

ML: 50 year old woman

- History of coronary stent in 2002 (? Vessel)
- End stage autoimmune liver disease
- Portal hypertension
- Chronic renal disease
- Morbid obesity
- Hypothyroidism

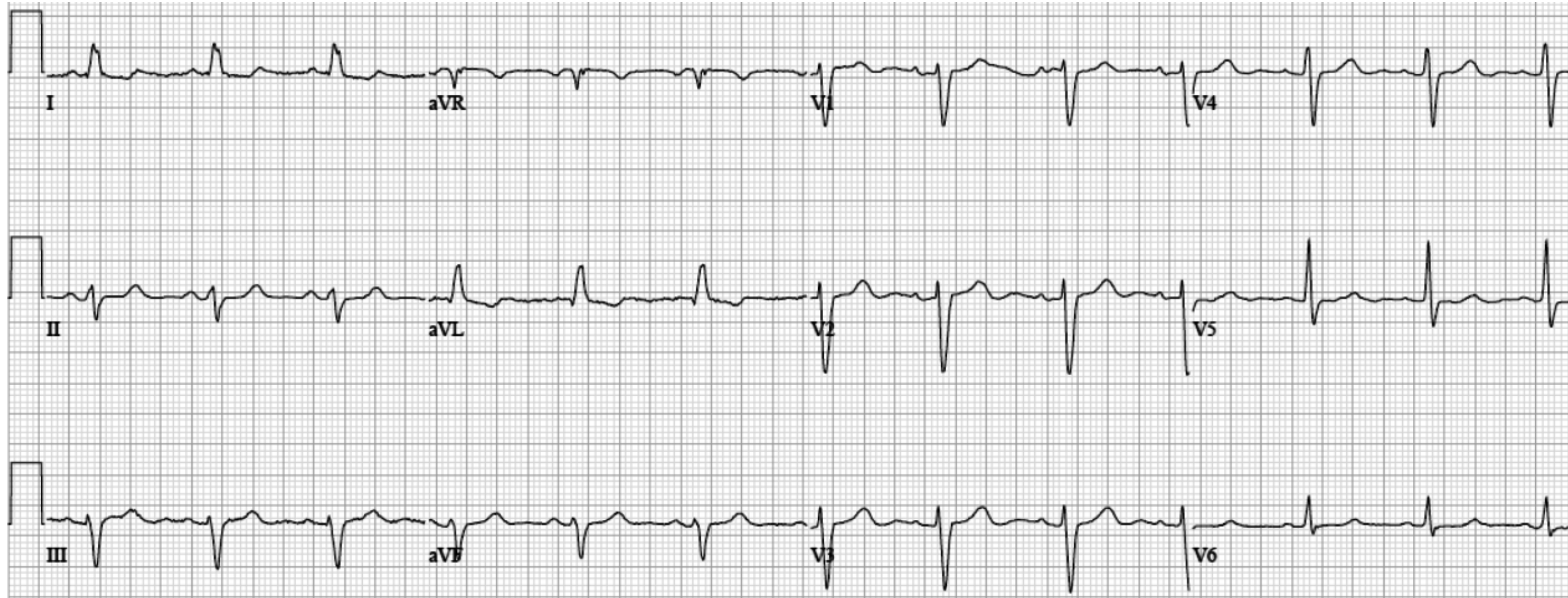


“This study predicts a medium risk for short-term adverse ischemic cardiovascular events.

