

CHARACTERISTICS OF THE CORONARY ARTERIAL LESIONS IN YOUNG PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

OBJECTIVES: To assess characteristics of coronary arterial lesion (CAL) by means of invasive coronary angiography in young patients, aged <35 years, who sustained acute myocardial infarction (AMI).

METHODS: This prospective study of one-year duration was conducted from December 2009 to November 2010 at the cardiology departments of three teaching hospitals in Peshawar, Pakistan. All patients aged <35 years, evaluated angiographically after an AMI, were included. The individual CAL were characterized.

RESULTS: About 101 patients with AMI underwent coronary angiography. Mean age of the patients was 32.56 ± 3.26 years (range 22-35 years). Out of 101 patients, 86 (78.18%) were males, while 15 (21.81%) were females. On coronary angiography, there were 25 (24.8%) patients with non-atherosclerotic coronary arteries, 39 (38.6%) with single vessel disease (SVD), 18 (17.8%) had double vessel disease (DVD), and 19 (18.8%) had triple vessel disease (TVD). Of the total, 3 patients (2.97%) had disease in the left main stem. One hundred thirty-two lesions ($39 \times 1 = 39$ in SVD; $18 \times 2 = 36$ in DVD & $19 \times 3 = 57$ in TVD) were studied. The lesions were mostly discrete to tubular with less diffuse involvement and had either no or mild calcification. Thrombus was found in 5 patients with SVD (12.82%), 2 with DVD (11.11%) and 1 with TVD (1.75%).

CONCLUSION: This study showed that young (age <35 years) patients who have sustained AMI, have less extensive coronary artery disease but complex morphologic features. There was a higher incidence of normal vessels on coronary angiography with a very few cases of left main coronary arterial involvement.

KEY WORDS: Myocardial Infarction (MeSH); Coronary Artery Disease (MeSH); Coronary arterial lesions (Non-MeSH); Coronary Angiography (MeSH), Atherosclerosis (MeSH).

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INTRODUCTION

The prevalence of acute myocardial infarction (AMI) in the young age groups has increased.¹ Additionally; MI in very young patients aged ≤ 35 years has been poorly studied. Young patients aged ≤ 35 years constitute less than 2% of all AMIs.² Previous studies suggested that Asians are at an increased risk of myocardial infarction at a younger age (<40 years), irrespective of whether they have migrated to other countries or

are resident Asians.³ Heart diseases are rising in Asian Indians and present 5-10 years earlier than in other populations around the world.⁴

The prevalence of risk factors has been rising in young adults. This will result in an increased disease burden in the near future. Smoking, which has been traditionally recognized as the most common risk factor for heart disease, has been shown to be increasingly prevalent in young adults and

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adolescents reaching up to 9%.⁵ Obesity is a growing concern among young adults and children and it has increased three folds in the UK in the past two decades.⁵⁻¹⁰ The disproportionate rise in prevalence of heart disease among certain ethnic groups like people of Asian Indian origin has been of great interest and these people tend to get MI at a younger age in addition to more complex coronary artery abnormalities.⁵⁻⁷

Notably, young patients are at increased risk to be misdiagnosed since they do not frequently have traditional coronary risk factors.¹¹⁻¹² Angiographic studies also showed major differences with higher incidence of normal coronary arteries, mild luminal irregularities, and single vessel coronary artery disease.¹³

There is limited data available concerning the risk factors, clinical features and characterization of coronary arterial lesions by coronary angiography on very young adults with acute myocardial infarction in Pakistan. So, this study was conducted to assess characteristics of coronary arterial lesion (CAL) by means of invasive coronary angiography in young patients, aged <35 years, who sustained AMI.

METHODS

Between December 01st, 2009 and November 30th, 2010, a total of 132 patients were entered into the registry. These patients were collected from the cardiology departments of the 3 main teaching hospitals in public sector in Peshawar, Pakistan, namely Hayatabad Medical Complex (Peshawar), Lady Reading Hospital (Peshawar) and Khyber Teaching Hospital (Peshawar).

