

Young Hearts go Ischemic too

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Abstract

Introduction: Young presentation of acute coronary syndrome (ACS) has been poorly described in literature. We hereby evaluate patients younger than 30 years.

Material and Methods: In this prospective study we enrolled 1377 patients who underwent coronary angiography for symptoms concerning for acute coronary syndrome over a period of one year.

Results: Male predominance (100%) was seen among the young patients (less than 30 years) with most common presentation being chest pain. Incidence of ST elevation myocardial infarction (STEMI) was significantly higher (75%) than non-ST elevation myocardial infarction/ unstable angina (NSTEMI/UA). Most common associated risk factor was current smoking (41.6%). As compared to elderly, young patients were seen to have better outcome with percutaneous coronary interventions (PCI) and thrombolysis.

Conclusions: Very young <30 years suffer from ischemia too and may differ in presentation, risk factors and outcome as compared to old. Primary prevention of avoidable risk factors should be aggressively promoted among young.

Introduction

Considering the potential years of life lost, acute coronary syndrome (ACS) is becoming a major concern in young population. ACS is a term that is applied to various manifestations of ischemic heart disease which can range from unstable angina, non ST elevation Myocardial infarction (NSTEMI) to ST elevation MI (STEMI).¹ Various risk factors that can contribute to an early occlusion of coronary vessels include diabetes mellitus, hypertension, obesity, smoking, dyslipidemia, various genetic factors and a hereditary prevalence. ACS manifests most commonly as sudden onset chest pain due to ischemia caused by occlusion of one or more main coronary arteries or its branches.² Though the overall prevalence of coronary syndrome is much more in middle aged and elderly population but presently it is no more an exception in young.³ Considering the morbidity and mortality burden associated with ACS, we certainly need to draw our attention towards its clinical presentation, management and outcome in young patients.

This prospective study was designed with an aim to assess acute coronary

syndrome: its various manifestations, risk factors, treatment measures and the clinical outcome with a short term follow up in young patients aged 30 years or less. The usual study of ACS in young has been for population <45 years or in 30-45 year range. To the best of our knowledge ours is among the very few studies in medical literature where such a young presentation of ACS has been evaluated.

Material and Methods

Patient selection

Consecutive 1377 patients admitted with ACS who underwent coronary angiography over a span of one year were studied. Majority of patients were over 40 years of age (1303/1377) while 74 patients were under 40 years. 62 out of 74 were in the age group 30-40 years and 12 out of 74 were under 30 years. All these 12 young patients were males. In our series, these 12 patients were evaluated for the clinical presentation, various cardiovascular

risk factors, prompt management measures and their clinical response. Review of the history and physical examination recorded at the time of admission yielded information about risk factor and presentation. Data collected included demographics, smoking habits, drug use, family history of cardiovascular disease, hypertension, glucose intolerance or hyperlipidemia and physical activity at the onset of myocardial infarction. Location of infarction, angiographic results, complications, and other follow-up data were added as they were collected.

Clinical diagnosis

ACS comprised of one of the following diagnosis: unstable angina, NSTEMI and STEMI. The clinical diagnosis of ACS was based on few parameters such as presenting symptoms and the initial electrocardiogram findings. A change in the level of cardiac biomarkers (creatinine kinase, CK-MB, troponin) with one value being above the 99th percentile of upper reference limit (URL) is required for diagnosing MI. In addition to symptoms and ECG changes, new regional wall abnormality also point towards the diagnosis of MI. Based on the ST segment elevation on initial ECG along with elevated cardiac markers, diagnosis of STEMI was made while patients falling into the category of NSTEMI presented with cardiovascular symptoms or ECG changes suggesting ACS or both with elevated cardiac markers while unstable angina was diagnosed when patient presented with symptoms but the level of cardiac markers was within the normal range.⁴

Cardiovascular risk factors analysis

The various cardiovascular risk factors were analysed. Hypertension and diabetes mellitus were considered

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Table 1: Summarises symptoms, signs and angiographic findings amongst the young ACS patients (< 30 years)

| Symptoms | |
|-----------------------|---------------|
| Chest Pain | 91.6% (11/12) |
| Radiation of Pain | 8.3% (1/12) |
| Dyspnoea | 25% (3/12) |
| Signs | |
| Bradycardia | 8.3% (1/12) |
| Hypotension | 16.6% (2/12) |
| Cardiogenic Shock | 8.3% (1/12) |
| Risk Factors | |
| Hypertension | 25% (3/12) |
| Diabetes | 0 |
| Smoking | 41.6% (5/12) |
| Angiographic Findings | |
| Normal Coronaries | 16.6% (2/12) |
| Single Vessel Disease | 50% (6/12) |
| Double Vessel Disease | 16.6% (2/12) |
| Triple Vessel Disease | 0 |
| Ectatic Coronaries | 16.6% (2/12) |

to be present if diagnosed in accordance with the defined practice guidelines.⁵ History of tobacco smoking as well as current smoking was another risk factor that was analysed due to its adverse cardiovascular effects. A positive family history of coronary artery disease (CAD) was considered if CAD was seen in first degree relative.

