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CHARACTERISTICS OF THE CORONARY ARTERIAL LESIONS IN YOUNG PATIENTS (⩽35YEARS) WITH ACUTE MYOCARDIAL INFARCTION

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Contribution

LN, MH conceived the idea and drafted the manuscript. MHD, FA collected and analyzed the data. UA, SU and ZAA critically reviewed the manuscript. All authors contributed significantly to submitted manuscript.

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ABSTRACT

Objectives: This study was designed to assess characteristics of coronary arterial lesion by means of invasive coronary angiography in young patients, less than age 35 years, who sustained acute myocardial infarction.

Methodology: This prospective study was conducted from December 2009 to November 2010 at the cardiology departments of all the three tertiary care hospitals in Peshawar. Total duration of the study was one year. All patients aged <35 years who were evaluated angiographically after an acute myocardial infarction were included. The individual coronary arterial lesions were characterized.

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). About eighty-six patients (78.18%) were males. As revealed by the coronary angiography, there were 25 (24.8%) patients with non-atherosclerotic coronary arteries, 39 (38.6%) with single vessel disease, 18 patients (17.8%) had double vessel disease, and 19 patients (18.8%) had triple vessel disease.Of the total, 3 patients (2.97%) had disease in the left main stem. As far as the length of the lesions is concerned, the lesions were mostly discrete to tubular with less diffuse involvement.The lesions mostly either had no or mild calcification. Thrombus was found in 5 patients with SVD (12.82%), 2 patients with DVD (11.11%) and 1 patient with TVD(1.75%).These lesions were located mostly in the ostial to proximal segments, and were mostly severely to completely occlusive disease. Type A lesions were found in 14%, type B1 in 33%, type B2 in 27%, type C1 in 25%, and type C2 in none.

Conclusion: We found that young (age < 35 years) patients who have sustained myocardial infarction, have less extensive coronary artery disease but complex morphologic features, with a high incidence of angiographically normal vessels and relative paucity of left main coronary arterial involvement.

Key Words: Acute Myocardial infarction, Coronary arterial lesions, Coronary angiography.

INTRODUCTION

The prevalence of acute myocardial infarction (AMI) in the young age groups has increased.[1] Additionally, AMI 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 suggest 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 is on the rise in young adults and children. 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 adolescents reaching up to 9%.[5] Obesity is a growing concern among young adults and children and it has increased by threefold in 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 characterize coronary arterial lesions by angiography.

METHODOLOGY

This cross sectional study was conducted from December 2009 to November 2010. These patients were collected from the cardiology departments of the 3 main tertiary care hospitals in public sector of Peshawar, namely Hayatabad Medical Complex (Peshawar), Lady Reading Hospital (Peshawar), and Khyber Teaching Hospital (Peshawar). Patients were determined to have had a history of myocardial infarction at presentation and form the basis of the present analysis. Criteria for myocardial infarction included physician records confirming a history of definite myocardial infarction, hospital records confirming characteristic rise in cardiac-specific enzyme (CK-MB / TROP-I) level up to the 99th percentile of the upper reference limit; accompanied by the presence of history of typical chest pain lasting for more than 30 minutes, or electrocardiographic (ECG) changes suggestive of ischemia; or a current diagnostic ECG with newly developed Q-waves; or echo evidence of new regional wall motion abnormality. Also, demographic data e.g. name, age, gender, address etc. were recorded on the proforma. Patients were counseled and written informed consent was obtained before undergoing invasive coronary angiography. Coronary angiograms were visually assessed by two independent observers (cardiologists) blinded to the identity and clinical characteristics of the patients. The angiographic findings, agreed upon by mutual consensus of the two observers, were recorded on the proforma annexed. Data so obtained was entered into and analyzed using SPSS version 16 software. The data has been presented as mean with standard deviation for the continuous variable i.e. age. Frequency and percentages were calculated for the categorical data such as the gender, the number of vessels involved, and the various characteristics of the stenotic lesions diagnosed at coronary angiography, such as the site, edges, surfaces, location, length, calcification, degree of occlusion, TIMI flow grade, presence of thrombus, and the type of lesion.

RESULTS

A total of 132 patients were entered into the registry. Among these 5 patients didn't consent for coronary angiography and 23 patients were lost to follow up. So a total of 101 patients underwent coronary angiography. About 3 patients were excluded who turned out to be Brugada Syndrome and acute pericarditis. Mean age of the patients was 32.56 ± 3.26 years (range 22 - 35 years). About 86 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, 18 patients (17.8%) had double vessel disease, and 19 patients (18.8%) had triple vessel disease (Figure 1).Of the total, 3 patients (2.97%) had disease in the left main stem.

LAD was found to be most frequently involved in all patterns of CAD, whether SVD, DVD or TVD. A total of 63 lesions (46.66%) occurred in LAD, followed by 35 lesions (25.92%) in RCA, 32 (23.70%) in left circumflex, 3(2.22%) in LMS, and 2 lesions (1.48%) Ramus Intermedius. A total of 132 lesions were studied and characterized according to the ACC/AHA coronary artery lesion classification system[14](Table 1).

