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Acute Myocardial Infarction in the Elderly – The Differences Compared with the Young

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ABSTRACT

Objectives: The aim of the study was to determine the differences in presentation, complications, management and outcome of elderly patients with acute myocardial infarction (AMI) compared to young patients.

Materials and Methods: All case-notes with a discharge or death diagnosis of AMI between January and July 1999 at a restructured hospital in Singapore were reviewed retropectively. Patients were categorised into those younger than 65 years (young) and those 65 years or older (elderly). Data on the demographic and clinical profile of patients were collected.

Results: There were 112 young and 101 elderly AMI patients. Chest pain was the most common presentation in both age groups, but more likely in the young than the elderly (89.3% vs 66.3%; p<0.001). Atypical presentations were more likely in the elderly, with shortness of breath as the most common presentation (20.8% vs 5.4%; p<0.001). The elderly were more likely to have complications of cardiac failure (65.3% vs 25%; p<0.001) and cardiogenic shock (8.9% vs 0.9%; p=0.006). The elderly were less likely to receive thrombolytic therapy (35.8% vs 64.8%; p<0.001) as they were more likely to have contraindications (34.5% vs 6.8%; p=0.002). The elderly were also less likely to receive beta-blockers (21.8% vs 60.7%; p<0.001). In-hospital mortality was higher in the elderly (20.8% vs 2.7%; p<0.001). Cardiogenic shock complicating AMI was associated with high in-hospital mortality.

Conclusion: In AMI patients, chest pain was the most common presentation in both age groups, though less frequently in the elderly. Atypical presentations were more likely in the elderly, with shortness of breath as the most common atypical presentation. In elderly AMI patients, prevalence of cardiac failure was higher, use of beta-blockers was lower and in-hospital mortality was higher than young patients.

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INTRODUCTION

The elderly with acute myocardial infarction (AMI) have been reported to present with more atypical symptoms in western literature[1,2]. However, to date, there have been a lack of local studies on the extent of atypical presentations in elderly AMI patients. AMI is associated with significantly higher mortality in the elderly compared with the young[2-7], yet the elderly are treated less aggressively than the young[2]. Thrombolytic therapy has the greatest effect in the elderly even though there is an increased risk of haemorrhagic stroke[8,9]. The benefits of aspirin, angiotensin converting enzyme (ACE) inhibitors and beta-blockers in AMI have been substantiated in numerous trials[10], but their usage in elderly AMI patients may be lower than in younger patients[11].

The main aim of this study was to determine the differences in presentation, complications, management and outcome in patients 65 years or older (elderly) with AMI compared with those younger than 65 years (young) at a restructured hospital in Singapore.

Knowing the differences between the elderly and young AMI patients in our local population will help identify aspects which may need further evaluation to formulate strategies to improve outcome in elderly AMI patients.

MATERIALS AND METHODS

All case-notes with a discharge or death diagnosis of AMI (diagnosis code 410) at Changi General Hospital between January and July 1999 were reviewed retrospectively. The diagnosis of AMI[6] was defined by characteristic evolution of serum cardiac enzyme (creatine kinase) level including MB isoenzyme (CKMB) index to ≥5%, in additional to a history compatible with AMI or electrocardiographic (ECG) abnormalities or both. ECG abnormalities were defined as (1) evolution of pathological Q-waves (≥0.04s in

duration) or (2) ≥0.1mV ST-segment elevation in contiguous leads or (3) ≥0.1mV ST-segment depression or definite T-wave inversion or both. All cases of AMI were classified as either Q-wave MI or non-Q-wave MI. Patients for whom a diagnosis of AMI by enzymes was made but whose ECG did not demonstrate typical ST-segment elevation with development of new Q-waves were classified as non-Q-wave MI. Sudden unexplained deaths with death diagnosis of AMI were excluded.