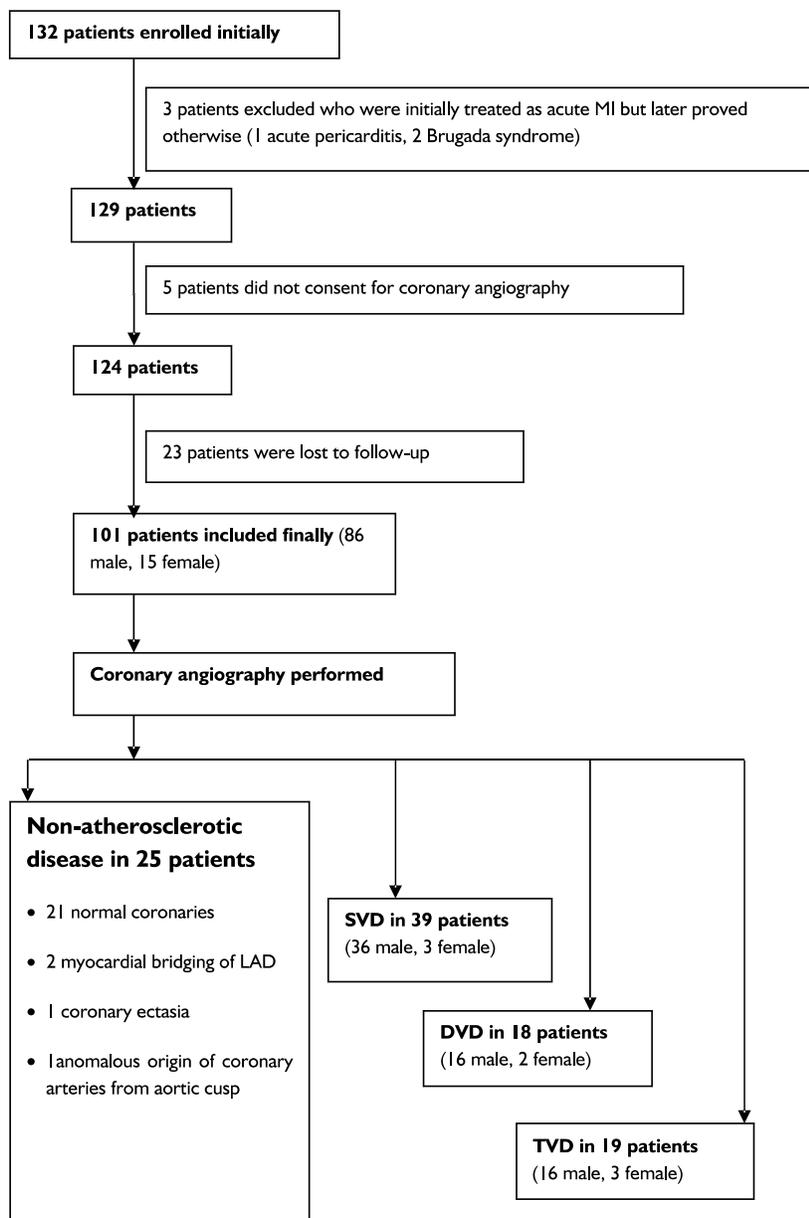


Figure 1: Algorithm of the Study

Initially 132 patients who have had a history of myocardial infarction at presentation were included in the study. Acute Myocardial Infarction was diagnosed according to standard criteria defined in guidelines. Three patients were excluded from the study who were initially diagnosed and treated as acute MI, but later two of these turned out to be Brugada Syndrome and one acute pericarditis. Also, demographic data e.g. name, age, gender, address etc. were recorded on the proforma annexed. Patients were counseled and

written informed consent was obtained before undergoing invasive coronary angiography. Among these, 5 patients did not consent for coronary angiography, and 23 were lost to follow-up; these were excluded from the study. So, a total of 101 patients underwent coronary angiography (Study Algorithm in Figure 1). Two independent observers (cardiologists) visually assessed coronary angiograms of the patients. The angiographic findings, agreed upon by mutual consensus of the two observers, were recorded on the

proforma annexed. Data was analyzed by SPSS software version 16.

