

Localizing Value of Anginal Pain to Coronary Artery Involvement in Patients with STEMI

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Abstract

Introduction: It is usually considered that pain in acute coronary syndrome has no localising value to identify the coronary artery involved. A few studies have tried to correlate the location and radiation of pain to the occluded vessel with conflicting results. The present study was done to find out the relationship between the site and / or radiation of chest pain with culprit artery in acute ST elevation myocardial infarction (STEMI).

Methods: Out of 469 patients admitted with STEMI for primary PCI, 274 patients were included. Exclusion criteria included patients with prior history of coronary syndrome, patients with multivessel disease (>50% lesion in non-culprit vessels), unable to localise the site and/or radiation of chest pain and unwillingness to give consent.

Results: Majority of the patients (62.5%) with chest pain radiating to left arm were having LAD occlusion while the majority of the patients (57.1%) with chest pain radiating to right arm were having RCA occlusion. Patients with chest pain radiating to neck and or jaw were having statistically significant higher occlusion of RCA (96.4%) with a p value of <0.05. Surprisingly, LAD involvement was not present even in single case in acute coronary syndrome patients presented with chest pain radiating to neck/jaw.

Conclusion: The present study showed a very high positive predictive value (96.42%) of radiation of anginal pain to neck/jaw radiation for predicting the RCA occlusion in patients presenting with acute ST elevation MI.

Key words: Angina, Neck radiation, Coronary artery disease, Acute coronary syndrome, Jaw pain

Introduction

Classical description of angina pectoris was first given by Heberden in 1768.¹ Anginal pain is usually described as retrosternal or predominantly in the left precordium and radiating to left arm. Occasionally, patients also present with epigastric or right sided chest pain radiating to right arm or the neck and jaw. It is usually considered that pain in acute coronary syndrome has no localising value to identify the site of myocardial infarction and hence the coronary artery involved. A few studies have tried to correlate the location and radiation of pain to the occluded vessel but they have been limited with conflicting results.^{2,3,4,5} In this present study, we tried to find out any relationship if there, between the site or radiation of the chest pain to the culprit artery in patients with acute myocardial infarction. To find out the relationship between the site and / or radiation of chest pain with culprit artery in patients presenting with acute myocardial infarction.

Materials and Methods

We included all the patients who presented with acute ST elevation myocardial infarction (STEMI) and underwent primary PCI. Exclusion criteria included patients with prior history of coronary syndrome, patients with multivessel disease (>50% lesion in non-culprit vessels), unable to localise the site and/or radiation of chest pain and unwillingness to give consent. All the patients included in the study were asked to identify the location and radiation of the pain. The area with the most severe pain was identified as location and the area with less severe pain or referring to particular area was identified as radiation. The locations included were divided as substernal, left precordium, right precordium and epigastric. The sites of radiation included were divided as neck/jaw, right arm and left arm. A total of 469 patients underwent primary PCI during the study period, of which 195 were excluded, mostly due to significant lesions in the non-culprit vessels and the remaining 274 patients were included in the study.

Results

Majority of patients were males (78.1%) in present study. Mean age of patients was 54.58 ± 9.96 years. Clinical characteristics of the patient are as mentioned in table 1.

Table 1: Clinical characteristic of the patients

	Number	Percentage
Sex		
Male	214	78.1%
Female	60	21.9%
History		
DM ₂	66	24.1%
HTN	104	38.0%
DLP	126	46.0%
SMOKER	90	32.8%
ALCOHOL	30	10.9%
FAMILY HISTORY	42	15.3%

Among all the patients (n= 274) included in present study, majority (n=173, 65.3%) of the patients were having retrosternal chest pain followed by left sternal in 22.6% and right sternal in 8.8%. Epigastric pain was present in only 3.3% of patients (Table 2). Similarly, majority

(51.1%) of patients were not having radiation of chest pain. Left arm radiation was present in 23.4% of cases followed by neck / jaw pain in 20.4%. Right arm radiation was present in only 3.3% of patients (Table 3).

Table 2: Site of chest pain

Site of chest pain	Frequency	Percentage (%)
Retrosternal	179	65.3
Left	62	22.6
Right	24	8.8
Epigastric	09	3.3

Table 3: Radiation of chest pain

Radiation of pain	Frequency	Percentage (%)
No radiation	140	51.1
Left arm	64	23.4
Right arm	14	05.1
Neck/Jaw	56	20.4

Among all the patients presenting with LAD occlusion, majority (64.5%) were having left precordial chest pain followed by retrosternal (36.9%) and right precordium (16.7%). None of the patients with LAD occlusion were having epigastric pain in present study. Almost similar trend was noted in patients with LCX occlusion except for epigastric pain which present in significant number of cases (22.2%). In patients with RCA occlusion, majority (77.8%) of the patients were having epigastric pain followed by right precordium, retrosternal and left precordium in 75%, 46.9% and 11.3% respectively. Though, there is no statistically significant correlation between the site of the chest pain and the coronary artery involved, most of the patients with epigastric pain were found to have lesion in right coronary artery but the number of patients in the group was too small for any definite conclusion. (Table 4)