The following demographic and clinical profile were examined:

1. Age;
2. Gender;
3. Type of AMI;
4. Time of onset of symptoms to presentation to attending doctor at Accident & Emergency Department (for patients refered from the community) or to attending doctor in the ward (for in-patients who developed symptoms);
5. Type of presentation (symptoms);
6. Risk factors;
7. Complications;
8. Thrombolytic therapy for Q-wave MI and the reasons if thrombolytic therapy was not given;
9. Medications used; and
10. Outcome within that admission.

Patients were categorised into those younger than 65 years (young) and those 65 years or older (elderly). The data were entered into Microsoft Access database and analysed using SPSS software. Statistical analysis was done using Fisher's exact test for univariate analysis. Odds ratio with 95% confidence interval was calculated to quantify the risk differences between the two age groups. Multiple logistic regression model was used to compare the outcome (in-hospital mortality) after adjustment for baseline characteristics.

RESULTS

A total of 303 case-notes with discharge or death diagnosis of AMI (diagnosis code 410) were reviewed. However, only 213 patients satisfied the defined criteria of AMI. Twenty-five cases were incorrectly coded. The rest were either unstable angina, acute pulmonary oedema, or sudden unexplained deaths.

There were 112 young and 101 elderly AMI patients. Table I summarises the study results.

Gender

There were more females in the elderly AMI patients compared to the young patients (51.5% vs 17%; p<0.001).

Type of AMI

The young patients were more likely to have Q-wave MI (75.9% vs 52.4%; p<0.001) while the elderly patients were more likely to have non-Q-wave MI (47.6% vs 24.1%; p<0.001).

Onset of symptoms to presentation

There was no difference between the two age groups with regard to presentation within 12 hours from onset of symptoms (67.9% vs 59.4%; p=0.13). This was also true when only Q-wave MI patients were considered (30.6% vs 39.6%; p=0.18).

Presenting symptoms

Presenting symptoms of chest pain were classified as typical and all other symptoms as atypical, while asymptomatic was classified as silent. Chest pain was the most common presenting symptom in both age groups, but more likely in the young than elderly patients (89.3% vs 66.3%; p<0.001). Atypical presenting symptoms were more likely in the elderly than young patients (33.7% vs 10.7%; p<0.001). Of the atypical presenting symptoms, only shortness of breath was more likely in the elderly than young patients (20.8% vs 5.4%; p<0.001).

The same trend was noted when Q-wave and non-Q-wave MI were considered separately. For Q-wave MI, chest pain was more likely in the young than elderly patients (92.9% vs 73.6%; p=0.002) while shortness of breath was more likely in the elderly than young patients (15.1% vs 1.2%; p=0.002). For non-Q-wave MI, chest pain was more in the young than elderly patients (77.8% vs 58.3%; p=0.07) while shortness of breath was more in the elderly than young patients (27.1% vs 18.5%; p=0.29).

Risk factors

The young AMI patients were more likely to be smokers (68.8% vs 31.7%; p<0.001) and have hyperlipidemia (75.9% vs 43.6%; p<0.001) compared to the elderly patients. However, there was no difference between the two age groups with regard to the presence of hypertension (p=0.06), diabetes mellitus (p=0.06) and history of prior myocardial infarction (p=0.13). Also, only the elderly AMI patients tended to give a history of previous cardiac failure (p<0.001) at the time of presentation.

Complications

The elderly AMI patients were more likely to have complications of cardiac failure (65.3% vs 25%; p<0.001) and cardiogenic shock (8.9% vs 0.9%; p=0.006), while the young AMI patients were more likely to have no complications (62.5% vs

Table I. Summary of study results.

