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Does Age Really Matter in Outcome Prediction Post CABG

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Abstract

Objectives: **This retrospective study observed the elderly patients (≥71 years old) undergoing lone CABG by single surgical team and same leading surgeon during the period of September 1997 to September 2007. The aim of the study was to find out whether chronological age is an independent mortality and major morbidity predicator of CABG surgery in Thai population.**

Materials and Methods: **One hundred and forty cases were divided into 2 groups; group A (younger age group) from 60-70 years old (n = 91) and group B (elderly group) from 71-89 years old (n = 49). The comparison of data was done under several variables such as preoperative risk factors, operative and post operative outcomes.**

Results: **Higher incidence of female gender in elderly (B) group, higher coronary risk factors and more critical angiographic lesions in younger (A) group were noted. Atherosclerotic diseases (CVA, PVD, and hypertension) as comorbid factors observed preoperatively were surprisingly not significantly different between the 2 groups. Although the incidence of renal dysfunction (Cr ≥2) was higher among elderly, it did not affect CABG outcome and cannot be used as a predictor for higher potential of post-operative dialysis. The universal acceptance of cardiogenic shock with preoperative IABP, emergency surgery, poor EF as potent in-hospital mortality predictors was positive in this study. Postoperative stroke rate was insignificantly different between the 2 groups. In-hospital mortality in elderly group was 1.5 times higher than the younger group but there was no statistical significance (p value).**

Conclusions: **CABG in the elderly carries certain surgical risks. However, chronological age, by itself, is not independent survival predictor. The inferior mid- and long-term survival in the elderly was merely due to biological nature of aging.**

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Introduction

The increase in life span of Thai population over the past decades has resulted in a significant increase in the number of people aged more than 70 years. Based on national statistical data derived from population studies in Thailand in the year 1994,[1] the total population was 59,243,740 and out of this, 4,011,854 aged over 60 which was 6.8% of total population. The ratio of male to female was 1:1.23. Thai female elderly had longer life expectancy (Table 1).

In 2007, 13 years later, from data of Mahidol University[2] derived from Thai population studies of 23,829,000, there was 6,824,000 with age over 60 which was equivalent to 28.6% of total population (Table 2). Four folds of elderly population expansion were documented.

During the last decade, we have observed 10 fold increase in the number of patients aged 70 years and over who were referred for cardiac surgery, and this is despite a context of growing control of health care expenditures, where one might think that expensive procedures, such as cardiac operations, would be limited for such elderly patients.

Recent studies had shown that cardiac surgical procedures, particularly CABG performed in the elderly in otherwise good physical and mental health, can improve mortality, morbidity and quality of life of those patients.[3-9]

Table 1 Thai population in 1994; total population 59,243,740, 4,011,854 (6.8%) aged over 60, male to female ratio of 1:1.23

Age (yrs)	Male (%)	Female (%)	Total (%)
60-64	36.8	37.9	35.9
65-69	27.5	28.1	37.0
70-74	17.5	17.5	17.6
≥ 75	18.2	16.5	19.5
	1,801,780	2,210,074	4,011,854 (6.8) M:F = 1:1.23

Table 2 Population study by Mahidol University in 2007

Total population	23,829,000	%
Age 60-79	6,172,000	25.9
Age 80-99	648,000	2.72
Age ≥100	4,000	0.017

However, there was no report of results from Thailand. To analyse these issues further, we reviewed our early and mid-term results in patients aged 71 and over who underwent CABG surgery by the same surgeon at our unit between September 1997 and September 2007 and compared them to the Euroscore predicted mortality rates.

Materials and Methods

Medical records of 670 patients (463 male, 207 female) undergoing CABG surgery including 650 CABG, 18 CABG plus valve replacement/repair, 1 CABG plus CVSD and 1 AAA correction plus CABG, by single cardiac team over the 10-year period from September 1997 to September 2007 were reviewed (Table 3). Patients' age varied from 32 to 89 years with the highest peak at age 51-70 (Figure 1). Twenty nine were 75 and over, 9 were 81 and over. In this study, classification was done by grouping patients into 2 groups: group A (younger age group) aged 60-70, group B (elderly group) aged 71-89. Out of 331 patients, parameters including cardiac profiles, preoperative risk factors, angiographic reports, surgical data, post operative complications, and in-hospital mortality were completely obtained in only 140 patients.

A p value <0.05 was considered significant. Statistical analysis was performed by using student's t-tests for continuous variables or X^2 tests for categorical variables. Results were expressed as mean ± SD.

