Diagnosis of Acute Myocardial Infarction in Left Bundle Branch Block

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Abstract

The diagnosis of acute myocardial infarction (AMI) in presence of left bundle branch block (LBBB) is challenging and requires utilization of Sgarbossa criteria. Wellens syndrome (WS) is pattern of ST-T wave changes in anterior leads that identify critical stenosis in proximal left anterior descending (LAD) artery. Herein, we discuss Sgarbossa criteria and utility of WS in diagnosing high grade LAD stenosis in presence of LBBB.

Keywords: Wellens Syndrome; Left Bundle Branch Block; Sgarbossa Criteria; Acute Myocardial Infarction; LAD Stenosis

Introduction

Early and timely recognition of AMI especially ST elevation MI in setting of LBBB is crucial to ensure early reperfusion. Sgarbossa criteria was first proposed in 1996 [1] and later modified by Smith [2]. De Zwaan and Wellens in the year 1982 first described EKG changes that are suggestive of LAD stenosis [3]. Large inverted T-waves that may mimic Wellens EKG changes include stress cardiomyopathy, memory T cells and acute stroke [4]. Our patients presented with chest pain and EKGs' with left bundle branch block and subsequently met Sgarbossa criteria or Wellens pattern on EKG. Careful examination of serial EKGs' is vital in the presence of preexisting LBBB for chest pain evaluation.