	Elderly (n=101)	Young (n=112)	p value	Odds ratio	95% Confidence interval
Mean age in years	73.0 (SD 6.8)	52.3 (SD 8.2)			
Range of age	65 to 95 years	31 to 64 years			
Gender					
Female	52 (51.5%)	19 (17%)	p<0.001	5.20	2.77 to 9.74
Male	49 (48.5%)	93 (83%)			
AMI type					
Q-wave MI	53 (52.4%)	85 (75.9%)	p<0.001	0.35	0.20 to 0.63
Non-Q-wave MI	48 (47.6%)	27 (24.1%)	p<0.001	2.85	1.60 to 5.11
Presentation within 12 hours	60 (59.4%)	76 (67.9%)	p = 0.13		
Median time of presentation	8 hours	5 hours			
Presenting symptoms					
Typical : Chest pain	67 (66.3%)	100 (89.3%)	p<0.001	0.24	0.11 to 0.49
Atypical : Shortness of breath	21 (20.8%)	6 (5.4%)	p<0.001	4.20	1.62 to 10.91
Syncope	3 (3%)	0 (0%)	p = 0.11		
Stroke	2 (2%)	3 (2.7%)	p = 0.55		
Confusion	3 (3%)	0 (0%)	p = 0.11		
Epigastric pain	2 (2%)	3 (2.7%)	p = 0.56		
Nausea	3 (3%)	0 (0%)	p = 0.11		
Asymptomatic: Silent	2 (2%)	0 (0%)	p = 0.22		
Risk factors					
Hyperlipidemia	44 (43.6%)	85 (75.9%)	p<0.001	0.25	0.14 to 0.44
Smoking	32 (31.7%)	77 (68.8%)	p<0.001	0.21	0.12 to 0.38
Hypertension	58 (57.4%)	51 (45.5%)	p = 0.06		
Diabetes Mellitus	47 (46.5%)	39 (34.8%)	p = 0.06		
History of myocardial infarction	15 (14.9%)	10 (8.9%)	p = 0.13		
History of cardiac failure	14 (13.9%)	0 (0%)	p<0.001		
Complications					
Cardiac failure	66 (65.3%)	28 (25%)	p<0.001	5.66	3.00 to 10.72
Cardiogenic shock	9(8.9%)	1 (0.9%)	p = 0.006	10.86	1.37 to 73.87
Arrhythmias	27 (26.7%)	25 (22.3%)	p = 0.28		
No complications	23 (22.8%)	70 (62.5%)	p<0.001	0.18	0.10 to 0.32
Medications					
Aspirin or Ticlopidine	95 (94.1%)	110 (98.2%)	p = 0.11		
ACE inhibitors	67 (66.3%)	82 (73.2%)	p = 0.17		
Beta-blockers	22 (21.8%)	68 (60.7%)	P<0.001	0.18	0.10 to 0.33
In-hospital mortality	21 (20.8%)	3 (2.7%)	p<0.001	9.54	2.75 to 33.08

22.8%; p<0.001). There was no difference between the two age groups with regard to occurrence of arrhythmias (ventricular tachycardia or fibrillation, bradycardia or heart blocks and atrial fibrillation).

The same trend was noted when Q-wave and non-Q-wave MI were considered separately. For Q-wave MI, the elderly AMI patients were more likely to have complications of cardiac failure (66% vs 23.5%; p<0.001) and cardiogenic shock (13.2% vs 1.2%; p=0.005), while the young AMI patients were more likely to have no complications (60% vs 11.3%; p<0.001). For non-Q-wave MI, the elderly AMI patients were more likely to have complications of cardiac failure (64.6% vs 29.6%; p=0.003), the young AMI patients were more likely to have no complications (70.4% vs 27.1%; p<0.001) and both age groups were as likely to develop cardiogenic shock (0% vs 4.2%; p=0.41).

Medications

The elderly AMI patients were less likely to receive beta-blockers (60.7% vs 21.8%; p<0.001) compared to the young patients. Even after correcting for the higher occurrence of cardiac failure and cardiogenic shock in the elderly AMI patients, they were still less likely to receive beta-blockers (p<0.001). There was no difference between the two age groups with regard to the use of anti-platelet agents and ACE inhibitors. Aspirin was the anti-platelet agent of choice. Ticlopidine was used in eight patients because of aspirin allergy.