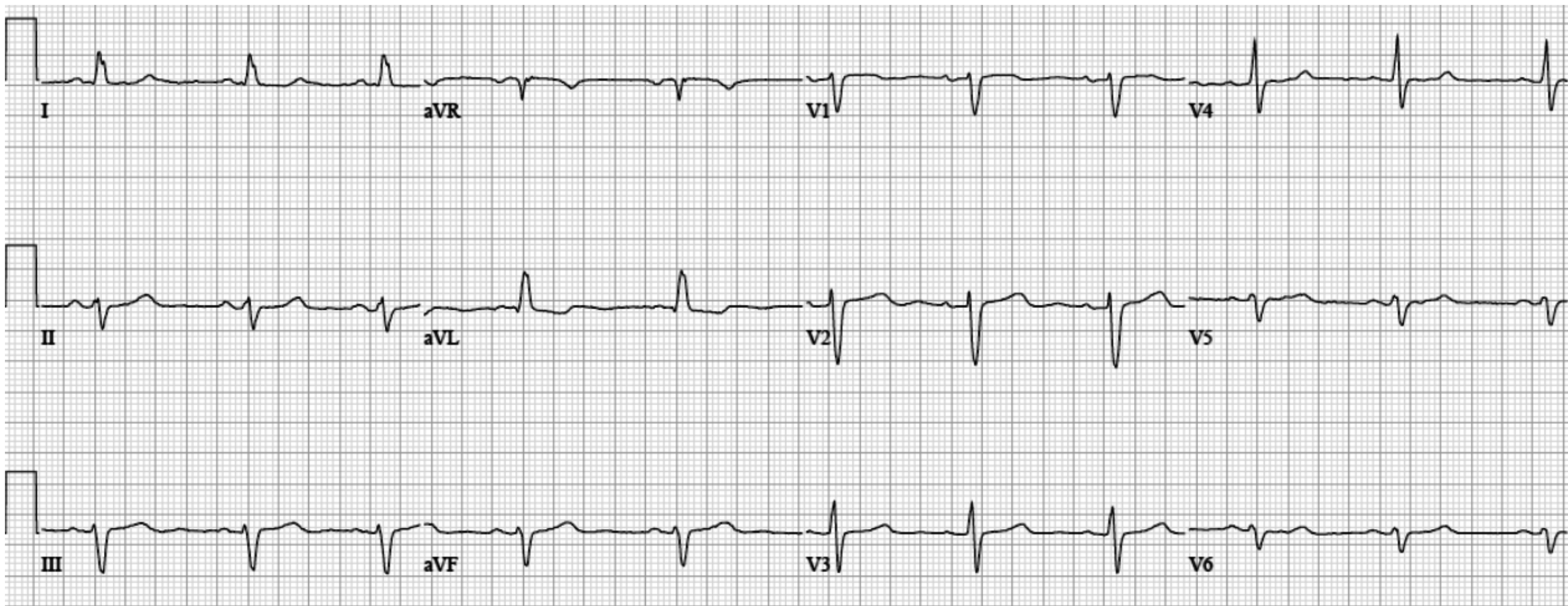
1. There is a moderate sized partially reversible perfusion defect involving the lateral wall. The perfusion defect is moderate in severity. This finding is suggestive of a prior non-transmural infarct with peri-infarct ischemia. Ischemic Burden = 9%.
2. Peak Stress Ejection Fraction = 57%. Rest Ejection Fraction = 51%. Transient Ischemic Dilation: 0.76
3. Normal wall motion.
4. Final stress ECG interpretation: Normal with no significant ST segment changes.
5. Coronary Calcium is severe in the LAD. Coronary Calcium is severe in the LCX. Coronary Calcium is severe in the RCA.

The presence of coronary artery calcification on this study confirms a higher likelihood of developing obstructive CAD, and an aggressive risk reduction strategy is strongly recommended.”

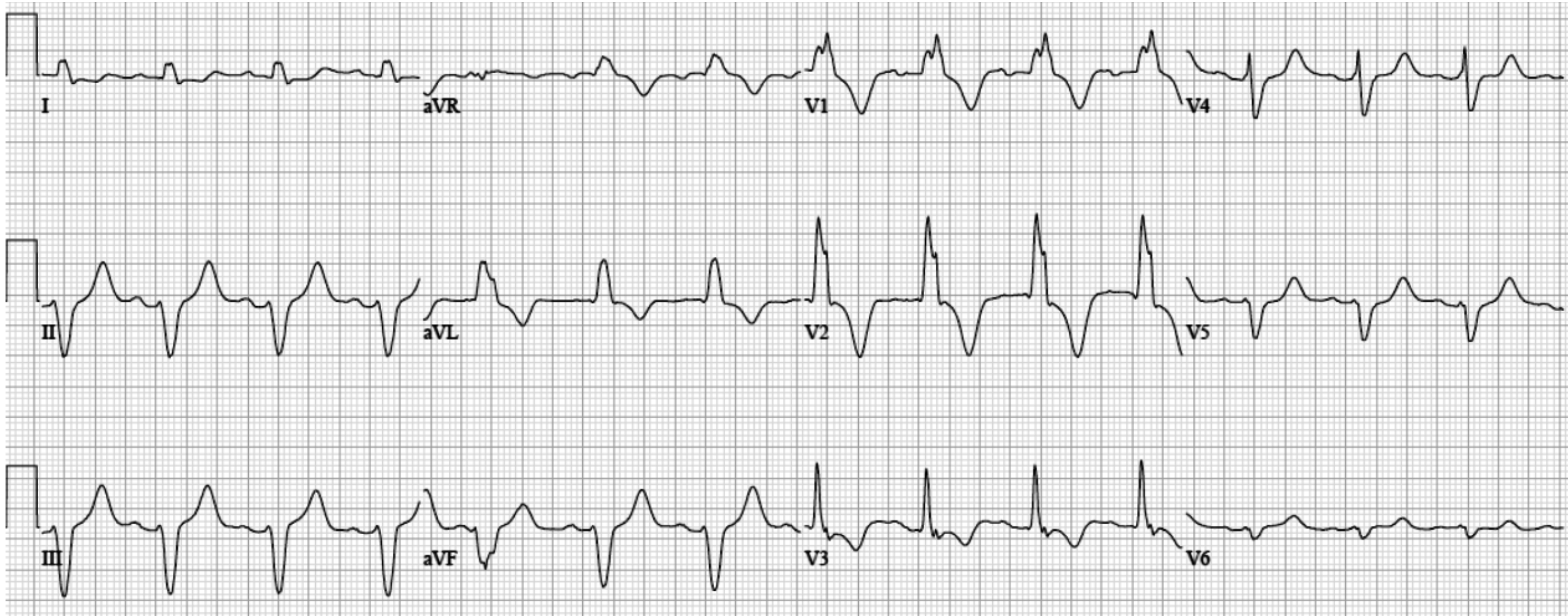
ECG-1 - ML: 4-May-2016 (Baseline)



