



## A STUDY OF ECG PATTERNS IN PATIENTS WITH PROXIMAL LEFT ANTERIOR DESCENDING ARTERY STENOSIS

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### Author's Contribution

IW: Conducted the study and wrote the article. ZH: Selected the patients. IM: Conducted coronary angiographies. SA and SMAN: Reviewed the article, MAA: Checked the references, SD: Collected data, AN: Made corrections and did the proof reading.

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### ABSTRACT

**BACKGROUND:** Anterior wall Myocardial Infarction is ST segment elevation myocardial infarction and involves left anterior descending artery which may be proximal or distal depending upon the site of stenosis. There is a diversity in Electrocardiographic patterns of anterior wall myocardial infarction including ST elevations in different limb leads and anterior leads applied on chest. Acute Left Bundle Branch Block with chest pain is also an important ECG presentation of anterior wall myocardial infarction. Similarly De Winter's syndrome or de Winter's T waves is also an important sign of proximal Left Anterior Descending Artery (LAD) occlusion and can be used in clinical practice to diagnose hidden acute myocardial infarction. <sup>1,2</sup>

**OBJECTIVE:** To study the ECG patterns in patients presenting with Anterior Wall Myocardial Infarction and proximal LAD occlusion.

**MATERIAL AND METHODS:** It was a cross sectional observational study carried out in the Department of Cardiology, Government Khawaja Muhammad Safdar Medical College, Sialkot and Wazirabad Institute of Cardiology Wazirabad over a duration from 01-12-2019 to 29-02-2020. A total number of 200 patients with electrocardiographic (ECG) evidence Acute Anterior ST segment elevation Myocardial infarction, Acute Left Bundle Branch Block with chest pain and de winters T waves were enrolled. Patients with Inferior, Infero Posterior and Right Ventricular infarct were excluded from the study. Coronary Angiography was performed over all the study cohort in the Cardiac Catheterization lab of Wazirabad Institute of Cardiology on presentation after ruling out contraindications and only those with Proximal LAD stenosis were included in the study while patients with the involvement of Right Coronary Artery and Left Circumflex were excluded. The study cohort was subdivided in to four groups depending upon the electrocardiographic patterns. Group one comprised of patients with ST-Elevations in leads I-aVL, V<sub>1</sub>-V<sub>6</sub> while the second group included those with ST Elevations in leads V<sub>1</sub>-V<sub>6</sub> and a third group comprised of patients presenting with Acute LBBB with Chest pain and the last group consisted of patients with de winters T waves. The classical electrocardiographic findings of de Winters syndrome are tall and upright significant T waves in precordial leads and these T waves are symmetrical. There is ST segment depression with up sloping of more than 1mm at the J point in the precordial leads without ST elevation. There is absence of ST segment elevation i.e. 0-5 mm - 1 mm in aVR. All the collected data was subjected to statistical analysis in SPSS for windows version 21 and results were analyzed.

**RESULTS:** Electrocardiographic analysis of the cases under



study revealed a diversity of patterns. 100(50%) patients had ST elevations in leads I-aVL and Precordial leads V1-V6. 29(14.5%) patients revealed ST elevations in V1-V6. De Winter's T wave pattern was seen in 30(15%) patients. Acute LBBB with chest seen was observed in 18(09%) of the patients while Wallen's Syndrome was present in 23(11.5%).

**CONCLUSION:** Proximal LAD artery stenosis reveals significant diversity in ECG patterns.

**KEY WORDS:** ECG (Electrocardiography), LBBB (Left Bundle Branch Block), deWinter's Twaves, LAD(Left Anterior Descending Artery)

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### INTRODUCTION:

A diversity of ECG pattern has been observed in those patients who present with proximal occlusion of the Left anterior descending artery. These changes in ECG are dependent upon the severity of stenosis of the vessel. Besides ST elevations in limb and precordial leads there are other patterns which are commonly observed. Important changes include ST Elevations, Acute LBBB, Wallen's Syndrome and de Winter's T wave pattern.

The classical electrocardiographic findings of de Winters syndrome are tall and significant T waves in anterior chest leads and these T waves are symmetrical. There is depression of ST segment more than 1 mm at the J point in the anterior chest leads with absence of ST elevation. There is absence of ST segment elevation i.e. 0-5 mm -1 mm in aVR. Another important feature of de Winter's pattern is that STEMI ECG changes may precede or follow the deWinter's pattern.

The rationale of this study is to study and differentiate various patterns of Electrocardiographic changes in patients presenting with anterior wall myocardial infarction so that treatment strategies may be modified for patients who can benefit from LAD stenting.

### MATERIAL AND METHODS:

A total of 200 patients of all ages and both genders were included in this study. The age mean was 51.25 years. 118(59%) patients were male while 82(41%) patients were female. All patients with suspicion of Anterior wall myocardial infarction with different ECG abnormalities were included. Cases with ECG evidence of Myocardial infarction involving anterior wall, Acute Left Bundle Branch Block with chest pain and de winters T waves were enrolled. Patients with Inferior, Infero Posterior and Right Ventricular infarct were excluded from the study. Coronary Angiography of every patient was carried out in Cardiac Catheterization lab of Wazirabad Institute of Cardiology on presentation after ruling out contraindications and only those with Proximal LAD stenosis were included in the study while others with Left Circumflex and Right Coronary Artery were not included. Patients with Anterior wall Myocardial infarction were subdivided in to four groups depending upon the electrocardio-