Case Presentations

Case 1

82-year-old man with past medical history of coronary artery disease, chronic obstructive pulmonary disease, diabetes mellitus type 2, peripheral vascular disease, moderate aortic stenosis, recent Non-ST elevation myocardial infarction (1 month back). His previous coronary angiogram showed proximal LAD and proximal circumflex 90% stenotic lesions. Successful percutaneous coronary intervention with drug eluting stents was done. He presented to the hospital for evaluation of chest pain that was going on and off for the past two days. His initial EKG showed normal sinus rhythm, left axis deviation and LBBB (Figure 1a). His troponins X 3 remained flat at 0.06 ng/ml. Subsequent EKG showed LBBB and met Sgarbossa criteria (Figure 1b). The diagnosis of AMI was made.
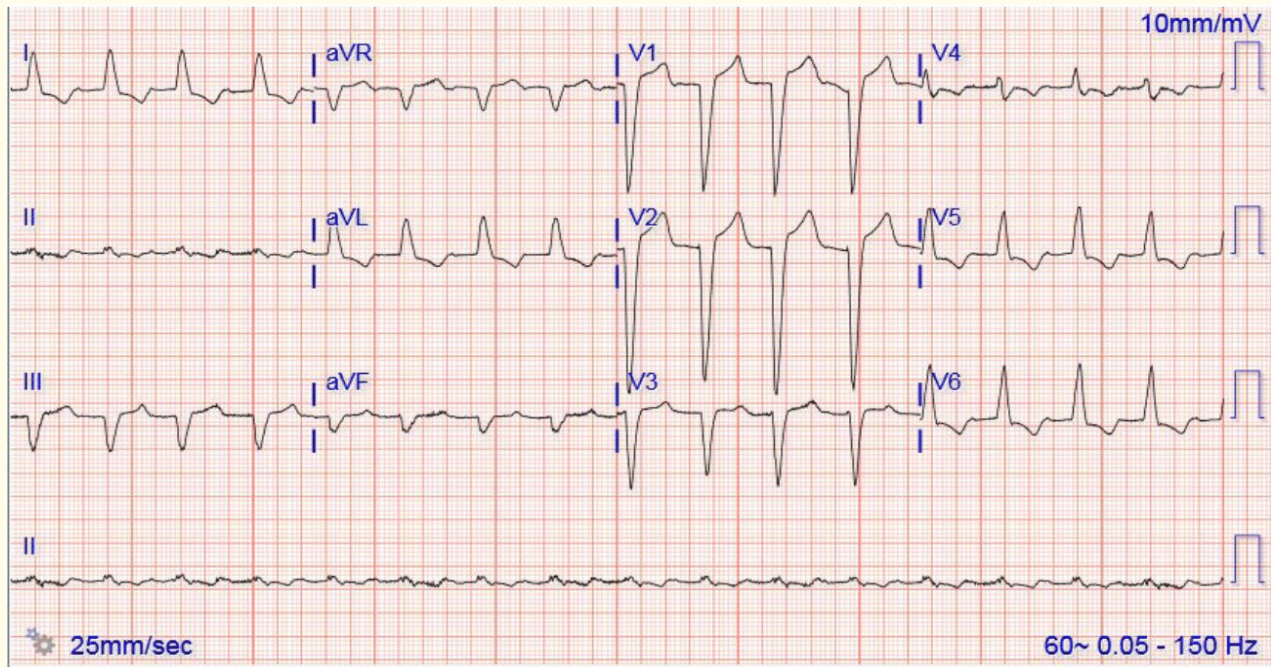
Figure 1a: *Normal sinus rhythm. Left axis deviation and left bundle branch block.*
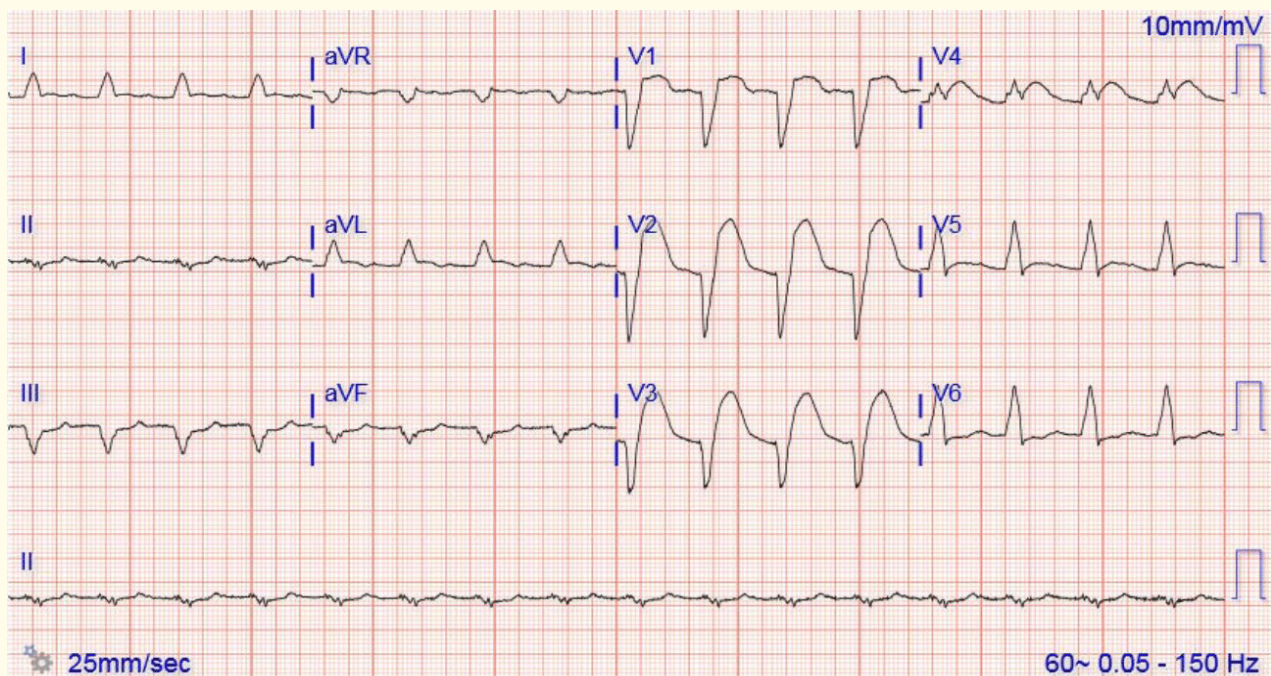

Figure 1b: *Sinus rhythm. Left axis deviation. Left bundle branch block. Sgarbossa score of 7 (5 points for concordant ST eleva-tion more than 1mm and 2 points for discordant ST elevation more than 5 mm).*

Case 2

65-year-old Caucasian man with past medical history of hypertension, type 2 diabetes mellitus, dyslipidemia and obesity presented for evaluation of shoulder and jaw pain. He was having intermittent episodes of chest heaviness and jaw pain with exertion for last 4 - 5 months. On the day of arrival to the hospital, chest pain was pressure like, retrosternal in location and 5/10 in intensity accompanied by shortness of breath and weakness. He is a former cigar smoker and quit in 1990's. He has family history of quadruple bypass in father and stroke in mother.