ECG-2 - ML: 23-Oct-2016 (pre-op)



ECG-3 - ML: 24-Oct-2016 (post-op 4-v CABG)



- Left internal mammary artery (LIMA) to LAD
- Saphenous graft to Post-descending, Post-lateral
- Saphenous graft to mid RCA

Colleagues opinions

Personally, I do not believe that the ECG is rest is sensitive for the detection of significant CAD without active ischemia. It can show post-ischemic changes of T wave inversion or nonspecific ST-T changes. It can show necrosis/fibrosis. It can show LA abnormality due to increased end diastolic pressure. However, if there is no active ischemia, there are no ischemic changes. However, there is this paper:

Stankovic I, Milekic K, Vlahovic Stipac A, Putnikovic B, Panic M, Vidakovic R, Aleksic A, Milicevic P, Neskovic AN. Upright T wave in precordial lead V1 indicates the presence of significant coronary artery disease in patients undergoing coronary angiography with otherwise unremarkable electrocardiogram. Herz. 2012 Nov;37(7):756-61. doi: 10.1007/s00059-011-3577-6.

And the T waves in lead V1 are positive in ECG-1

Regards

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Yochai Birnbaum, MD, FAHA, FACC

Dear Andrés, My feelings:

The ECG of this overweight middle aged woman suffering from an autoimmune liver disease displays intra and inter ventricular conduction disturbances in the context of a cardio-renal syndrome. No metabolic syndrome : diabetes, hypertension, dyslipidemia?

ECG1: Left anterior hemiblock picture (no q wave etc..) but QRS width at 120 msec except in V6 or a leftward shift due adiposity? Complete left bundle branch block but unusual morphology in V6? QRS fragmentation in aVR?

ECG 2: The centra-septal block features are completed with a S wave in V6?

ECG 3: Increased sinus heart rate, broad QRS with increased pulmonary wedge pressure (P Wave modifications). Hyperkaliemia combined with PR lengthening? PR depression in D2 means pericarditis? QS in V5 V6: Lateral myocardial infarction?

The risk benefit ratio did not favor surgery! Was it really necessary to perform CABG?

Personal best wishes

Philippe Chevalier

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Chef du service de Rythmologie GHE, CHU Lyon

Claude Bernard University Lyon, France



1st ECG: LAFB

2nd ECG: LAFB and lateral wall MI manifest by r followed by deep S wave which can be seen in LAFB alone but it was not present in ECG 1

ECG 3 shows LAFB and strong anterior forces raising issue of posterior lateral MI vs Left septal block pattern. the small q wave in V2 suggests the latter

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Spanish Estimado Potro.

En el **primer ECG-1**: Ritmo sinusal , frecuencia cardiaca: 80 latidos por minuto, crecimiento auricular izquierdo, bloqueo del fascículo anterior izquierdo y bloqueo incompleto de la rama izquierda BIRI (QRS 0,12 seg).

En el **ECG-2** preoperatorio presenta RS 75 por minuto y disminución de la amplitud de la onda R en V5 y V6 con onda S profunda, que interpreto como probable secuela lateral.

En el **ECG-3** post-CRM presenta RS, FC 95 latidos por minuto, BCRD, que interpreto como fenómeno transitorio post-CRM, con secuela lateral y fuerzas anteriores prominentes. Observación: Los trastornos de la conducción intraventricular en el postoperatorio de CRM pueden ser transitorios o permanentes y corresponder a eventos isquémicos. Los bloqueos completos de rama derecha (BCRD) transitorios en la seria referida referencia (1), de los trastornos de la conducción el 5,5% fueron permanentes (de estos 85% BCRD), y 4% fueron transitorios (de estos el 84% por BCRD). El 20% con BCRD presentaron aumentos de CPK. (2) Dado lo descripto, sería importante conocer los marcadores séricos de injuria miocárdica, y descartar evento isquémico periprocedimiento. Me inclino a sospechar que el BCRD es taquicardico dependiente, transitorio post-CRM. No así la secuela lateral y la aparición de FAP asociadas.

Ya nos explicara Ud. porque motivo la rama derecha es mas sensible que la izquierda a presentar trastornos de la conducción en condiciones como la CRM referida.

Un abrazo

Martín Ibarrola MD Provincia de Buenos Aires Argentina.

1. Tuzcu EM, Emre A, Goormastic M, Loop FD, Underwood DA. Incidence and prognostic significance of intraventricular conduction abnormalities after coronary bypass surgery. J Am Coll Cardiol. 1990 Sep;16(3):607-10.
2. Caspi Y, Safadi T, Ammar R, Elamy A, Fishman NH, Merin G. The significance of bundle branch block in the immediate postoperative electrocardiograms of patients undergoing coronary artery bypass. J Thorac Cardiovasc Surg. 1987 Mar;93(3):442-6.



English

Dear Potro Andrés,

In the first ECG-1: sinus rhythm, HR: 80 bpm, left atrial enlargement, left anterior fascicular block. ILBBB (QRS 0.12 sec).

