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Case Report

A Rare Case of ST Segment Elevation in Anterior Leads Due to Transient Acute Marginal Branch Occlusion During Right Coronary Artery Stenting

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Abstract

Isolated right ventricular infarction is an extremely rare phenomenon which may be difficult to recognize. Also, it is rare to observe ST segment elevation in anterior leads caused by isolated, transient acute marginal branch occlusion. We described the case of a patient suffering Acute coronary syndrome with transient ST segment elevation in precordial leads from V1 to V4, due to isolated right side branch occlusion during right coronary artery stenting.

Keywords: Anterior ST Elevation; Transient Acute Marginal Branch Occlusion, Coronary Artery Stenting

Case Presentation

A 60-year-old male patient was admitted to our Hospital with a 1-year history of retrosternal chest pain. The basal ECG showed minimal ST depression in the anterior leads due to an old anterior myocardial infarction 10 years before. Figure 1, in particular, shows sinus rythm and T inverted waves from V1 to V4, suggestive of anteroseptal ischemia.

Physical examination was unremarkable. A two-dimensional transthoracic echocardiography (TTE) showed severe hypokinesia of the mid-apical left ventricular wall and normal global righ ventricular (RV) systolic ventricular function (without regional wall motion abnormalities).

The day after, a coronary angiography (CCG) revealed critical stenosis of the middle third of the right coronary artery (RCA) and a severely stenotic small acute marginal branch (Figure 2), a normal left anterior descending artery (LAD) and a critical stenosis of a first, well developed diagonal branch, and a normal left circumflex artery (Figure 3).

A coronary angioplasty was successfully performed with implantation of a drug eluting stent (Xience Prime 3.5 x 23 mm)