Baseline investigations and coronary angiogram analysis

An initial electrocardiogram (ECG) formed the common baseline investigation for all patients. An echocardiography was performed to further analyse the cardiac chambers and cardiac wall abnormalities along with analysing ejection fraction. Baseline coronary angiogram was performed and analysed on Seimens Axiom Artis Zee cathlab. The digital angiograms were analysed using QCA at the cardiology catheterization lab of Christian Medical College, Ludhiana. Various quantified parameters included reference vessel's diameter, point of maximum stenosis, percentage diameter stenosis and length of stenotic segment.

Intervention and post-intervention analysis

An overall assessment of the severity and nature of coronary stenosis was performed to further decide the need of percutaneous coronary intervention (PCI). PCI with stenting was done depending upon degree of stenosis.

Statistical analysis

Statistical analysis was done with Statistical Package for Social Sciences

Table 2: Summarises the presentation, risk factors, treatment given and the final outcome among young ACS patients

| No | Age | Sex | Presentation | Risk factor | Precipitating factor | Vessels Involved | Treatment | Outcome |
|----|-----|-----|---------------------------------|----------------|----------------------|-------------------------|---|-----------|
| 1 | 30 | M | Chest pain | Smoking | At rest | Double Vessel | PCI with Stenting to Proximal LAD | Recovered |
| 2 | 22 | M | Chest pain Dyspnoea | None | At rest | Normal | Medical management | Recovered |
| 3 | 25 | M | Dyspnoea | None | At rest | Single Vessel | PCI with Stenting to Proximal LAD | Recovered |
| 4 | 30 | M | Chest pain | HTN | While exercising | Normal | Thrombolysis | Recovered |
| 5 | 24 | M | Chest pain | None | At rest | Single Vessel | PCI with Stenting to Mid LAD | Recovered |
| 6 | 28 | M | Chest pain | Smoking | At rest | Single Vessel | PCI with Stenting to Proximal LAD | Recovered |
| 7 | 27 | M | Chest pain Dyspnoea Shock | Smoking HTN | At rest | 100% Occluded left main | PCI with Stenting to Left Main Artery | Expired |
| 8 | 28 | M | Chest pain | None | At rest | Ectatic Vessel | Medical management | Recovered |
| 9 | 28 | M | Chest pain | HTN | At rest | Single Vessel | PCI with Stenting to Proximal LAD | Recovered |
| 10 | 28 | M | Chest pain | Smoking | At rest | Single Vessel | Medical management | Recovered |
| 11 | 26 | M | Chest pain | None | At rest | Ectatic Vessel | Medical management | Recovered |
| 12 | 30 | M | Chest pain | Smoking | At rest | Double Vessel | PCI with Stenting to LAD. STK prior to CAG. | Recovered |

(SPSS, version 16.0, SPSS, and Chicago, IL, USA). A descriptive analysis primarily focusing on percentage distribution and incidence of clinical presentation, various risk factors and treatment outcome was performed.

Results

A total of 1377 patients admitted with ACS underwent coronary angiogram. Young patients aged < 30 years accounted for 0.87% of the total coronary angiograms performed in our institution during the study period.

A clear male predominance (100%) was seen with none of the young patient aged <30 being female. Among these young males various presentations were analysed. Most frequent presenting symptom observed was chest pain though with a variable duration with or without radiation of chest pain. However bradycardia (8.3%), dyspnoea (25%) and signs of cardiogenic shock (8.3%) were less commonly observed among young. Amongst the young, incidence of STEMI was significantly higher (75%) than NSTEMI/UA (25%). The most common risk factor seen

was current smoking (41.6%) while hypertension was seen in 25% of young patients.

Coronary angiographic findings were assessed. A typical picture of diffuse atherosclerotic lesions involving multiple vessels was less common. Single vessel disease was the most common angiographic finding seen in 50% of young ACS patients while 16.6% showed a double vessel coronary artery disease.

Different therapies were based on the angiographic findings and the clinical diagnosis. PCI with stenting and thrombolysis were more commonly used in patients with STEMI (88.8%) while a conservative management and symptom based approach was a common line of action for patients with NSTEMI/UA. A good clinical outcome was seen in young patients from both PCI as well as thrombolysis. Only one patient presenting late with cardiogenic shock expired during hospitalisation while the rest showed a good response.