Outcome

The elderly AMI patients had higher in-hospital mortality compared to the young patients (20.8% vs 2.7%; p<0.001). Of note, all patients with cardiogenic shock died. Of these patients, nine were elderly and

one young. However, mortality may be influenced by baseline characteristics such as age group, gender, hyperlipidemia, smoking, hypertension, diabetes mellitus, history of prior myocardial infarction, history of previous cardiac failure. Therefore, multiple logistic regression analysis was used to adjust for baseline characteristics (age, group, gender, hyperlipidemia, smoking, hypertension, diabetes mellitus, history of prior myocardial infarction, history of previous cardiac failure), and only the elderly age group was found to be associated with higher in-hospital mortality.

In the young AMI patients, the in-hospital mortality rate of Q-wave and non-Q-wave MI were 2/85 (2.4%) and 1/27 (3.7%) respectively (p=0.57). In the elderly AMI patients, the in hospital mortality rate of Q-wave and non-Q-wave MI were 14/53 (26.4%) and 7/48 (14.6%) respectively (p=0.22). Thus, there was no association between AMI type and in-hospital mortality in both age groups.

Table II shows the use of thrombolytic therapy for Q-wave MI patients and the reasons for not giving thrombolytic therapy.

Table II. Thrombolytic therapy for Q-wave MI.

	Elderly (n = 53)	Young (n = 85)
Given thrombolytic therapy	19 (35.8%)	55 (64.8%)
Reasons for not giving thrombolytic therapy		
• Presented too late (later than 12 hours)	21 (39.6%)	26 (30.6%)
• Collapsed requiring prolonged resuscitation	5 (9.4%)	2 (2.3%)
• Refused	3 (5.7%)	–
• Had stroke	2 (3.8%)	2 (2.3%)
• Had high systolic blood pressure	1 (1.9%)	–
• Gastrointestinal bleeding	1 (1.9%)	–
• Terminal carcinoma of the lung	1 (1.9%)	–

Thrombolytic therapy

Thrombolytic therapy was considered for Q-wave MI patients who present within 12 hours from onset of symptoms. The elderly AMI patients were less likely to receive thrombolytic therapy compared to the young patients (35.8% vs 64.8%; p<0.001). After excluding those who presented too late or refused thrombolytic therapy, the elderly AMI patients were also more likely to have contraindications for thrombolytic therapy compared to the young patients (34.5% vs 6.8%; p=0.002).

DISCUSSION

In this study, we found that elderly AMI patients were more likely to be females compared to young AMI patients. This trend was similarly noted in other study populations[5,12,13]. One of the possible reasons for this could to be loss of estrogen and its cardio-protective effects in the elderly females[14]. However, the role of hormone replacement therapy to reduce the risk of coronary artery disease in postmenopausal women is still controversial[14].

As reported in other studies, this study also showed that the elderly patients were more likely to have non-Q-wave MI[6] (47.6% vs 24.1%) while young patients were more likely to have Q-wave MI (75.9% vs 52.4%).

Similar to another western study[1], this study showed that although chest pain was the most common presentation in AMI in both age groups in our local population, it was less frequent in the elderly (66.3% vs 89.3%). Atypical presentations were more likely in the elderly, with shortness of breath as the most common atypical presentation (20.8% vs 5.4%). The other atypical and silent presentations were uncommon in our population, although this could be due to our relatively small sample size or to the lack of documentation of atypical symptoms by attending doctors. In contrast, the western study[1], reported that shortness of breath was equally common in both age groups while syncope, confusion and nausea were more likely in the elderly. This highlights the possibility that different populations may have different presentations. Knowledge of the common local atypical presentations would increase our awareness in considering an acute cardiac event when the elderly present atypically. By detecting AMI earlier, the outcome may be improved with early intervention.

Risk factors of hypertension and diabetes mellitus were just as prevalent in both the young and elderly AMI patients while smoking and hyperlipidemia were more prevalent in the young AMI patients. Knowing the prevalence of various modifiable risk factors among the two age groups may help in planning appropriate secondary preventive programmes to target the different age groups. Emphasis for the elderly population should be more targeted at better control of hypertension and diabetes mellitus, while for the young population, in addition to hypertension and diabetes mellitus, smoking habits and control of hyperlipidemia should be emphasised.