Follow-up information was obtained from hospital survivors through clinic visit or phone visit and was roughly 85% reliable. The longest follow-up was 8 years.

Results

Group A (younger) consisted of 91 patients, 55

Table 3 CABG in 670 patients (463 males, 207 females) from September 1997-September 2007

Procedures	Number of Cases	Male : Female
Lone CABG	650	
CABG + valves	18	
CABG + CVSD	1	
CABG + AAA	1	
	670	**463 : 207**

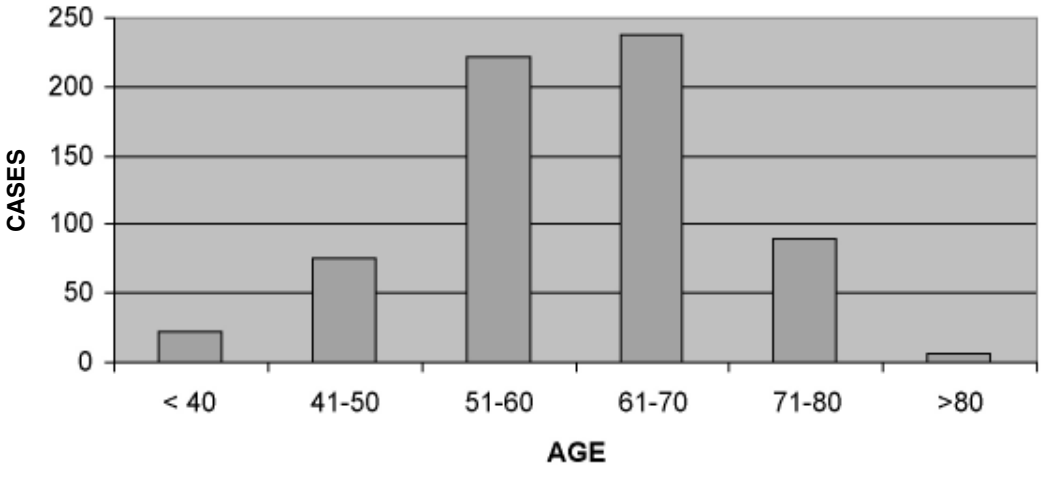

Figure 1 Cases of CABG and CABG plus performed by same surgeon from September 1997- September 2007

Table 4 Characteristics and preoperative data in 140 patients

Variables	Preoperative risk factors presented as mean ± SD (95%CI) or No (%) Age 60-70 (n = 91, 65%)	Age 71-89 (n = 49, 35%)	p Value
Clinical characteristics			
Age (year)	63.68 ± 2.2	74.88 ± 3.2 (71-89)	<0.05*
Female gender	36 (39.5%)	26 (55%)	<0.05*
Angiographic profile			
LM	39 (42.8%)	10 (20.4%)	<0.001*
TVD	65 (71.4%)	37 (75.5%)	NS
Number of diseased vessels	2.62 ± 0.6 (1-4)	2.76 ± 0.6 (1-4)	NS
Cardiac profile			
Unstable angina	18 (19.7%)	9 (18.3%)	NS
Acute MI	16 (17.9%)	14 (28%)	NS
Old MI	75 (83.3%)	35 (70%)	NS
History of CHF	8 (8.8%)	4 (8.1%)	NS
Poor EF (<35%)	18 (19.7%)	9 (18.3%)	NS
Fair EF (35-59%)	50 (55%)	19 (38.7%)	NS
Emergent surgery	6 (6.45%)	3 (6.3%)	NS
Pre-op IABP	2 (2.2%)	1 (2%)	NS
Cardiogenic shock	2 (2.2%)	1 (2%)	NS
Coronary risk factors			
Hypertension	66 (72.5%)	38 (77.5%)	NS
Diabetes	43 (47.2%)	19 (38.7%)	<0.032*
Hyperlipidemia	80 (86.8%)	19 (38.7%)	<0.0001*
Comorbidity			
CVA	4 (4.3%)	4 (8.1%)	
AAA	2 (2.1%)	1 (2%)	
PVD	0	1 (2%)	
Renal dysfunction(Cr ≥2)	8 (8.8%)	9 (18.3%)	<0.005*
Dialysis	5 (5.3%)	0	NS
COPD	4 (4.3%)	1 (2%)	NS
Malignancy	2 (2.1%)	0	NS