In post-myocardial revascularization (MCR), he presents sinus rhythm 95 bpm, with CRBBB, which I interpret as transient post-MCR phenomenon, with lateral sequela and prominent anterior forces. Intraventricular conduction disorders in the post-operative period of MCR could be transient or permanent and correspond to ischemic events. Transient complete right bundle branch blocks (CRBBB) in the mentioned series (1). From the conduction disorders, 5.5% were permanent (from them, 85% CRBBB) and 4% were transient (from these 84% CRBBB). 20% presented CPK increase (2).

From what has been described, it would be important to know the serum markers of myocardial injury, and to rule out peri-procedure ischemic event.

I suspect that CRBBB is tachycardia-dependent, and transient post-MCR. Not so the associated lateral sequela and the appearance of PAF.

I'm certain you will explain why the right branch is more prone than the left one to present conduction disorders in scenarios like the mentioned MCR.

Warm regards,

1. **Tuzcu EM, Emre A, Goormastic M, Loop FD, Underwood DA. Incidence and prognostic significance of intraventricular conduction abnormalities after coronary bypass surgery. J Am Coll Cardiol. 1990 Sep;16(3):607-10.**
2. **Caspi Y, Safadi T, Ammar R, Elamy A, Fishman NH, Merin G. The significance of bundle branch block in the immediate postoperative electrocardiograms of patients undergoing coronary artery bypass. J Thorac Cardiovasc Surg. 1987 Mar;93(3):442-6.**

Martín Ibarrola M.D. Provincia de Buenos Aires Argentina



Dear Andres,

This case contributed by Dr Yanowitz is indeed very interesting.

The QRS pattern is not much different between baseline and preOp as having LAFB. After CABG, she is in the fringe of developing a "distal complete heart block": CRBBB+LSFB+LAFB and partial blockage of left posterior fascicle manifested as 1st degree of AVB.

I could be wrong. Will look forward to hearing correct answer from you.

Thank you very much,

Li Zhang, MD; PhD
Lankenau Medical Center and Lankenau Institute for Medical Research, Wynnewood, PA, USA



Unforgettable memories of you and I in the Great Wall of China



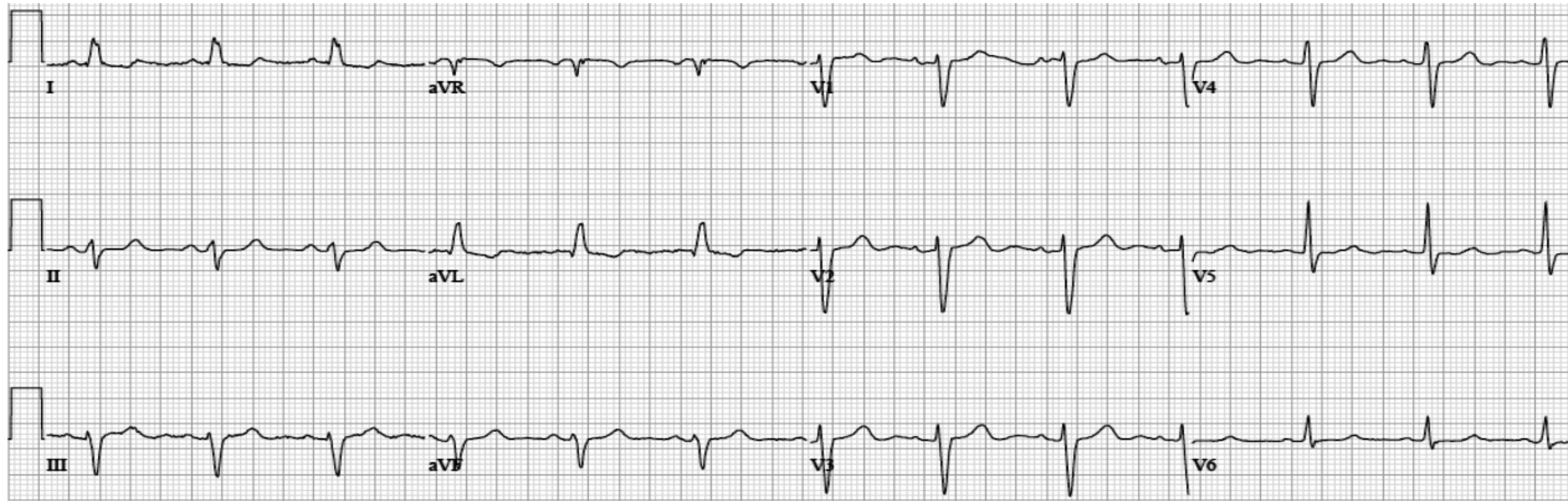
Final comment by Andrés Ricardo Pérez-Riera, M.D. Ph.D



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<https://ekgvcg.wordpress.com>

ECG-1 - ML: 4-May-2016 (Baseline)