Table 4: Site of the chest pain and the coronary artery involved

		Coronary artery involved			TOTAL
		LAD	LCX	RCA	
Site of Retro	Count	66	29	84	179
Chest pain sternal	%	36.9%	16.2%	46.9%	100.0%
Right	Count	4	2	18	24
	%	16.7%	8.3%	75.0%	100.0%
Left	Count	40	15	7	62
	%	64.5%	24.2%	11.3%	100.0%
Epigastric	Count	0	2	7	9
	%	0.0%	22.2%	77.8%	100.0%
Total	Count	110	48	116	274
	%	40.1%	17.5%	42.3%	100.0%

Further we tried to find out the relation between radiation and the coronary artery involved. Majority of the patients (62.5%) with chest pain radiating to left arm were having LAD occlusion while the majority of the patients (57.1%) with chest pain radiating to right arm were

having RCA occlusion. Patients with chest pain radiating to neck and or jaw were having statistically significant higher occlusion of RCA (96.4%) with a p value of <0.05. Surprisingly, LAD involvement was not present even in single case in acute coronary syndrome patients presented with chest pain radiating to neck/jaw. (Table 5)

Table 5: Relation between radiation of chest pain and the coronary artery involved.

			Coronary artery involved			TOTAL
			LAD	LCX	RCA	
Radiation	No	Count %	66 47.1%	28 20.0%	46 32.9%	140 100.0%
	Neck/jaw	Count %	0 .0%	2 3.6%	54 96.4%	56 100.0%
	Left Arm	Count %	40 62.5%	16 25.0%	8 12.5%	64 100.0%
	Right Arm	Count %	4 28.6%	2 14.3%	8 57.1%	14 100.0%
Total		Count %	110 40.1%	48 17.5%	116 42.3%	274 100.0%

Sensitivity of neck/jaw radiation to predict RCA occlusion was 46.55%. However, the positive predictive value was very high (96.42%). Among 56 patients with neck or jaw radiation, 54 had involvement of RCA. It indicates the high positive predictive value of neck/jaw radiation to RCA occlusion.

$$\text{Sensitivity} = \frac{54}{116} = 46.55\%$$

$$\text{Positive predictive value} = \frac{54}{56} = 96.42\%$$

Discussion

Angina pectoris is an important clinical manifestation of patients with coronary syndrome. The classical description of angina includes pain involving left precordium, retrosternal area and/or radiation to left arm. Sometimes patients also present with pain in other areas such as right precordium, epigastrium and may radiate to right arm or neck and jaw. The site or radiation of chest pain doesn't help to localise the coronary artery involved. It is accepted that patients with anterior or inferior wall MI experience pain in the same areas with a slight predilection of the epigastric area for inferior wall MI.

In a study by Proudfit et al,⁶ most patients with pain to the right side of the chest were found to be having lesion in either the circumflex or the right coronary artery. However the number of patients included in the study was not sufficient enough to draw statistically significant conclusions. Similarly, Lichstein E et al² showed that patients presenting with an epigastric pain radiating to jaw had an 86% chance that right coronary artery was involved and the LAD involvement was very unlikely. However, there were various studies after that which showed conflicting results and didn't show any relationship between the site or radiation of pain to the coronary artery involved.

In present study, we found that majority of the patients with pain radiating to neck or jaw (54 out of 56, 96.42%) had involvement of right coronary artery which was statistically significant (p value <0.05). The result in our study was in variance with that of Vincenzo et al [5] who concluded that patients with anterior or inferior wall MI have similar distribution of cardiac pain. Patients in their study however did not undergone angiography and so the lesion in nonculprit vessels was not known. Around 25% of the patients included in study by Vincenzo et al were diabetic which further supports that the patients might be having multivessel disease. In present study we excluded the patients with significant lesions in nonculprit vessels. In study by Vincenzo et al and other similar studies, patients were divided into two groups consisting of either AWMi or IWMI and no attempts were made to identify the culprit vessel. IWMI in many of such patients might have been due to involvement of circumflex artery leading to conflicting results. In the present study, individual coronary artery was assessed and so IWMI caused by circumflex or right coronary artery could be distinguished accurately.

A number of studies have shown that both afferent sympathetic and afferent vagal fibres are responsible for transmission of cardiac pain.^{7,8,9} The mechanism of ischemic pain includes stimulation of receptors that send information to the central nervous system via eighth cervical and first four thoracic ganglia. As mentioned by Lichstein et al, anginal pain that is referred to neck or jaw may involve an additional central site where the mechanism for referred pain may be activated by vagal afferent nerve fibres. These vagal afferent nerve fibres may be localised around the right coronary artery leading to radiation of the pain to neck or jaw in RCA involvement. Limitations of present study were small sample size.

Conclusion

The present study showed a very high positive predictive value (96.42%) of radiation of anginal pain to neck/jaw radiation for predicting the RCA occlusion in patients presenting with acute ST elevation MI.

What is already known?

It is usually considered that pain in acute coronary syndrome has no localising value to identify the site of myocardial infarction and hence the coronary artery involved. A few studies have tried to correlate the location and radiation of pain to the occluded vessel but they have been limited with conflicting results

What this study add:

Radiation of anginal pain to neck/jaw has very high positive predictive value in predicting RCA involvement. The converse however is not true and patient with RCA lesion may have radiation to various areas or no radiation at all.

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