RESULTS

A total of 101 patients with acute myocardial infarction underwent coronary angiography. Mean age of the patients was 32.56 ± 3.26 years (range 22-35 years). Eighty-six patients (78.18%) were male, while 15 (21.81%) were female. As revealed by the coronary angiography, there were 25 (24.8%) patients with non-atherosclerotic coronary arteries, 39 (38.6%) with single vessel disease (SVD), 18 patients (17.8%) had double vessel disease (DVD) and 19 patients (18.8%) had triple vessel disease (TVD) (Figure 1). Of the total, 3 patients (2.97%) had disease in the left main stem.

Left anterior descending (LAD) was found to be most frequently involved in all patterns of coronary artery disease (CAD), whether SVD, DVD or TVD. A total of 63 lesions (46.66%) occurred in LAD, followed by 35 lesions (25.92%) in right coronary artery (RCA), 32 (23.70%) in left circumflex, 3 (2.22%) in left main stem (LMS), and 2 lesions (1.48%) in Ramus Intermedius. One hundred thirty-two lesions ($39 \times 1 = 39$ in SVD; $18 \times 2 = 36$ in DVD & $19 \times 3 = 57$ in TVD) were studied and characterized according to The American College of Cardiology and American Heart Association (ACC/AHA) coronary artery lesion classification system¹⁴ (Table I).

DISCUSSION

In our study, we found a relatively high frequency of angiographically normal coronary arteries, almost one fourth of the total study population. This important finding of our study conforms to the high incidence of angiographically normal coronary arteries in young patients with AMI, a fact which has been recorded previously as well.¹⁵⁻¹⁷

There is paucity of data in literature regarding the characteristics of angiographic stenosis morphologic features in young patients who sustain acute myocardial infarction. A study by Chen et al¹⁸ in UK in 1995 is worth mentioning. In our study, we observed that there was a dominance of normal coronaries and SVD, and complex

TABLE 1: CHARACTERISTICS OF THE CORONARY ARTERIAL LESIONS

*Lesions in 39 SVD (39x1=39); **Lesions in 18 DVD (18x2=36); ***Lesions in 19 TVD (19x3=57)		Single Vessel Disease (SVD)	Double Vessel Disease (DVD)	Triple Vessel Disease (TVD)
Total Number of Lesions	Number of patients	39	18	19
	Number of lesions	39x1=39	18x2=36	19x3=57
	Lesion Characteristics	SVD (%)	DVD (%)	TVD (%)
SITE	Ostial	02 (5.12)	08 (22.22)	08 (14.03)
	Proximal	25 (64.10)	19 (52.77)	18 (31.57)
	Mid	11 (28.20)	07 (19.44)	22 (38.59)
	Distal	01 (2.56)	02 (5.55)	09 (15.78)
EDGES	Concentric	20 (51.28)	22 (61.11)	32 (56.14)
	Eccentric	10 (25.64)	10 (27.77)	12 (21.05)
SURFACES	Regular	22 (56.41)	26 (72.22)	29 (50.87)
	Ulceration	06 (15.38)	04 (11.11)	12 (21.05)
	Intimal flap	01 (2.56)	00	00
	Aneurysm	00	00	00
	Saw-toothed appearance	02 (5.12)	02 (5.55)	(5.26)
LOCATION	Simple	25 (64.10)	15 (41.66)	31 (54.38)
	Bifurcation	15 (38.46)	05 (13.88)	17 (29.82)
	Trifurcation	00	02 (5.55)	05 (8.77)
CALCIFICATION	None	21 (53.84)	13 (36.11)	20 (35.08)
	Mild	06 (15.38)	18 (50.00)	23 (40.35)
	Moderate	04 (10.25)	01 (2.77)	01 (1.75)
	Severe	00	00	00
LENGTH	Discrete	13 (33.33)	15 (41.66)	13 (22.80)
	Tubular	14 (35.89)	10 (27.77)	13 (22.80)
	Diffuse	04 (10.25)	07 (19.44)	18 (31.57)
OCCCLUSION	Total	09 (23.07)	04 (11.11)	14 (24.56)
	Severe	23 (58.97)	22 (61.11)	41 (71.92)
	Moderate	03 (7.69)	10 (27.77)	01 (1.75)
	Mild	01 (2.56)	00	00
	Re-canalized	03 (7.69)	00	00
TIMI FLOW GRADE	Grade 3	15 (38.46)	10 (27.77)	05 (8.77)
	Grade 2	12 (30.76)	19 (52.77)	26 (45.61)
	Grade 1	03 (7.69)	03 (8.33)	12 (21.05)
	Grade 0	09 (23.07)	04 (11.11)	14 (24.56)
THROMBUS	Present	05 (12.82)	02 (5.55)	01 (1.75)
LESION TYPE	A	10(25.64)	06(16.66)	03(5.26)
	B1	13(33.33)	18(50)	13(22.8)
	B2	10(25.64)	05(13.88)	21(36.84)
	C1	06(15.38)	07(19.44)	20(35.08)