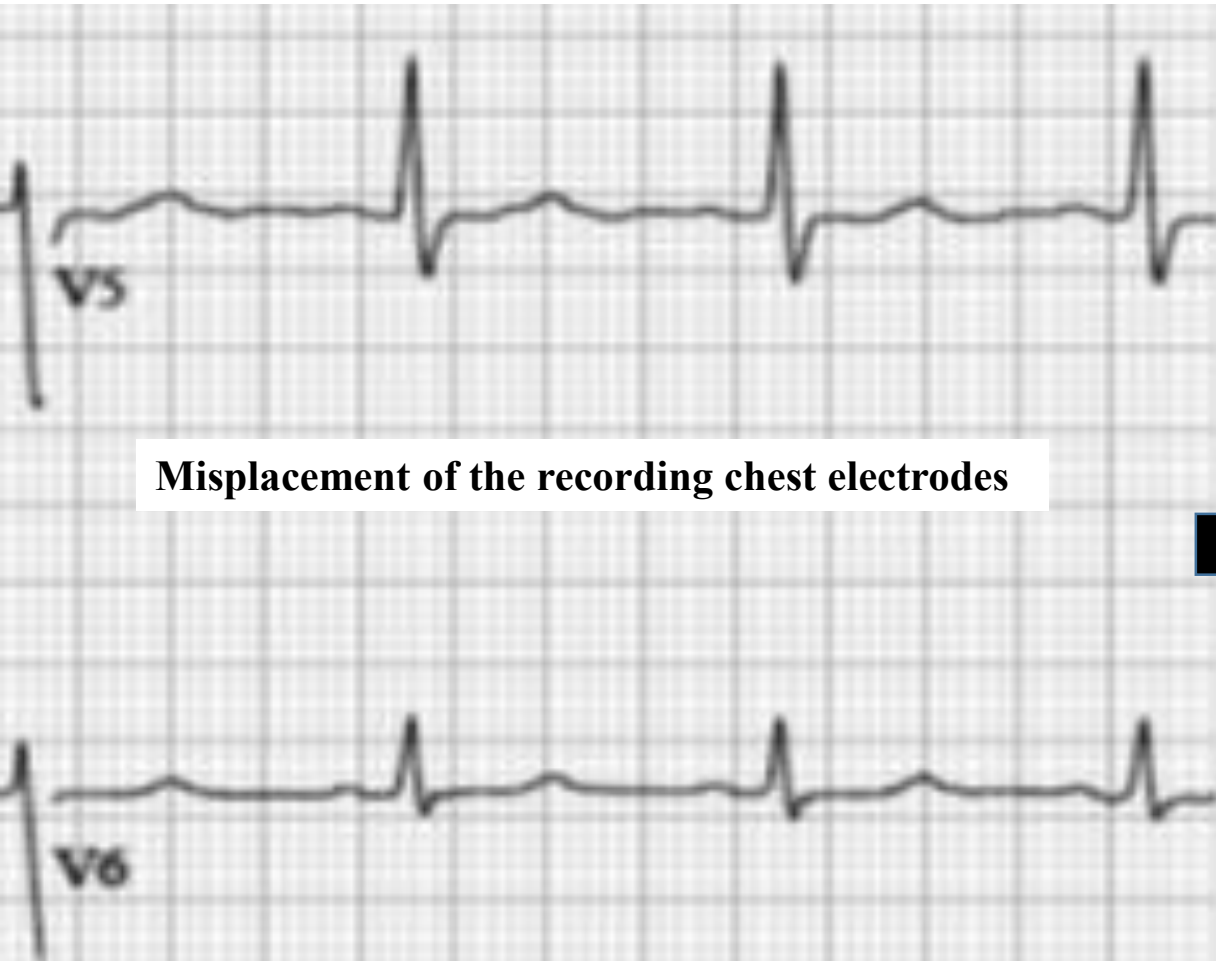


ECG diagnosis: sinus rhythm, heart rate 75 bpm, P axis + 60°, P duration 110ms, PR interval 150ms, QRS duration 105ms, QRS axis - 40° (Extreme shift of SÂQRS in the left superior quadrant), rS in II, III and aVF., SIII > SII, qR pattern in aVL; R-peak time in aVL ≥ 45 ms; aVR. QS and QRS duration less than 120 ms. Late transition in precordial lead (R/S ratio = 1) (When it happens in leads V4, V5, or V6 it is referred to as a late transition.). If the transition occurs after V4, this is called clockwise rotation. In Left Anterior Fascicular Block (LAFB) dislocation to the left of the transition is observed. In LAFB it may be in V5 and V6. Additionally, in LAFB voltage decrease of R wave and concomitant increase in S wave depth in V5 and V6, as a consequence of the superior dislocation of the forces. This behavior is not observed in the present case(misplace left precordial V5-6 electrodes?). Confirm this hypothesis the pattern of second ECG-2 (see next slide).

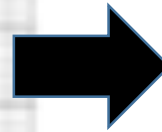
Conclusion: LAFB.

Observation: We did not observe low QRS voltage as you would expect in a morbid obese patient (Low QRS voltage concept: the amplitudes of all the QRS complexes in the limb leads are < 5 mm; or the amplitudes of all the QRS complexes in the precordial leads < 10 mm).

