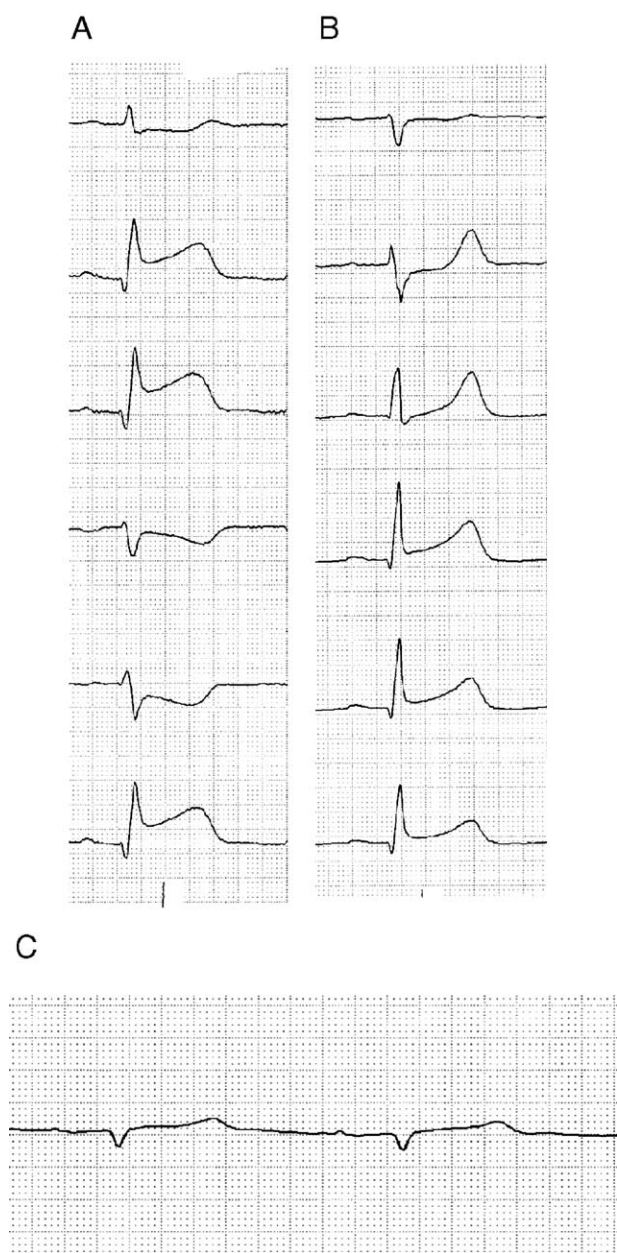


Fig. 1. A, ECG (50 mm/s) showing the extremity leads (I, II, III, aVR, aVL, and aVF). ST elevation in leads II, III, and aVF and reciprocal ST depression in I and aVL. B, ECG showing the chest leads V1-V6. ST depression in V2 and ST elevation in V4-V6. C, ST elevation (1 mm) in the right-sided chest lead V_{4R}.

The aim of our study is to evaluate how often the additional lead was recorded in unselected consecutive patients with acute myocardial infarction, and how this might be associated to usage of fibrinolytic therapy and outcome of the patients.

Material and methods

Study population

This prospective observational study included 814 consecutive patients with acute ST-elevation or non-ST-elevation myocardial infarction with elevated cardiac troponin I levels admitted to the emergency department of

Tampere University Hospital between January and December 2002. We excluded patients who died in the emergency department. Blood samples for cardiac troponin I were collected at baseline and after 6 to 12 hours. Myocardial infarction was defined as elevated cardiac troponin I (normal value <0.2 µg/L; ACS:180, Bayer Diagnostics, Tarrytown, NY) in the clinical setting of acute myocardial ischemia.¹¹ An ECG from the acute phase was analyzed. All study participants gave their written informed consent for study participation at hospital admission, and the Ethics Committee at Tampere University approved the study protocol. The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki. A study nurse contacted all alive patients by telephone to collect follow-up data. Causes of death were registered from official statistics. The outcome of the patients was defined on the basis of composite end points (reinfarction, unstable angina, stroke, and/or death). Patient follow-up ended in case of a composite end point or at the time of the phone call by the study nurse. The median follow-up was 285 days (174–313 days).

ECG analysis

The prevailing American College of Cardiology/American Heart Association (ACC/AHA) guidelines for ECG recording adopted for routine praxis include the use of lead V_{4R} in inferior myocardial infarction.¹⁰ Two investigators (KCN and MJE) analyzed the ECGs (N = 814) from the acute phase manually. The ECGs were recorded at the admitting health center, in the ambulance, or in the emergency department. During the collection of the patient series, the investigators did not actively intervene to change routine practice in recording additional leads. ST-segment deviation from the isoelectric line, determined by drawing a line between subsequent PQ segments, was considered elevated or depressed if it was ≥0.5 mm above or below the isoelectric line, respectively. Measurement was done at 80 ms after the J-point.

ECG criteria for fibrinolytic therapy were defined as ST-segment elevation ≥2 mm in 2 or more consecutive chest leads, ≥1 mm in 2 or more consecutive extremity leads, or (presumed) new left bundle branch block.

Statistical analysis

The associations between the use of V_{4R} and the noncontinuous parameters were compared with Pearson χ^2 test, Fisher exact test, or with the Mann-Whitney test. A multivariate logistic regression analysis for factors leading to the use of fibrinolytic therapy in the whole study cohort was calculated using age, sex, previous myocardial infarction, hypertension, smoking, as well as diabetes mellitus as covariates. A probability value of <.05 was considered statistically significant. All calculations were performed using the SPSS 11.5 statistical package (SPSS Inc, Chicago, Ill).

Results

Mean age of the whole study cohort (N = 814) was 71.8 years, 58% were male and 42% female. Of the study population, 26% had a history of prior myocardial infarction,

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