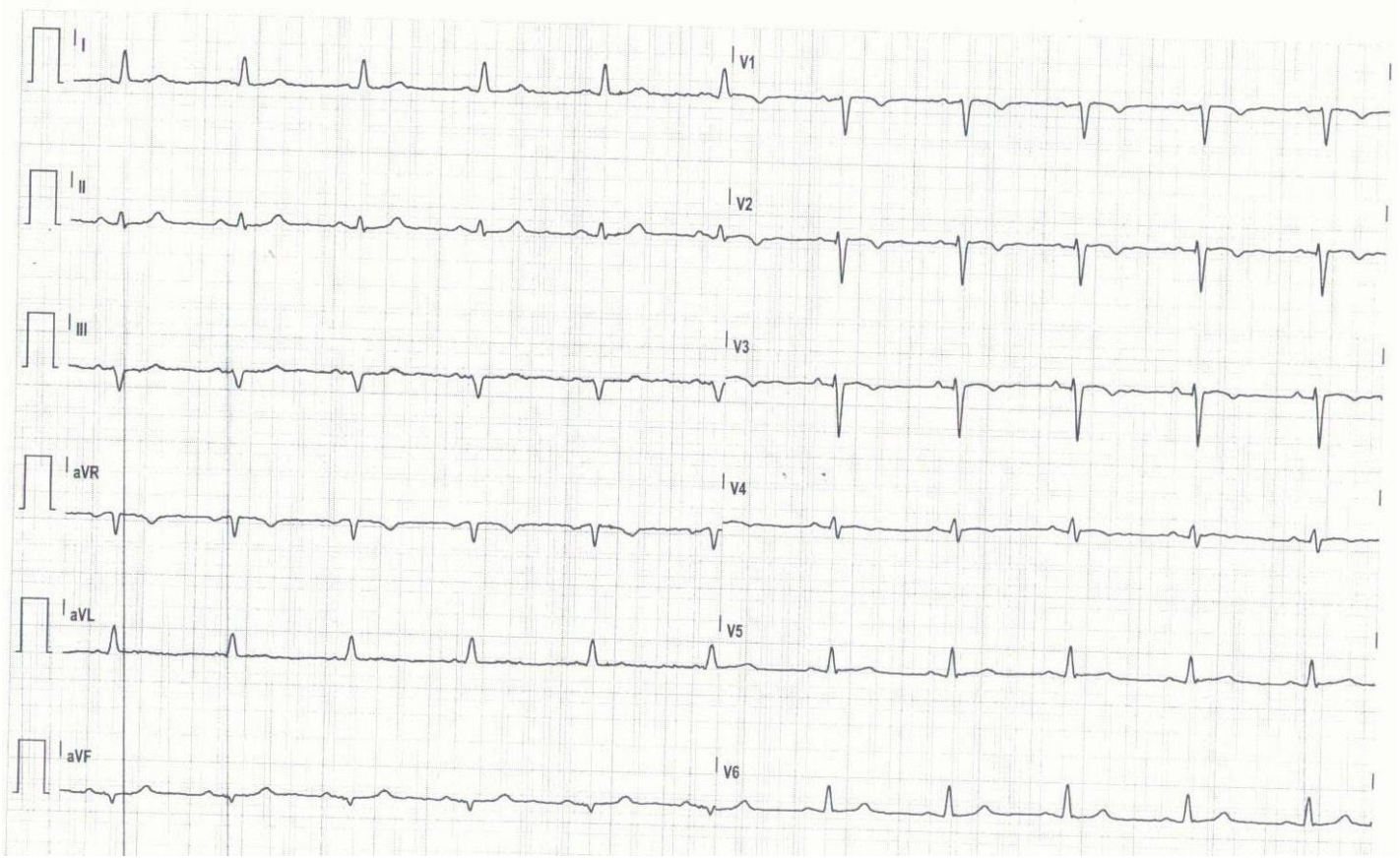

Figure 1. The basal Electrocardiogram (ECG) shows normal ST-T segment in the inferior leads and T inverted waves in V1, V2 and V3.

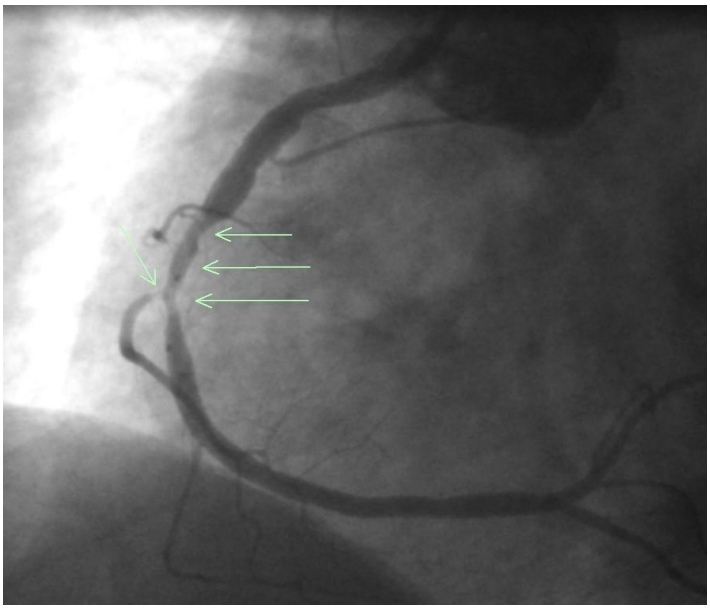

Figure 2. Selective coronary arteriography (0° antero-posterior 30° left view) shows the critical stenosis in the middle right coronary artery and the ostial sub-occlusion of the right ventricular branch (arrows).

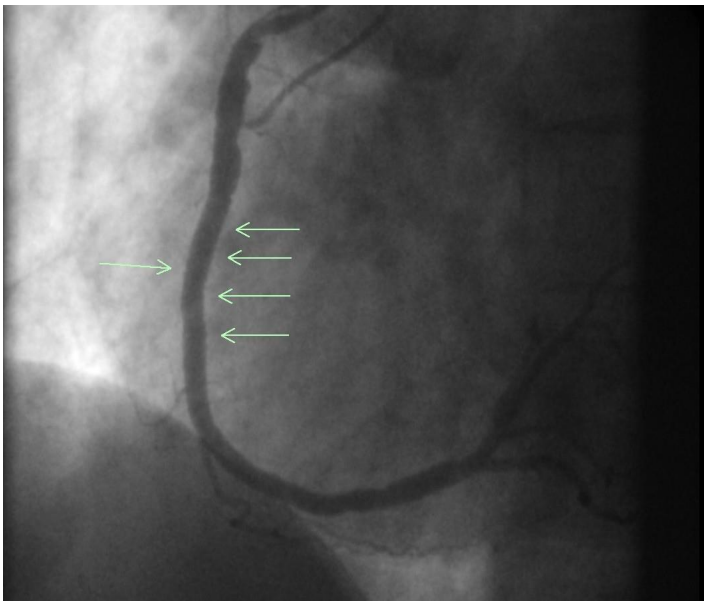

Figure 3. Selective coronary arteriography (0° antero-posterior 30° left view) shows the stent implantation of the middle right coronary artery (multiple arrows) and the post-stenting occlusion of the right ventricular branch (single arrow).