ECG-1 - ML: 4-May-2016 (Baseline)



Misplacement of the recording chest electrodes



ECG-2 - ML: 23-Oct-2016 (pre-op)

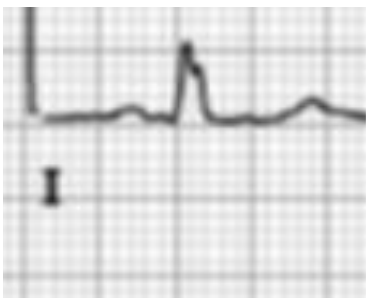


V5-V6 $r < s$

V5-V6 $R > s$

In LAFB voltage decrease of R wave and concomitant increase in S wave depth in V5 and V6, as a consequence of the superior dislocation of the forces, consequently the **ECG-1** has misplacement of the recording chest electrodes V5-V6. S waves tend to disappear in leads above the normal level and are deeper when the electrodes are placed below the normal level. Additionally, The normal initial q/ waves in V65-V6 may sometimes be absent in LAFB, probably because of changes of left to right septal activation. LAFB may conceal signs of LVH in the V5-V6 leads and may also hide signs of inferior ischemia (**Elizari 2007**).

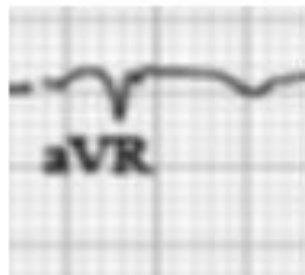
ECG-1



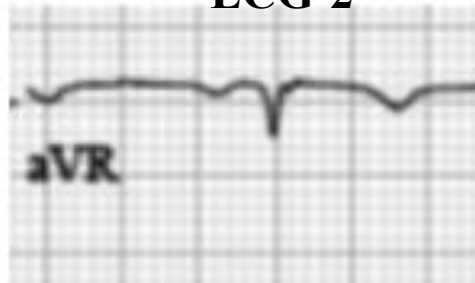
ECG-2



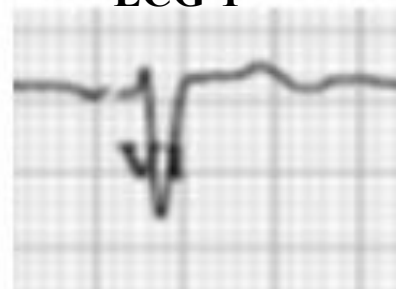
ECG-1



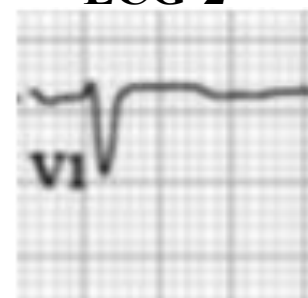
ECG-2



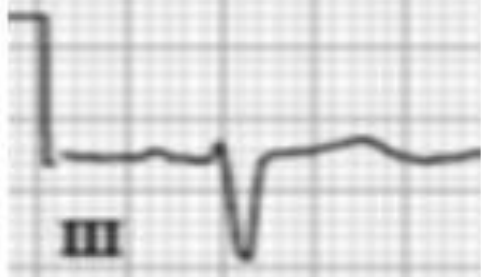
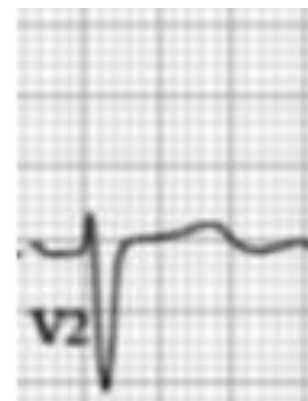
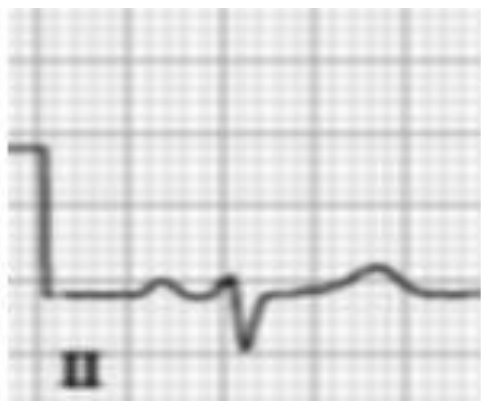
ECG-1