EKG showed normal sinus rhythm with LBBB (Figure 2a). EKG did not meet Sgarbossa criteria. Laboratory data showed normal electrolytes, BUN of 27 mg/dl, creatinine 1.7 mg/dl, pro BNP 273 ng/ml, normal liver panel, HbA1C-6%, troponin increased from 0.57→0.79 →1.1→1.6 ng/ml. His follow up EKG showed normal sinus rhythm, LBBB and deep T wave inversion in V2-V6 (Figure 2b). Wellens criteria was met. Patient was taken for urgent cardiac catheterization. He had severe ostial 95% and proximal 70% LAD stenosis (Figure 3a). Left main, circumflex and right coronary artery without significant stenosis. Successful percutaneous coronary intervention of ostial and proximal LAD was done with RESOLUTE INTEGRITY 2.75 x 30 mm stent. Excellent angiographic result with TIMI-3 flow was achieved
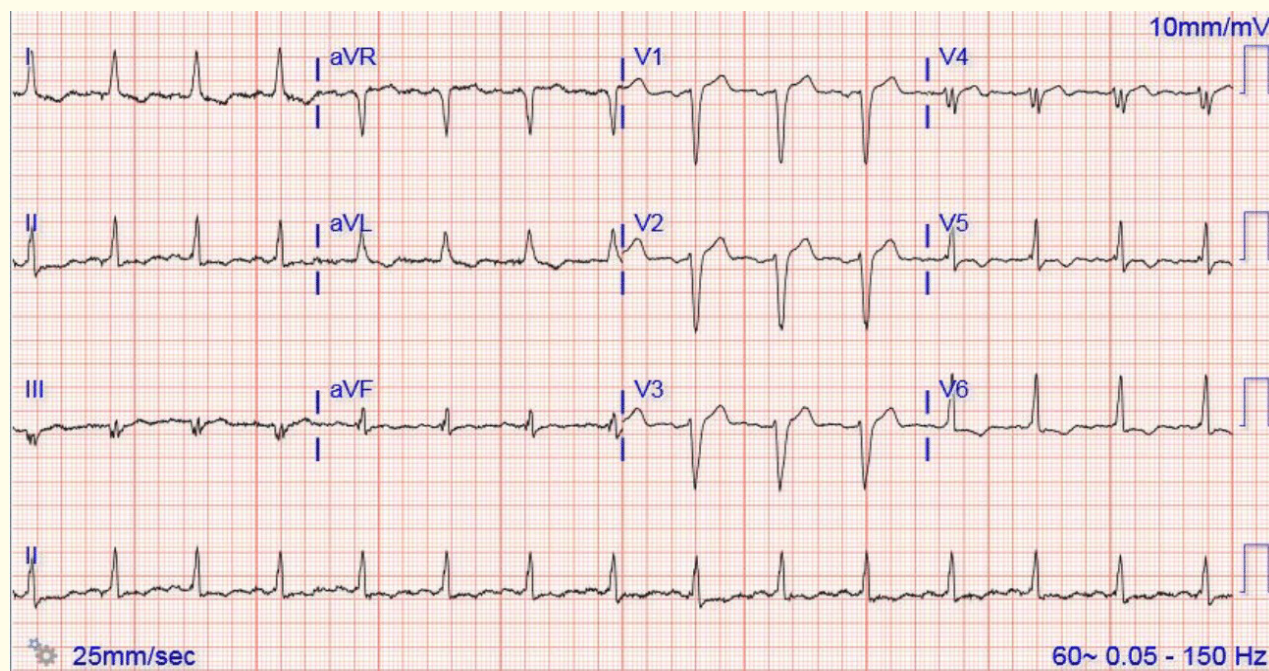

