Myocardial Infarction in the ''Young'': Risk Factors, Presentation, Management and Prognosis

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Myocardial infarction (MI) in the ''young'' is a significant problem, however there is scarcity of data on premature coronary heart disease (CHD) and MI in the ''young''. This may lead to under-appreciation of important differences that exist between ''young'' MI patients versus an older cohort. Traditional differences described in the risk factor profile of younger MI compared to older patients include a higher prevalence of smoking, family history of premature CHD and male gender. Recently, other potentially important differences have been described. Most ''young'' MI patients will present with non-ST elevation MI but the proportion presenting with ST-elevation MI is increasing. Coronary angiography usually reveals less extensive disease in ''young'' MI patients, which has implications for management. Short-term prognosis of ''young'' MI patients is better than for older patients, however contemporary data raises concerns regarding longer-term outcomes, particularly in those with reduced left ventricular systolic function. Here we review the differences in rate, risk factor profile, presentation, management and prognosis between ''young'' and older MI patients.

Keywords   Young • Myocardial infarction • Coronary heart disease • Risk factor • Coronary angiography

Introduction

The leading cause of death in the world is coronary heart disease (CHD) [1] and while there is a large body of data available for CHD, literature focussing on premature CHD and myocardial infarction (MI) in the ''young'' is lacking. Consequences of MI can be devastating particularly at a ''young'' age due to its greater potential impact on the patient's psychology, ability to work and the socioeconomic burden. As ''young'' MI patients may be the main income producer of the family, the aftermath of MI can also affect multiple dependents. Clinicians may not appreciate the differences that exist between ''young'' and older MI patients.

In this paper we report the differences in rate, risk factor profile, presentation, management and prognosis between ''young'' and older MI patients.

Methods

A literature search was conducted via MEDLINE and GOOGLE for the years between 1980 and 2015 using the keywords ''young'' and ''myocardial infarction''. The search was restricted to papers published in the English language and in peer-reviewed journals.

Definition and Epidemiology

There is disparity in the literature on the definition of ''young'' with respect to premature CHD and MI. The term ''young'' varies from ≤40 [2–4] to ≤55 years of age [5]. Others have suggested 45 years as a cut-off when defining ''young'' with respect to MI [6–8]. As there is no universally accepted age cut-off, this review will not use a single definition but

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rather will accept the cut-off or range used by the authors of the data being reviewed.

There is a paucity of data on MI in the "young" relative to literature on CHD as a whole. Perhaps the most well-known of all epidemiological studies in cardiovascular medicine is, The Framingham Heart Study which reported a 10-year incidence of "young" MI (defined as <55 years of age) as high as 51.1/1000 in men and 7.4/1000 in women [9]. In contrast, McManus et al. reported an incidence of 66/100,000 of MI among patients aged between 25 and 54 years [10]. While this may appear relatively low, McGill et al. demonstrated an unexpectedly high prevalence of CHD in men under the age of 35 years with 20% shown to have advanced coronary artery lesions at autopsy [11]. Fournier et al. have reported higher rates of "young" MI with an incidence of approximately 4% in those aged ≤40 years [12]. Meanwhile, Doughty et al. demonstrated >10% of all MI patients admitted at their institution were "young", where they defined "young" as ≤45 years of age [13]. One of the highest rates of MI in the "young" was reported by Loughnan et al. who examined admissions to hospitals in Melbourne, Australia over a six-year period and reported that 20% were younger than 55 years of age [14]. This represented approximately 0.1% of the Melbourne population aged less than 55 years during the study period [15]. In contrast approximately 1% of the Melbourne population older than this age experienced MI over the same period [14,15].

Risk Factors

The extent of relative risk for future events of traditional cardiovascular risk factors are comparable in "young" and older adults [16]. The majority of patients suffering MI at a "young" age are reported to have at least one identifiable cardiovascular risk factor [6,17–19]. Hoit et al. reported a higher prevalence of smoking, family history of premature CHD and male gender among "young" MI patients compared with their older counterparts [6]. Others have supported this finding and, in addition, have demonstrated higher rates of hyperlipidaemia and lower rates of prior history of CHD, diabetes mellitus and hypertension in "young" MI patients compared to older MI patients [17,18,20–22].