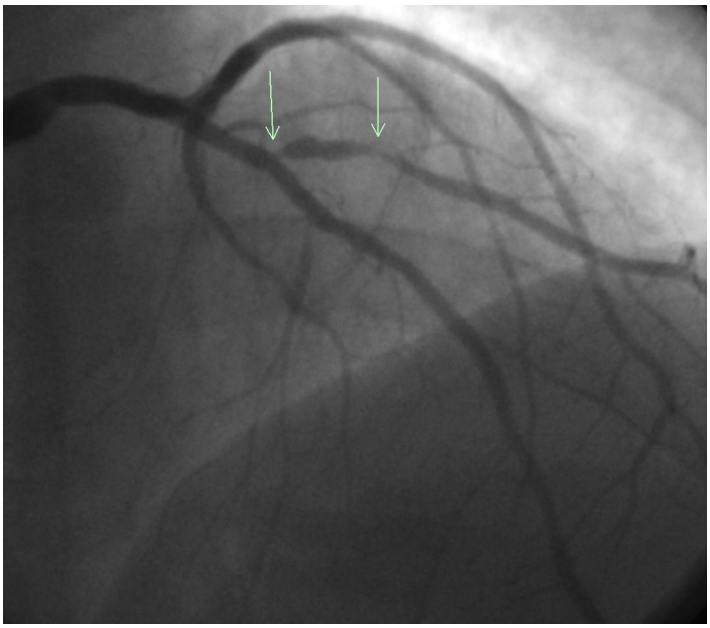

Figure 4. Selective coronary arteriography (40° cranial 0° antero-posterior view) shows the critical, double stenosis in the first diagonal branch of the left anterior descending coronary artery (arrows).

in the RCA, but total occlusion of the small RV branch occurred (Figure 4), due to the stent implantation and a plaque shift in the ostium of side branch.

The patient experienced acute chest pain and an ECG taken just after stent implantation showed a 3 mm ST segment elevation in precordial leads from V1 to V4 and leads V3R to V5R (Figure 5). The TTE showed no evidence of new left ventricular anterior wall motion abnormalities than those seen at baseline and no septum involvement, with wall motion abnormalities (hypokinesia) limited to basal RV inferior wall.

CCG was repeated and showed a patent RCA (TIMI 3 grade flow) and occlusion of the RV branch. The left coronary system shows the same stenosis in the diagonal branch, as shown already in the first angiogram.

The operator decided to perform angioplasty without stent implantation of the involved branch and reopen the RV branch only with balloon. The chest pain was then resolved and ST segment elevation in leads from V1 to V4 and in leads V3R to V5R disappeared.

The patient remained asymptomatic during follow-up in hospital.

