



Correlation of Surface Ecg & Coronary Angiography Findings in Diabetics with Cardiac Symptoms

KEYWORDS

Coronary angiography (CAG), Coronary artery disease (CAD), Diabetes mellitus (DM), Double vessel disease (DVD), Single vessel disease (SVD), Triple vessel disease (TVD).

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ABSTRACT *Aims & Objectives:* 1. To see whether patients with type II DM with cardiac symptoms have abnormal ECG pattern. 2. To see whether ECG findings correlate with coronary angiography findings.

Material & methods: 101 patients were selected who had type II DM with cardiac symptoms. All were subjected to 12 lead ECG and also coronary angiography. Reports of ECG and CAG were compared and conclusions were drawn. Study period Nov. 2013 to Oct. 2015.

Results: Out of 101 patients, 31 had AWMI, 14 had IWMI & 2 had LWMI. Rest of them had either ischemic ECG pattern or non-specific ECG changes. Only 3 patients had normal ECG findings. Out of the total 47 infarcted patients only 20 had SVD, while others had either DVD or TVD.

Conclusion: CAG findings when compared to surface ECG findings showed advanced CAD, which extended beyond the ischemic/infarcted artery zone.

Introduction:

Diabetes is an atherogenic state and has been proved long back by various trials. Diabetes is known to cause both microvascular and macrovascular complications. Many patients who apparently appear healthy may harbor severe coronary artery disease.

Surface ECG is a sensitive marker as a routine screening measure for coronary evaluation but sensitivity is only 90%. 10% ECGs turn out to be normal in spite of ischemia/infarct. Moreover resting ECGs tend to underestimate the severity of coronary disease which otherwise worsen even with slight exertion. Moreover ECGs are difficult to interpret in presence of conduction blocks and arrhythmias. Coronary angiography findings do give exact anatomical evaluation of coronary tree and also tell us about stenosed or occluded arteries. They also tell us the severity of coronary occlusions.

Our aim in this study was to correlate surface ECG findings with coronary angiography findings. Those latent ischemic zones, which may not be picked up on surface ECG may be brought to notice with coronary angiography. This will help in timely intervention, lifestyle modification and if necessary advice for coronary angioplasty or CABG can be given.

Also it was interesting to note whether surface ecg findings and coronary angiography correlate with each other.

Material & Methods:

This study was conducted on the indoor patients of Bharati Vidyapeeth Deemed University Medical College & Hospital, Sangli with Diabetes Mellitus (Type-2) during November 2013 to October 2015. This was an observational study.

The study sample consisted of 101 patients with Diabetes Mellitus (Type 2) admitted with cardiac symptoms, with or without electrocardiography (ECG) changes or who were willfully opting for coronary angiography.

Permission & consent:

Ethical clearance from the college and university committee (BVDUMC&H/Sangli/IEC/Dissertation 2013-14/42) was taken. After ethical clearance, permission of the head of the department was taken. All the patients were explained about the nature of the study in their local language and written & informed consent was taken from every patient.

Inclusion criteria:

Diabetic individuals with cardiac symptoms, with or

without ECG changes, who were willfully opting for coronary angiography.

Cardiac symptoms comprises of:

- Chest pain
- Sweating
- Pain radiating to left arm
- Breathlessness
- Dyspnea on exertion
- Palpitation

Exclusion criteria:

- Type 1 diabetes mellitus.
- Age < 30 years.
- Diabetic individuals who were asymptomatic.
- Diabetic individuals with severe bleeding diathesis.
- Diabetic individuals with cardiogenic shock/ advanced CCF.
- Diabetic individuals with renal failure.
- Diabetic individuals with advanced age (> 90 years, relative).
- Detailed clinical history was taken about the present & relevant past illness along with the history of habits (smoking & alcoholism).
- After clinical history thorough clinical examination was done.

Study tools:

After examination, all the patients were subjected for the following investigations. However ECG & CAG reports were compared head to head & observations and conclusions were drawn accordingly.