Figure 2a: *Normal sinus rhythm with left bundle branch block.*
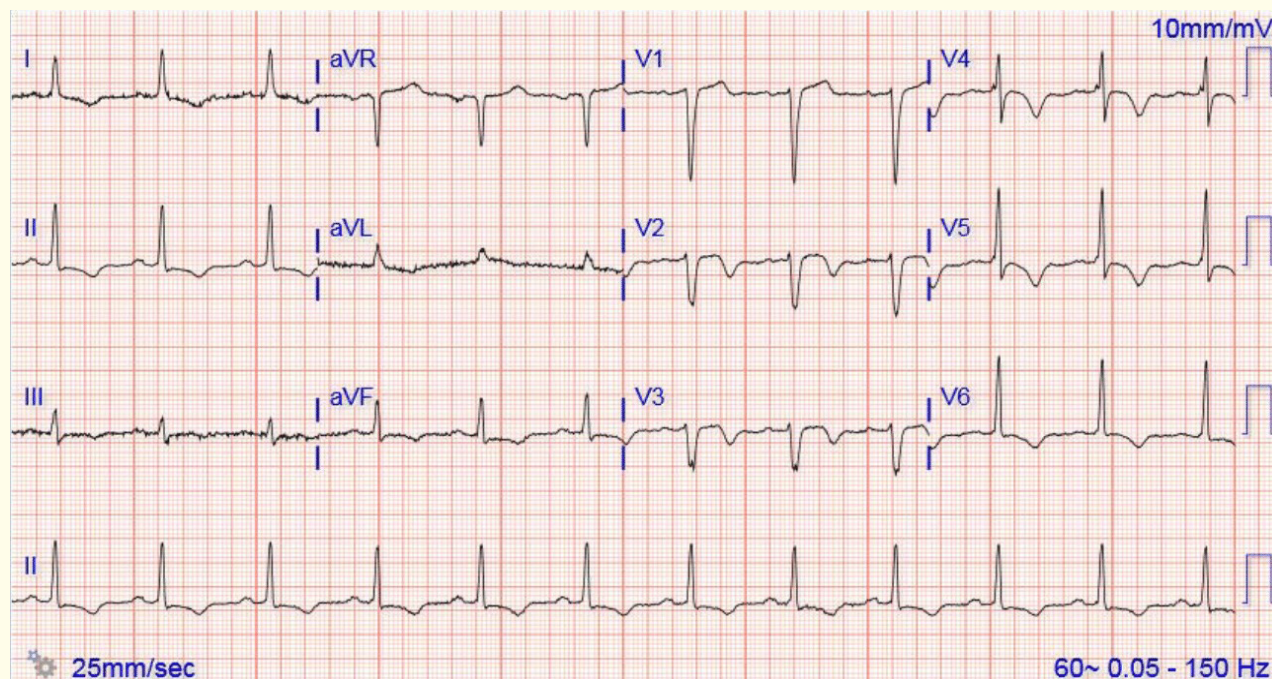
Figure 2b: *Normal sinus rhythm. Left bundle branch block with anterolateral T wave inversion. Wellens criteria is met (Deep T wave inversion V2-V6).*

Figure 3a: *Ostial 95% and proximal 70% LAD stenosis.*

Figure 3b: *Post Drug eluting stent placement in LAD.*

(Figure 3b).

Discussion

Sgarbossa A	Concordant ST elevation > 1mm in leads with positive QRS	5
Sgarbossa B	Concordant ST depression > 1mm in V1 - V3	3
Sgarbossa C	Discordant ST elevation > 5mm independent of the amplitude of S	2
Modified Sgarbossa C	Discordant ST elevation and ST/S ratio - 0.25 or less	

Table 1: *Sgarbossa criteria with scoring.*

The diagnose of AMI in the presence of LBBB in not easy. Sgarbossa and Modified Sgarbossa criteria are used which includes Sgarbossa A, B, and C. Sgarbossa C criterion was modified by Smith., *et al.* [2] to minimize false-positive results (Table 1).

A Sgarbossa score of ≥ 3 has low sensitivity (20%), high specificity (98%) and positive predictive value for diagnosis of AMI. Patients

	Biphasic or deeply inverted T waves in V2 and V3 or occasionally, V1, V4, V5 and V6
	Normal or minimally elevated cardiac enzymes
	Normal or slightly elevated (< 1 mm) ST segment
	No loss of R wave progression in precordial leads
	Absence of abnormal Q waves
	Anginal chest pain

Table 2: *Diagnostic criteria of Wellens Syndrome.*

who meet Sgarbossa concordance criteria had similar or higher mortality rate when compared to STEMI patients [5,6].

WS is a combination of clinical and EKG findings that help identify critical proximal LAD lesion (Table 2) [4,7].

Two EKG variants of Wellens syndrome have been identified. Type A Wellens syndrome (24% Cases): Biphasic T wave in leads V2 and V3; Type B Wellens syndrome: Deep and symmetrical T-wave inversion typically in leads V2 and V3, and, occasionally in V1-V4, V5 and V6 (76% Cases).

The exact mechanism of WS is unknown. Repolarization heterogeneity between ischemic and normal adjoining myocardium is thought to be the possible mechanism for T-wave morphology of WS [3]. Wellens EKG pattern has also been detected in a pacemaker rhythm [8]. Right ventricular pacing has comparable flow of current as LBBB and hence has a similar ECG pattern.

Conclusion

The presence of new (presumed) LBBB should not be used to diagnose AMI by itself. A clinical suspicion of myocardial ischemia with EKG evidence of Sgarbossa criteria (especially concordant ST elevation criterion) strongly suggest occluded artery. WS can be a helpful diagnostic indicator of critical proximal LAD occlusion even in presence of LBBB not meeting Sgarbossa criteria.

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