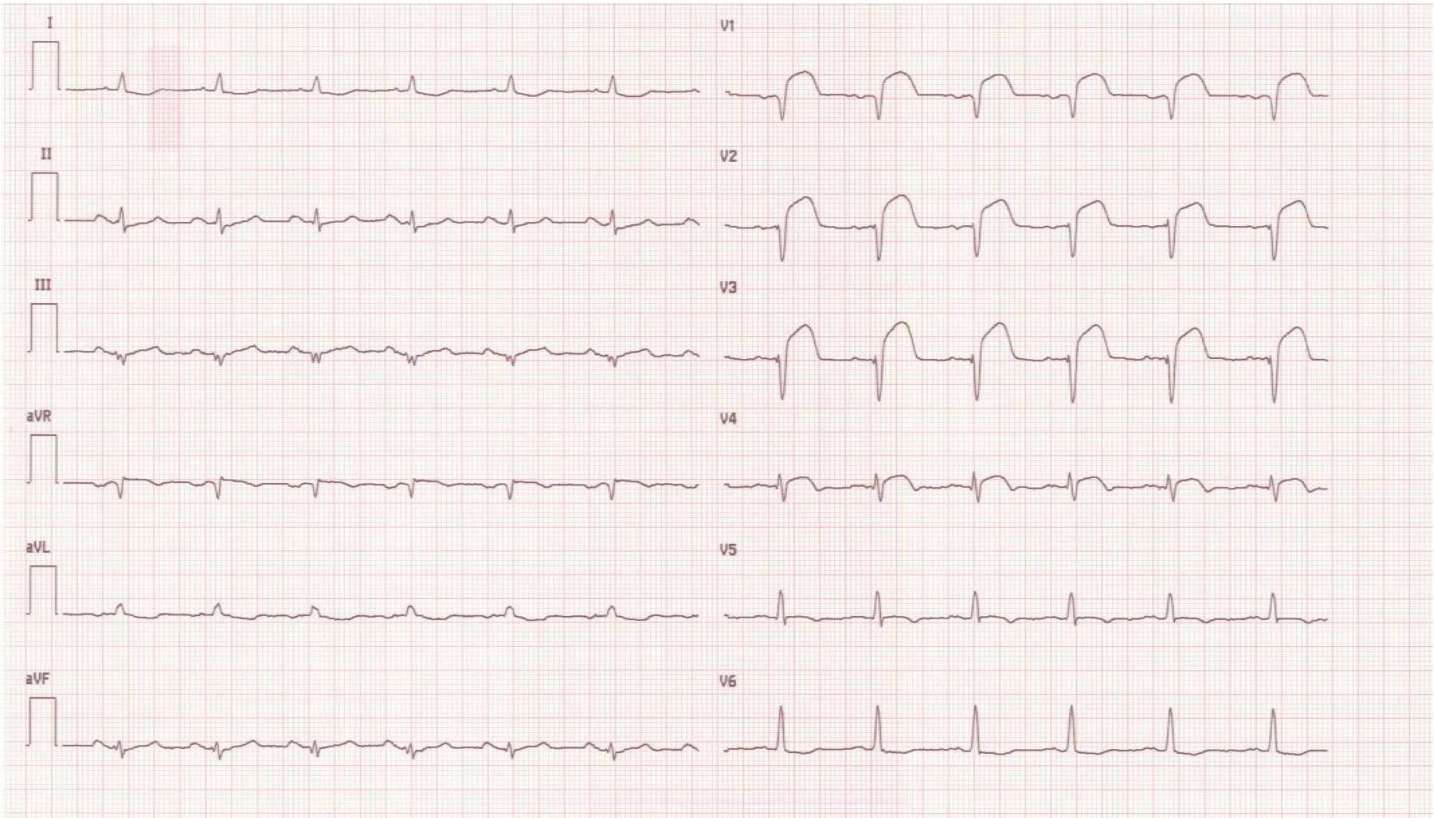

Figure 5. The ECG during PCI shows the ST elevation in V1-V4 due to transient occlusion of the right ventricular branch. The ST remains normal in the inferior leads.

Discussion

This case describes the ST segment elevation in precordial leads from V1 to V4, with progressive ST segment elevation from V1 to V3, due to isolated RV branch occlusion occurring during RCA angioplasty in a patient without changes in inferior leads and elective PCI.

Right ventricular myocardial infarction (MI) is usually diagnosed by ST segment elevation of 1 mm or more, in leads V3R to V6R. In the presence of acute inferior MI, ST segment elevation of 1 mm or more in the right-sided precordial leads, especially in V3R, was found to be diagnostic of right ventricular MI with a positive diagnostic value of 79–100% [1]. Classically, ST segment elevation in precordial leads V1 to V3-V4 is characteristic of anterior left ventricular MI secondary to LAD occlusion, but generally if the ST segment progressively lower from V3 to V1 or some like this elevation the culprit artery is probably be due to isolated occlusion of branch of the RCA [2].

In our case, the LAD and its septal branches were normal; the first diagonal shows a critical stenosis but there was no procedure (only angiography) in LAD and orits branches.

In the literature, ST segment elevation instead of reciprocal ST depression in precordial leads V1 to V3 has been described in patients with right ventricular MI in association with acute inferior MI [3–4]. In the presence of coexisting acute right ventricular injury and dilatation, because a larger part of the right ventricular free wall is directed anteriorly, ST segment elevation may be seen in the anteriorly oriented precordial leads V1 to V3-V4. Using an experimental infarction model, Geft et al. [3] found evidence that the ST segment elevation in the left precordial leads was dependent on the coexisting electrical forces ratio between the ischemic right ventricular free wall and the left ventricular inferior wall.

Isolated right ventricular MI results in an ST segment elevation in the precordial leads, whereas its combination with inferior left ventricular MI suppressed this ST segment elevation in the precordial leads and yielded an ST segment elevation in leads DII, DIII, and aVF.

The ECG of our case showed, during PCI, no reciprocal ST segment depression in anterior leads and ST elevation only in V1-V4 leads. In the occurrence of anterior ST segment depression during acute inferior MI, the proposed explanations vary from extensive infero-posterior infarction or additional anterior ischemia to a reciprocal change [6,7].

In our case, there was no new anterior ischemia and, in addition, no echocardiographic and findings of inferior MI, but only in a transient ischemic impairment of basal part of RV. During the angioplasty, ST segment elevation only in precordial leads V1 to V4 was atributed to isolated occlusion of a stenotic acute marginal branch.

Van der Bolt et al. [8] have observed that isolated acute occlusion of the right ventricular branch after angioplasty could be followed by ST segment elevations in leads V1 to V3. Sonoda et al. [9] have reported that ST segment elevation in the precordial leads occurred in a reproducible manner when the balloon occluded the right ventricular branch. Hence, our case is supported by previous studies and observations that ST segment elevation in precordial leads V1 to V4 may be a rare sign of RV branch occlusion.

This explains that, electrocardiographically, right ventricular MI may occur also because of isolated RV branch acute occlusion in the absence of inferior electrocardiographic changes [9, 10, 11, 12].

In conclusion, patients who develop transient ST segment elevation in precordial leads V1 to V3/V4 especially with ST elevation of V1> V3, during or following right coronary angioplasty, should not be assumed to have LAD occlusion, since the RV branch may be responsible for this phenomenon.

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