- Blood sugar level – fasting & post prandial
- Glycosylated hemoglobin (HbA1C)
- Blood urea
- Serum creatinine
- Fasting lipid profile
- 12 lead ECG (Electrocardiogram)
- 2 Dimensional Echocardiography (2D Echo)
- Coronary angiography

Observations & Results:

Table 1: Correlation of ECG & CAG findings.

ECG findings	CAG findings				Total
	TVD	DVD	SVD	Normal	
AWMI	8	12	11	0	31
IWMI	3	3	8	0	14
LWMI	1	0	1	0	2
Ischemia	8	6	9	3	26
Non-specific	9	3	8	5	25
Normal	2	0	0	1	3
Total	31	24	37	9	101

31 patients had Anterior wall MI, out of them 11 had SVD, 12 had DVD & 8 had TVD.

14 patients had Inferior wall MI, of which 8 had SVD, 3 had DVD & 3 had TVD.

2 patients had Lateral wall MI, out of them 1 had SVD & 1 had TVD.

26 patients had either anterior wall ischemia (22) or inferior wall ischemia (4) & CAG in them showed,

Normal CAG	3
SVD	9
DVD	6
TVD	8
Total	26

25 patients had non-specific changes (bundle branch blocks, ventricular hypertrophy, etc.) out of which 8 had SVD, 3 had DVD, 9 had TVD while only 5 had normal CAG findings.

3 patients had normal ECG of which 1 had normal CAG & 2 had TVD.

Table 2: CAG findings.

CAD	CAG findings	No. of patients
Present	SVD	37
	DVD	24
	TVD	31
Absent	Normal	9
Total		101

Out of 101, 92 patients had abnormal CAG findings, whereas only 9 had normal CAG findings.

Out of the 92 patients, 37 had SVD, 24 had DVD & 31 had TVD.

Table 3: Statistical significance of ECG & CAG findings.

ECG findings	CAG finding					Significance
	TVD (%)	DVD (%)	SVD (%)	Normal (%)	Total (%)	
AWMI	8 (25.81)	12 (38.71)	11 (35.48)	0 (0)	31 (100)	p >0.05 Not significant
IWMI	3 (21.43)	3 (21.43)	8 (57.14)	0 (0)	14 (100)	p <0.0001 Significant
LWMI	1 (50)	0 (0)	1 (50)	0 (0)	2 (100)	p >0.05 Not significant
Ischemia	8 (30.77)	6 (23.08)	9 (34.61)	3 (11.54)	26 (100)	p >0.05 Not significant
Non-specific	9 (36)	3 (12)	8 (32)	5 (20)	25 (100)	p >0.05 Not significant
Normal	2 (66.67)	0 (0)	0 (0)	1 (33.33)	3 (100)	p <0.0001 Significant
Total	31	24	37	9	101	-

Conclusion:

Our study clearly demonstrates that almost 97% diabetics included in this study had abnormal ECG patterns. Almost 47% cases showed clear-cut infarct pattern on surface ECG. Almost 31% patients had anterior wall infarct & 14% had inferior wall infarct. A sizeable 26% cases also showed an ischemic pattern on surface ECG.

97.03% diabetics with cardiac symptoms had abnormal ECG pattern.

91.09% patients in this study had abnormal coronary angiography findings.

The above correlation was well on expected lines.

However we further tried to correlate abnormal ECG findings with coronary angiography findings.

Surface ECG was proved to under estimate the severity of coronary artery disease. The extreme example in our study was, two patients with normal surface ECG had severe coronary artery disease on coronary angiography.

Coronary angiography on the contrary showed coronary occlusions in those areas which were not suspected on surface ECG patterns and these changes were so critical that coronary angioplasty was also recommended.

To conclude coronary angiography findings may not limit to the infarct/ischemia related arteries as it may be assumed looking at the surface ECG patterns and may well extend beyond the infarct related artery zone, which needs to be taken seriously because we will never know when these silent ischemic zones turn out to be an infarct. Early picking up of silent ischemic zones will allow us and give us sufficient time & opportunity to battle against the life threatening coronary artery disease.

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