There is data that suggests smoking may be the most important modifiable risk factor among "young" MI patients [21]. Yusuf et al. identified it as one of the most important risk factors associated with "young" MI [23]. They suggested the association of smoking and MI in the "young" has an odds ratio (OR) of 3.33 (99% confidence interval (CI), 2.86-3.87) compared to controls [23]. This was significantly higher than older individuals (OR 2.44: 99% CI, 2.86-3.87) [23]. Smoking rates among "young" MI patients are quoted between 51% and 89% [2,4,6,10,17,20,21,24–27]. The high prevalence of smoking among patients presenting to hospital with premature MI was also highlighted by Aggarwal et al. [2]. Smoking was found to be five times more prevalent among "young" MI patients than age- and gender-matched patients presenting to

hospital with non cardiac complaints [2]. In comparison to older patients, "young" MI patients smoked a greater number of cigarettes per day but had a lower pack year history as expected due to their younger age [21]. Of "young" MI patients presenting with ST-elevation myocardial infarction (STEMI), the rate of smoking was found to be highest among the youngest [28]. Oliveira et al. studied the association between smoking and MI among "young" men aged ≤45 years that smoked more than 15 cigarettes a day [8]. They demonstrated an OR for MI of 4.56 (95% CI, 2.32-9.00), in comparison with ex smokers [8]. This data appears to confirm the enduring detrimental effect of continuing smoking. The population attributable fraction (PAF) or risk (PAR) is a theoretical measure of the proportion of the disease burden attributable to a risk factor in the population at large. The PAF of smoking for MI among "young" men aged ≤45 years, according to Oliveira et al., is 63.5% (95% CI, 42.0-80.6) [8].

A family history of CHD or a family history of premature CHD (which is usually defined in the literature as documented CHD in a first-degree relative before the age of 55-60 years) is reported in 41% - 71% of "young" MI patients [4,6,20,21,24,25,27]. Compared to older individuals, "young" MI patients appear to have double the prevalence of family history of CHD [6,27] although some data suggests the increase in prevalence may be as high as four-fold [17]. This was illustrated by Chan et al. who reported an OR of 2.98 (95% CI, 2.26-3.94) for family history of premature MI among MI patients aged ≤45 years compared to older MI patients [17]. Zimmerman et al. reported that the prevalence of family history of CHD in "young" MI patients is only greater in men compared to their older counterparts [20]. Oliveira et al. demonstrated the adjusted OR of MI among "young" men aged ≤45 years that had a family history of MI in a first-degree relative of 1.84 (95% CI, 1.07-3.17), compared with those who did not [8]. The PAF of family history of MI for MI among "young" men aged ≤45 years, according to Oliveira et al., is 14.4% (95% CI, 5.3-33.9) [8]. Yusuf et al. confirmed a similar PAF (14.8% (99% CI, 11.7-18.5)) and highlighted the importance of family history as a risk factor in younger individuals [23].

There is a large gender bias with the vast majority of "young" MI occurring in men. The gender distribution of "young" MI in men is reported to be between 79 - 95% [2,10,17,21,24,25]. Chan et al. reported that 90% of patients presenting with MI who are aged 45 years or less were male compared to 68.4% (OR 3.59: 95% CI, 2.37-5.44) of older patients [17]. This is one potential reason that women, and "young" women in particular, may experience delays in prompt care and may appear to be neglected when they truly present with MI [29]. Contributing factors in women receiving prompt management of potential MI include cultural factors that may not be universal [29].

Hyperlipidaemia is a traditional risk for CHD in all age groups and appears to be associated with "young" MI [17,22]. The link however does not appear to be as robust as the risk factors already discussed. The presence of hyperlipidaemia is reported in more than half of "young" patients