Elderly AMI patients tend to give a history of previous cardiac failure. Complications of cardiac failure (65.3% vs 25%) and cardiogenic shock (8.9% vs 0.9%) were also more common in the elderly AMI patients than the young. It is known that cardiac failure is an important predictor of poor outcome after AMI[15]. It is also recognised that even with "best practice" interventions, the prognosis for established cardiac failure in the elderly patients remains poor[16]. Also, the management of cardiac failure in elderly patients is often complicated by multiple comorbid conditions, polypharmacy and the difficulty in tolerating recommended target doses of drugs[16,17]. Therefore, future research should be aimed at developing more effective strategies for prevention of cardiac failure in elderly patients.

The elderly AMI patients were as likely to receive anti-platelet agents and ACE inhibitors. This is a healthy trend. The elderly were, however, less likely to receive beta-blockers compared to the young (21.8% vs 60.7%). This trend was also noted in another study[18]. It is unclear why this is so, though in our study, cardiac failure and cardiogenic shock were probably not the main reasons. More research is needed to evaluate the use and tolerability of beta-blockers in elderly patients with the aim of increasing the usage of beta-blockers in elderly patients to improve outcome after AMI.

As seen in other studies, elderly AMI patients were less likely to receive thrombolytic therapy (35.8% vs 64.8%) compared to the young patients[8,19,20]. Thrombolytic therapy was given if the Q-wave MI patients present within 12 hours from onset of symptoms. It is generally regarded that elderly AMI patients tend to delay seeking medical assistance after onset of symptoms[2,13,21] but in this study, there was no difference between the two age groups with regard to presentation within 12 hours from onset of symptoms. This may be due to the easy access to hospitals in Singapore. Our study found that elderly AMI patients were more likely to have contraindications for thrombolytic therapy than the young patients (34.5% vs 6.8%) and this may explain why they were less likely to receive thrombolytic therapy.

Numerous studies have reported higher mortality in elderly patients with AMI[3,5,7,19]. This study showed that elderly AMI patients had higher in-hospital mortality compared to the young patients (20.8% vs 2.7%). Cardiogenic shock was associated with in-hospital mortality in AMI patients.

The main limitation of this study was that it was a retrospective study with a relatively small sample size. However, useful clinical information has been obtained in various aspects that will guide further evaluation of clinical practice guidelines, particularly for elderly AMI patients.

CONCLUSION

Our study showed that there were differences in various aspects between the elderly and young AMI patients in our local population.

Even though chest pain was the most common presentation in both age groups, the elderly were more likely to have atypical presentations than the young. It is important to recognise that shortness of breath was the most common atypical presentation of AMI in the elderly in our local population. The prevalence of cardiac failure was higher in the elderly AMI patients. The use of beta-blockers in the elderly after AMI was lower than in the young. Elderly AMI patients had higher in-hospital mortality. Cardiogenic shock complicating AMI was associated with high in-hospital mortality. More research is needed to find effective strategies in the prevention and management of cardiac failure in the elderly and also ways to increase use of beta-blockers in the elderly with the hope of improving the outcome in elderly AMI patients.