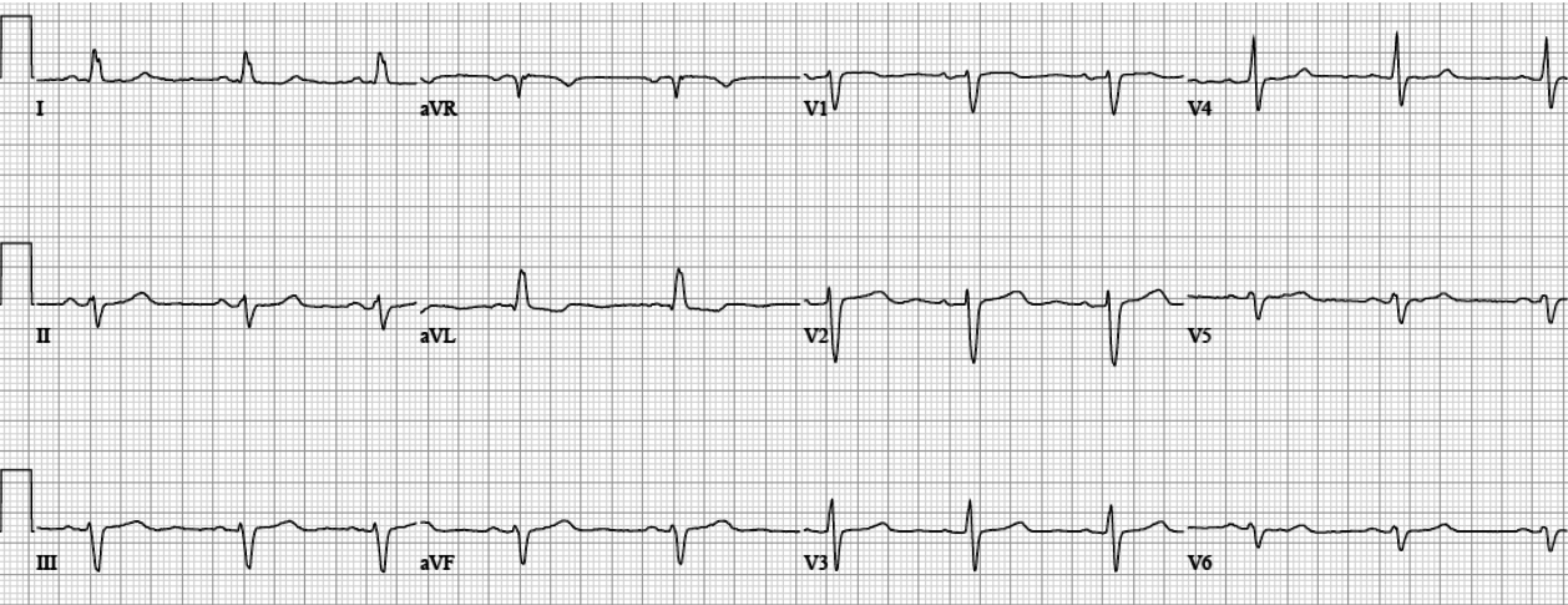
ECG-2



Without differences between ECG-1 and ECG-2

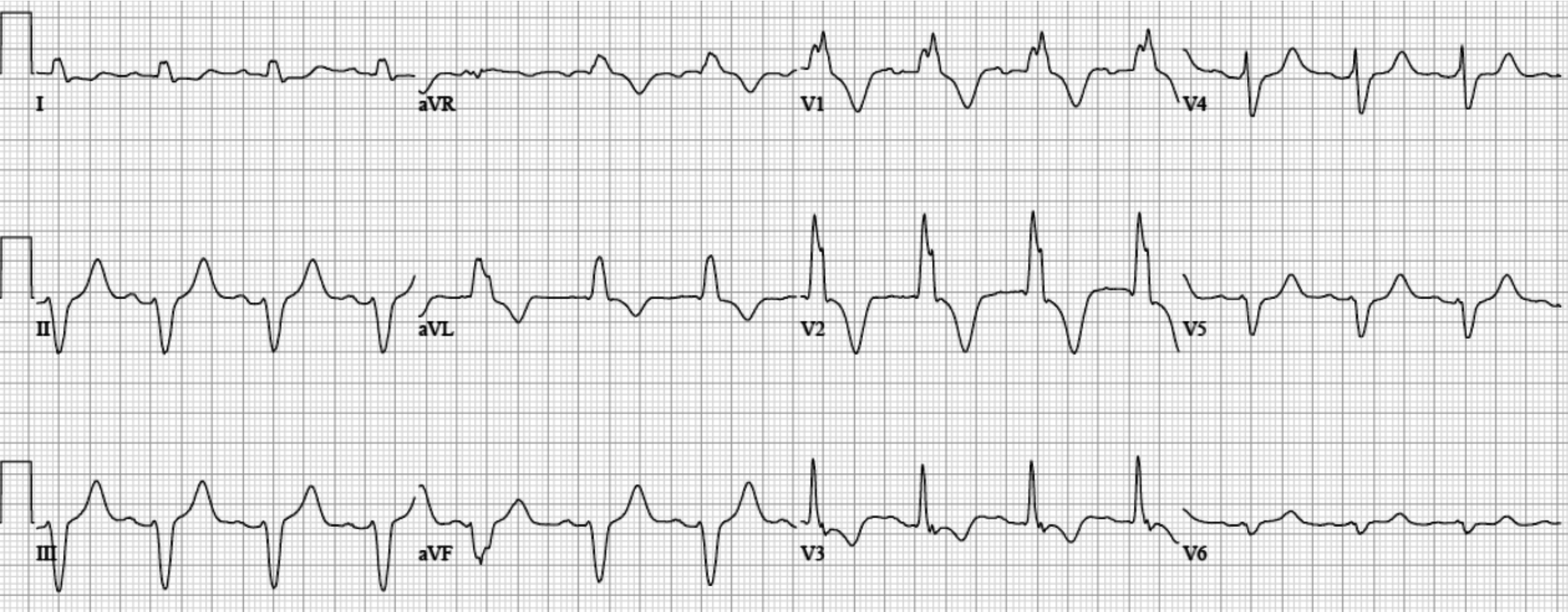


ECG-2 - ML: 23-Oct-2016 (pre-op)



ECG-2 diagnosis: equal to ECG-1.