Discussion

Our analysis emphasises various

differences in presentation, risk factors, clinical outcome of ACS among young patients as compared to the old patients. Firstly, the commonest presenting complaint was chest pain as against older age group where signs of frank heart failure are more commonly seen.⁶ Secondly, higher incidence of STEMI was found in young patients (75%).

As seen by Tuzcu et al⁷ smoking was the commonest risk factor (41.6%) adding to the early occlusion of coronaries in our analysis too. A favourable clinical outcome was the most positive difference analysed in our study. All our patients less than 30 years of age were males. This is in accordance with the study conducted by LM Branco et al.⁸ This may be due to the more widespread prevalence of risk factors like smoking and hypertension among young males. The low incidence of MI in young women limited our ability to investigate this entity adequately in young females. None of our patients who had ACS at less than 30 years of age was a female. Risk factors associated with MI in men had similar implications in women, with oral contraceptives being an additional consideration.

Schoenenberger et al. showed that chest pain is the commonest presentation of ACS in young.¹ Our study affirms this statement and further shows that in comparison to signs of frank heart failure, chest pain was the most frequent presentation with a high incidence of 91.6%. Other symptoms such as bradycardia, hypotension were a less common presentation of ACS.

Morillas et al found STEMI to be the presenting feature in 80% of young patients.⁹ Our study is in accordance with their study as STEMI was seen in 75% of patients and NSTEMI/UA in 25% of patients. This could be attributed to the commoner single vessel involvement with plaque rupture among young as compared to a more diffuse atherosclerotic disease in the older patients.

As previously analysed and reported regarding the cardiovascular risk factors,¹⁰⁻¹³ we saw similar high risk prevalence with tobacco smoking. Diabetes and hypertension were less commonly seen as against the older age group. Family history of premature CAD was present in none of our patients as compared to 40.2% by Mark

et al in American population. This may be due to the changing lifestyle and eating habits among Indians.

Studies conducted previously have shown high prevalence of illicit substance abuse leading to cardiovascular manifestations. One of the most common among these was cocaine. In our study none of the patients had history of cocaine abuse, though this may be underreported due to social taboos.¹⁴

In young patients sudden rupture in a previously insignificant plaque may lead to acute presentation. An acute physical stress or an emotional strain leads to a sudden increase in the coronary shear forces. Along with the genetic predisposition vasospastic component predisposes to the sudden plaque rupture. It has been seen that exertion prior to myocardial infarction is more common in younger patients or in those with normal coronaries, suggesting coronary spasm as a possible etiology.¹⁵ If we successfully characterize and understand the mechanism of disease in young, the preventive and curative measures will be vastly improved. Although no firm association could be established, one of our patients presented with sudden onset chest pain while playing cricket. Coronary angiogram showed dissection and occlusion of proximal LAD.

In our study only 16.6% of young presenting with ACS had normal coronary vessels. Majority had a single vessel involvement as previously seen by Schoenenberger et al.¹ Single vessel disease is a major target of reperfusion therapies and thrombolysis. A favourable outcome was seen in majority of our patients which is in accordance with the mortality analysis reported previously. A probable explanation could be less extensive disease among young and a prompt pharmacological or catheter intervention. Percutaneous stenting as well as thrombolysis showed a good response in STEMI and NSTEMI patients with a quick recovery in majority of young.

Arzamendi et al¹⁶ studied the cause of sudden cardiac death (SCD) among young and found that CAD was the main cause leading to 37% of deaths among 21-30 year old and a major share of 80% deaths in 31-40 year old. In our study majority of patients showed a

good response to various treatment measures while only one patient presenting late with cardiogenic shock expired during hospitalisation. There was no young patient with sudden cardiac death in our study.

The gender differences between smoking in males and females has been declining in the recent years and smoking prevalence among young is increasing specially in developing countries.¹⁷ It has been analysed that maintaining a healthy lifestyle throughout young adulthood does lower the cardiovascular disease risk profile during middle age. Strong public health and individual efforts are essential to improve and maintain healthy lifestyles in young adult.

Conclusions

To conclude, very young <30 years suffer from ischemia too and may differ in presentation, risk factors as well as outcome of ACS as compared to old. Symptoms pointing towards cardiac ischaemia should not be ignored in the young patients and it needs an early intervention and treatment. Awareness about heart attack, early referral and evaluation is important as a quick response to reperfusion therapy can be life saving. Every effort should be made to spread awareness about avoidable risk factors especially smoking in the young.

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