REFERENCES

1. Bayer AJ, Chadha JS, Farag RR, Pathy MS. Changing presentation of myocardial infarction with increasing old age. J Am Geriatr Soc 1986; 34(4):263-6.
2. Tresch DD, Brady WJ, Aufderheide TP, Lawrence SW, Williams KJ. Comparison of elderly and younger patients with out-of-hospital chest pain. Clinical characteristics, acute myocardial infarction, therapy and outcomes. Arch Intern Med 1996; 156(10):1089-93.
3. Wang SW, Ren GC, Shio SF, Yu SY, Zhen FY. Acute myocardial infarction in elderly Chinese. A clinical analysis of 631 cases and comparison with 389 younger cases. Jpn Heart J 1998; 29(3):301-7.
4. Day JJ, Bayer AJ, Pathy MS, Chadha JS. Acute myocardial infarction: diagnostic difficulties and outcome in advanced old age. Age Ageing 1987; 16(4):239-43.
5. Yang XS, Willems JL, Pardaens J, De Geest H, Acute myocardial infarction in the very elderly. A comparison with younger age groups. Acta Cardiol 1987; 42(1):59-68.
6. Paul SD, O Gara PT, Mahjoub ZA, DiSalvo TG, O Donnell CJ, Newell JB, et al. Geriatric patients with acute myocardial infarction: Cardiac risk factor profiles, presentation, thrombolysis, coronary interventions and prognosis. Am Heart J 1996; 131(4):710-5.
7. Mehta RH, Rathore SS, Radford MJ, Wang Y, Krumholz HM, Acute myocardial infarction in the elderly: differences by age. J Am Coll Cardiol 2001; 38(3):736-41.
8. Reardon M, Camm JA. CME paper: Acute myocardial infarction in the elderly. Am J Geriatr Cardiol 2000; 9(3): 138-42.
9. Haase KK, Schiele R, Wagner S, Fisher F, Burczyk U, Zahn R, et al. In-hospital mortality of elderly patients with acute myocardial infarction: Data from the MITRA Registry. Clin Cardiol 2000; 23:831-6.
10. Antman EM, Braunwald E. Acute myocardial infarction. In: Fauci AS, Braunwald E, Isselbacher KJ, et al, editors. Harrison s Principles of Internal Medicine. New York: McGraw-Hill, 1998; 1352-65.
11. Smith SC Jr. Drug treatment after acute myocardial infarction: Is treatment the same for the elderly as in the young patient? Am J Geriatr Cardiol 1998; 7(1):60-4.
12. Kam R, Cutter J, Chew SK, Tan A, Emmanuel S, Mak KH, Chan CNS, Koh TH, Lim YL. Gender differences in outcome after an acute myocardial infarction in Singapore. Singapore Med J 2002; 43(5):243-8.
13. Tresch DD. Management of the older patient with acute myocardial infarction: difference in clinical presentations between older and younger patients. J Am Geriatr Soc 1998; 46(9):1157-62.
14. Chew S, Ng SC. Hormone replacement therapy (HRT) and ischaemic heart disease: Getting to the heart of the matter. Singapore Med J 2002; 43(1):41-4.
15. Spencer FA, Meyer TE, Gore JM, Goldberg RJ. Heterogeneity in the management and outcomes of patients with acute mycardial infarction complicated by heart failure: the National Registry of Myocardial Infarction. Circulation 2002; 105(22):2577-9.
16. Rich MW. Management of heart failure in the elderly. Heart Fail Rev 2002; 7(1):89-97.
17. Lien CT, Gillespie ND, Struthers AD, McMurdo ME. Heart failure in frail elderly patients: diagnostic difficulties, co-morbidities, polypharmacy and treatment dilemmas. Eur J Heart Fail 2002; 4(1):91-8.
18. Krumholz HM, Radford MJ, Yun Wang, Chen J, Marciniak TA. Early beta-blocker therapy for acute myocardial infarction in elderly patients. Ann Intern Med 1999; 131(9):648-54.
19. Boucher JM, Racine N, Thanh TH, Rahme E, Brophy J, Theroux P. Age-related differences in in-hospital mortality and the use of thrombolytic therapy for acute myocardial infarction. Canadian Medical Association Journal 2001; 164(9):1285-90.
20. Straznicky IT, French JK, White HD, Califf RM. Fibrinolysis for acute myocardial infarction in the elderly patient: Is it effective or too dangerous? Am J Geriatr Cardiol 1998; 7(1):22-7.
21. Gurwitz JH, McLaughlin TJ, Willison DJ, Guadagnoli E, Hauptman PJ, Gao X, et al. Delayed hospital presentation in patients who have had acute myocardial infarction. Ann Intern Med 1997; 126(8):593-9.