ECG-3 - ML: 24-Oct-2016 (post-op 4-v CABG) Left internal mammary artery (LIMA) to LAD; Saphenous graft to Post-descending, Post-lateral and Saphenous graft to mid RCA



ECG-3 diagnosis: Right Bundle Branch Block (RBBB) in the precordial leads with Left Bundle Branch Block (LBBB) in the limb frontal leads (I and aVL) and extreme left axis deviation (LAFB) (QRS axis -80° (**Elizari 2013**) or “Standard Type” or Standard Masquerading. The ECG complex coined since Richman as “masquerading bundle-branch block” (**Richman 1954**) that today we know it is essentially a complete RBBB and high degree LAFB, with further modifications of the initial and final QRS vectors, so that standard leads, and at times the left precordial leads, resemble LBBB (**Schamroth 1975**). Masquerading BBB is not a specific entity but is an electrocardiographic complex that

result of RBBB with varying combinations of LAFB, intramural left ventricular block, left ventricular enlargement/hypertrophy and anterior myocardial infarction or fibrosis. Since the pioneer (**Lepeschin 1964**) Rosembaum's et al studies (**Rosembaum 1968; 1970; 1973**) we know two ECG types of "Masquerading" Bundle-Branch Block. There are a third type that is the association of both:

I. The "Standard Type" or Standard Masquerading Bundle-Branch Block: *consisting of the pattern of left bundle-branch block (LBBB) in the limb leads and right bundle-branch block (RBBB) in the unipolar precordial leads.*

II. The "Precordial Type" or Precordial Masquerading Bundle-Branch Block

III. The Standard and Precordial Masquerading Bundle-Branch Block in Association.

Recently Kukla described a fourth type:

IV. Concomitant both types of masquerading bundle branch block (Kukla 2014**)**

The "standard type" ("standard masquerading right bundle-branch block")

In "*standard masquerading right bundle-branch block*" the presence of a high degree left anterior fascicular block (LAFB) obscured totally or partially the diagnosis of right bundle branch block (RBBB) only on frontal plane by abolishing (or becomes very small) the final broad S wave in the leads I and aVL (**Ortega-Carnicer 1986**). Consequently, the limb leads may resemble left bundle branch-block (LBBB) although the precordial ECG remain typical for CRBBB. The precordial leads reflect the feature of RBBB. Figure 2

Conditions necessary for the presence of standard masquerading right bundle –branch block

- 1.High degree of left anterior fascicular block
- 2.Right Bundle-Branch Block
- 3.Bilateral bundle-branch lesions of considerable intensity, which do not completely disrupt the continuity of the branches (**Unger 1958**)
- 4.Left Ventricular Enlargement or Hypertrophy (LVE/LVH) and marked biventricular hypertrophy
- 5.Localized block in the left ventricle.
- 6.Frequent severe fibrosis, or truly massive myocardial infarction mainly in anterior wall.

Etiologies

- 1) Coronary heart disease
- 2) Long standing systemic hypertension
- 3) Cardiomyopathy Ex. Chronic Chagasic myocarditis
- 4) Lev's disease
- 5) Association of previous one.

The four main developmental ECG patters of standard masquerading type (**Schamroth 1975**)

	aVL	I	II	III
1. Uncomplicated LAFB: QRS duration <120ms	qR	qR	rS	Rs (SIII>SII)
2. LAFB with CRBBB: QRS duration ≥120ms	qRS	qRS	rS with notch on ascending ramp of S	Rs with notch on ascending ramp of S
3. LAFB with CRBBB and diminution of the final QRS vectors. QRS duration ≥120ms	qR	qR	rS	rS
4. LAFB with CRBBB and diminution of the final QRS vectors and diminution of the initial QRS vectors	R	R	QS	QS

Among the population with RBBB associated with LAFB, the so called ‘masquerading’ type of RBBB represents a particular group because of its association with a high degree of LAFB, severe LVE and, frequently, a focal infarction or a fibrotic block in the anterolateral wall of the LV. The high incidence of AV block imparts a distinctive diagnostic, prognostic and conceptual character to masquerading RBBB with LAFB. Thus, this ECG pattern always implies the presence of severe underlying heart disease. It is a subgroup of patients with a high risk of advanced atrioventricular block; a pacemaker implant does not significantly reduce the high mortality in this group because of the severity of the underlying disease (**Bayés de Luna 1988**).

Observation: Nowadays, the last guideline on ECG Part III: Intraventricular Conduction Disturbances considers Masquerading Bundle-Branch Block (RBBB criteria in the precordial leads and LBBB criteria in the limb leads, and vice versa) as Nonspecific or Unspecified Intraventricular Conduction Disturbance: QRS duration >110 ms in adults, >90 ms in children 8 to 16 years of age, and >80 ms in children less than 8 years of age without criteria for RBBB or LBBB. **The definition may also be applied to a pattern with RBBB criteria in the precordial leads and LBBB criteria in the limb leads, and vice versa (**Surawicz 2009**).**

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