Figure 1: Algorithm of the Study (n=132)

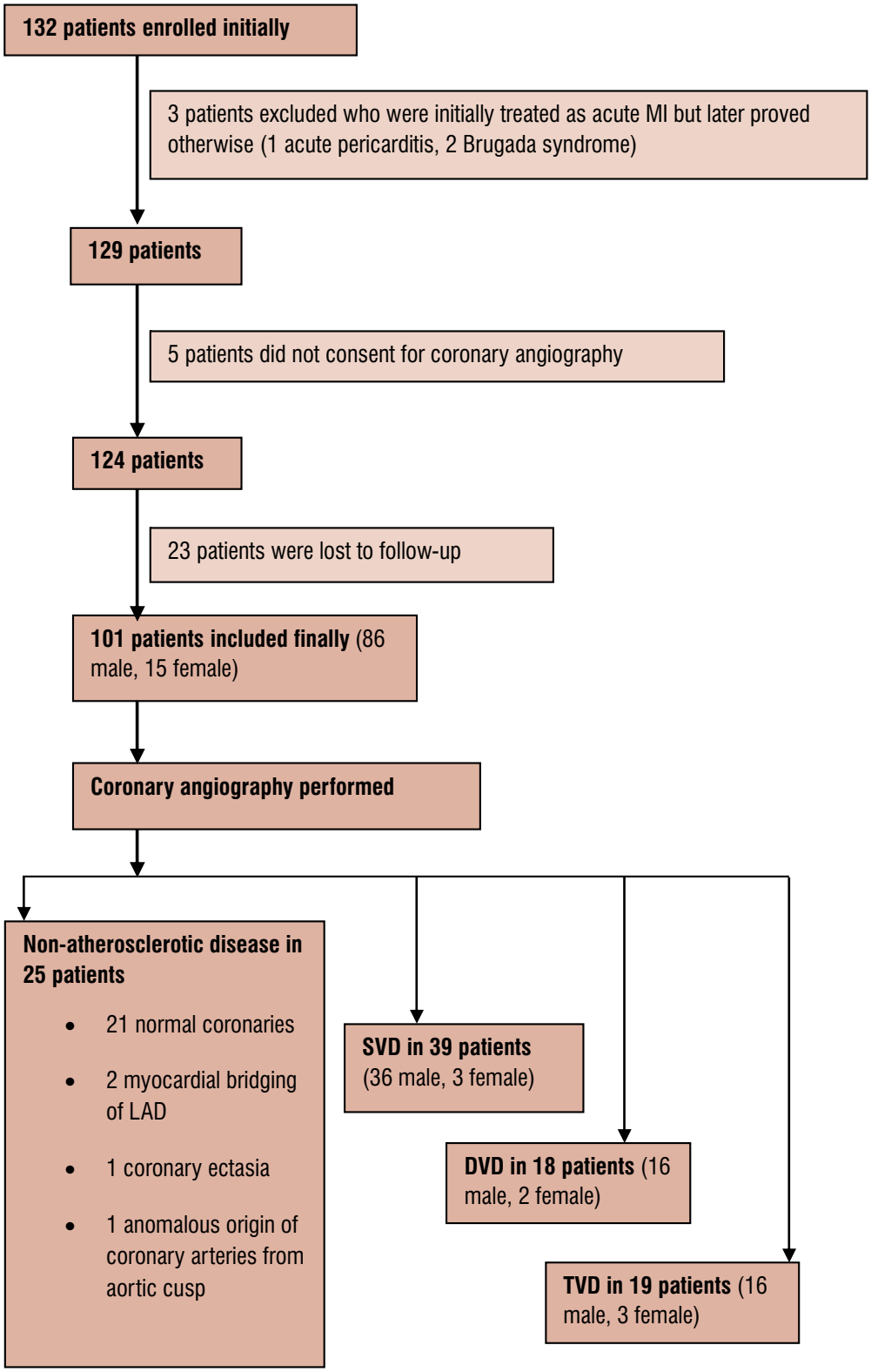

Table 1: Characteristics of the Coronary Arterial Lesions (n=132)

TOTAL NUMBER OF LESIONS	39 in SVD	36 in DVD	57 in TVD
LESION CHARACTERISTICS	**SVD (%)**	**DVD (%)**	**TVD (%)**
1. 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)
2. EDGES			
• concentric	20 (51.28)	22 (61.11)	32 (56.14)
• eccentric	10 (25.64)	10 (27.77)	12 (21.05)
3. LENGTH			
• discrete	13 (33.33)	15 (41.66)	13 (22.80)
• tubular	14 (35.89)	10 (27.77)	13 (22.80)
• diffuse	04 (10.250)	07 (19.44)	18 (31.57)
4. OCCLUSION			
• 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
• recanalized	03 (7.69)	00	00
5. 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)
6. THROMBUS			
• present	05 (12.82)	02 (5.55)	01 (1.75)
7. 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)
• C2	00	00	00

DISCUSSION

On studying the pattern of coronary arterial involvement in our study patients, we came across a relatively high frequency of angiographically normal coronary arteries, almost one fourth of the total study population. This important finding of our study conflrms with 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 al in UK in 1995 is worth mentioning.[18] In our study, we observed that there was a dominance of normal coronaries and SVD, and complex 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 TIMI flow has been found in 20% of the total 132 lesions (23%, 11% and 24% of SVD, DVD and TVD respectively). 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 SCAI lesion classification system 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.[24-27]

The less extensive coronary artery disease and high prevalence of complex lesions observed in younger patients in our study might suggest that premature coronary artery disease is associated with rapid disease progression (plaque rupture, plaque complication, or both) rather than with a gradually evolving process. 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

We found that very young (age < 35 years) patients who sustain a myocardial infarction, have less extensive coronary artery disease but complex morphologic features, with a high incidence of angiographically normal vessels and relative paucity of left main coronary arterial involvement.

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