angiographic morphologic features were also more frequent. There was a predominance of location of the lesion in the ostial to proximal segments of the vessel. Severely occlusive disease (70% to 99%) was found in 59%, 61% and 25% of SVD, DVD and TVD respectively. While total occlusive disease of the vessel with resultant grade zero Thrombolysis in Myocardial Infarction (TIMI) flow has been found in 20% of the total 132 lesions (23%, 11% and 24% of SVD, DVD and TVD respec-

tively). Although definite thrombus was found in only 6% of the lesions, it could be presumed that the totally occlusive lesions associated with unheralded acute myocardial infarction, were also thrombotic in origin. As far as the morphology of the individual lesions is concerned, most of the lesions were concentric, discrete to tubular, simple and located along straight segments of the vessels with little or no calcification. We also observed that 14% of the lesions were found to be of Type A, 33%

of Type B1, 27% of Type B2, 25% of Type C1 and none of Type C2. This implies that PCI, if performed in such lesions, would carry a >85% success rate with low risk in 47% lesions (both Type A and Type B1 lesions together), while 27% (type B2) lesions would carry a moderate success rate of 60-85% with moderate risk, and in 25% (Type C) lesions (i.e. in one fourth of all the lesions), a lower success rate of <60% would be expected with high risks involved.¹⁹⁻²³ When the The Society

for Cardiovascular Angiography and Interventions (SCAI) lesion classification system²⁴⁻²⁷ is applied to the lesions in our study, where lesion patency carries more importance, it can be implied more than 20% of the lesions would be technically difficult lesions to handle carrying a higher risk and lower expected success rate.

The finding of less extensive coronary artery disease with more complex lesions observed in younger patients in our study might suggest that there is rapid disease progression (plaque rupture, plaque complication, or both) in younger population. This is in agreement with the finding that younger patients with coronary artery disease commonly present with an unheralded acute coronary syndrome without prior history of angina.²⁸⁻²⁹ In contrast; a contemporary study in the same setting compared the clinical and angiographic features of young versus older patients. They found no significant difference with respect to clinical features as well as lesion severity and occurrence of normal coronary arteries. However, lesser extensive coronary artery disease was met in younger group of patients.³⁰

We, therefore, suggest coronary angiography along with urgency for early revascularization should be mandatory in patients who sustain acute MI in a younger age, even if asymptomatic with anti-ischemic medication.

CONCLUSION

This study shows that young (age < 35 years) patients presented with acute myocardial infarction, have less extensive coronary artery disease but complex morphologic features. There was a higher incidence of normal vessels on coronary angiography with a very few cases of left main coronary arterial involvement.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

LN: Study design, acquisition, analysis & interpretation of data, drafting the manuscript, final approval of the version to be published

YA, MHD, UA, FA: Acquisition of data, drafting the manuscript, critical revision, final approval of the version to be published

ZAA: Concept, acquisition of data, critical review, final approval of the version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest

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NIL



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