graphic patterns. One group comprised of patients with ST-Elevations in leads I- aVL, V1-V6 while the second group included those with ST Elevations in leads V1-V6 and a third group comprised of patients presenting with Acute LBBB with Chest pain and the last group consisted of patients with de winters T waves. These ECG changes do not change neither they evolve until the occluded artery has been opened by revascularization or stenting. In acute LBBB and chest pain, Sgarbossa criteria were used to diagnose Acute Anterior Wall Myocardial infarction. Sgarbossa criteria is defined as an ECG consisting of elevation of ST-segment of 1 mm or more and with concordance of QRS complex (i.e., positive complex) in any lead (was given a score of 5), 1 mm or more ST-segment depression in lead V<sub>1</sub>, V<sub>2</sub> or V<sub>3</sub> (was given a score of 3) and 5 mm or more ST-segment elevation that is discordant with the QRS complex in any lead (was given a score of 2).<sup>3</sup> Wellen's syndrome which is defined as a set of specific ECG abnormalities in precordial T waves associated with proximal LAD stenosis was also assessed in all cases under study. All the collected data was subjected to statistical analysis and results were analyzed.

**RESULTS:**

Electrocardiographic analysis of the cases under study revealed a diversity of patterns. 100(50%) patients had ST elevations in leads I-aVL and Pre- cordial leads V<sub>1</sub>-V<sub>6</sub>. 29(14.5%) patients revealed ST elevations in V<sub>1</sub>-V<sub>6</sub>. De Winter's T wave pat-

**Table-1: Demographic profile of cases under study; n=2000**

|                   |             |
|-------------------|-------------|
| <b>AGE (Mean)</b> | 51.25 Years |
| <b>MALES</b>      | 118 (59%)   |
| <b>FEMALES</b>    | 82(41%)     |

**Table-2: Electrocardiographic patterns in patients with proximal lad stenosis in cases under study**

|   |           |
|---|-----------|
| <b>ST elevations in leads I-aVL AND V1-V6</b> | 100(50%)  |
| <b>ST elevations in leads V1-V6</b>           | 29(14.5%) |
| <b>de Winter's T waves pattern</b>            | 30(15%)   |
| <b>Acute LBBB</b>                             | 18(09%)   |
| <b>Wallen's syndrome</b>                      | 23(11.5%) |

tern was seen in 30(15%) patients. Acute LBBB with chest seen was observed in 18(09%) of the patients while Wallen's Snyderome was present in 23(11.5%). TABLE-1 and TABLE-2.

**DISCUSSION:**

Those patients who present with ST-T changes in precordial leads have a very high incidence of left anterior descending artery stenosis.<sup>4</sup>

A fresh LBBB during acute myocardial infarction has a poor prognosis and the infarcted area of the myocardium is large.<sup>5</sup> These findings are in conformation with the results of our study. The de Winter electrocardiographic pattern is associated with ischemia in early phases of acute ST elevation Myocardial infarction instead of being an independent change.<sup>6</sup> Any patient who presents with chest pain and a fresh LBBB on ECG who also fulfils Sgarbossa criteria must be treated and revascularized as early as possible.<sup>7</sup> The electrocardiographic changes of Wellen's Syndrome revert to normal with timely management and revascularization of proximal LAD occlusion.<sup>8</sup> In our study population the patients with Wellen's responded very well and the ECG changes of most of them reverted to normal after revascularization. These results are therefore endorse the findings of our study. The patterns of ECG in acute Anterior wall myocardial infarction can be a useful determinant of monitoring and reducing in hospital moratlity.<sup>9</sup> A group of researchers in Amsterdam observed that in patients who present with acute onset chest pain with ST-segment depression and upsloping of ST-segments at J point and with tall, symmetrical T-waves in the anterior chest leads, there is strong evidence of proximal LAD stenosis. It has important implications in the management strategy of the patients.<sup>10</sup>

De Winter ECG is an atypical presentation of acute myocardial infarction resulting from LAD stenosis and an equivalent of STEMI. In our study only 30(15%) patients presented with this ECG pattern and it is an indication for urgent mechanical or pharmacological revascularization.<sup>11</sup> An ECG is the most important and economical tool for initial diagnostic evaluation of acute myocardial infarction. Utilization of ECG as a diagnostic tool with extreme degree of vigilance aids in timely diagnosis and management of Acute coronary syndromes.<sup>12</sup> A group of researchers in Tel Aviv Israel studied the electrocardiographic pattern in patients with anterior myocardial infarction. They reported ST elevations with positive/ up-right T waves in non-consecutive leads like aVL and V2. Coronary Angiography showed occlusion of the first diagonal branch of the LAD.<sup>13</sup> The results of our study did not confirm these findings. Our all patients had stenosis of proximal LAD. A study group from New York reported that those patients who develop Incomplete LBBB (Bilateral Bundle Branch Block) or AV block with acute anterior myocardial infarction have a mortality rate of 63% and 76% of them develop complete heart block ,



cardiac arrest and ventricular fibrillation. Our study population did not reveal any such result except 18(09%) patients who had LBBB.<sup>14</sup> Presence of ischemic ECG changes in anterior wall myocardial infarction is associated with LAD occlusion in most of the cases.<sup>15</sup> Takotsubo cardiomyopathy (TC) simulates Acute ST Elevation Myocardial Infarction but the changes in TC are less pronounced.<sup>16</sup> No

such case was seen in our study population.

### CONCLUSION:

Hence we conclude here that there is a diversity of Electrocardiographic patterns in Acute Anterior myocardial infarction and these patients have proximal LAD artery stenosis. Early diagnosis and pharmacological or mechanical reperfusion is mandatory in order to prevent high mortality associated with these subsets of ECG changes.

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