Table 5 Operative & postoperative data in 140 patients

Variables	Age 60-70 yrs (Group A) (n = 91, 65%)	Age >71 yrs (71-89 yrs) (Group B) (n = 49, 35%)	p Value
Grafts	2.62 ±	2.76 ±	
G-1	11 (11.8%)	2 (4.2%)	NS
G-2	21 (23.6%)	14 (29.7%)	NS
G-3	50 (53.8%)	26 (52%)	NS
G-4	9 (9.6%)	7 (7.5%)	NS
Complete revascularization	85 (93.3%)	39 (78%)	NS
OPCAB	13 (13.9%)	6 (12.7%)	NS
Transfusion	81 (89.1%)	45 (90%)	NS
Prolonged respirator >24 hr	3 (3.2%)	1 (2.1%)	NS
Major complications			
Stroke	2 (2.7%)	1 (2.1%)	NS
Dialysis	4 (4.3%)	2 (4.1%)	NS
Wound complications	0	2 (4.2%)	NS
Mediastinitis	1 (1.1%)	1 (2%)	NS
Observed			
In-hospital death	2 (2.1%)	3 (6.3%)	NS
Euroscore predicted death	5.59 ± 0.43%	10 ± 0.87%	-

men 36 women, with mean age of 63.68 and group B (elderly) consisted of 49 patients, 23 men 26 women, with mean age of 74.88. Pre-operative data were illustrated in Table 4. Female gender (55%) was significantly prevalent in group B (elderly) as compared to 39.5% in group A ($p < 0.05$). Male:female ratio coincides well with Thai general population at the same age.

There was no significant difference in cardiac profile between the 2 groups. All of 5 deaths were positive for the following known mortality predictors; emergency CABG, cardiogenic shock with the use of IABP and poor EF. Mortality rate in the elderly group was 1.5 times of that in the younger group, however it was not statistically significant.

There was more incidence of renal dysfunction ($Cr \geq 2$) in the elderly groups (18.8% : 8.8%, $p < 0.005$) but it cannot be used as predictor of potential postoperative dialysis as shown in Table 5. The incidence of dialysis was not different between the 2 groups.

While the comparison of the number of graft and major complications were not significantly different between the 2 groups, all patients had LIMA to LAD and SVG to the right system and circumflex artery. Only one patient had bilateral internal mammary arteries (BIMA) and mediastinitis did not occur in this case.

Two patients with mediastinitis presented with CHF, COPD, poor EF and obesity. Postoperative angiography was not routinely performed. Survival analysis failed to demonstrate advanced age as an independent predictor of hospital death. Nonetheless, there were significant independent predictors concluded from this study as mentioned above which includes history of CHF, emergency surgery, cardiogenic shock and previous uncontrolled infection.

Discussion

Patient Profile

It is universally accepted that atherosclerosis is common in advanced age. Hypertension, coronary artery disease, cerebrovascular accident, calcified aorta and peripheral vascular disease are all related to atherosclerotic vascular changes.[3,4]

However, comparison of coronary risk factors and angiographic findings between the 2 groups reflected the fact that our elderly group (B) was far more physically healthy (lesser number of patients with diabetes and hyperlipidemia) and less LM critical lesions than that of our younger age group.

The increasing number of female patients in the elderly group (B) was firstly due to longer life expectancy in Thai women compared to Thai men (ratio M:F = 1:1.23) (Table1). Secondly, it was known that atherosclerosis is more common in menopausal women.[3,4]

Surgical Technique Consideration

All patients underwent lone CABG using LIMA to LAD grafting, only 1 patient in group B had BIMA, LIMA → LAD, RIMA → RCA proper off pump. No other arteries such as radial artery or gastroepiploic artery were used. Saphenous vein graft was used for the anastomosis to the right system and circumflex territory.

Complete revascularization was our goal, however, data in Table 5 failed to show 100% complete revascularization due to discrepancy in judgment among cardiologists and surgeons as to which arteries to be grafted.

Mediastinitis in 2 patients were not related to BIMA/LIMA grafting but rather to COPD/low cardiac output syndrome and obesity.

In late 2004, off-pump CABG was introduced in our unit. It clearly facilitates recovery with few complications.[5-7] The major benefit would be for patients with calcific aorta which carries risks of post-operative stroke and patients with poor LV function.

Out of 19 off-pump patients, none developed stroke postoperatively and there was no conversion. Six of 19 patients were over 75 years of age. All of them had rapid recovery. The ICU and hospital stay was significantly shorter than those undergoing conventional CABG.

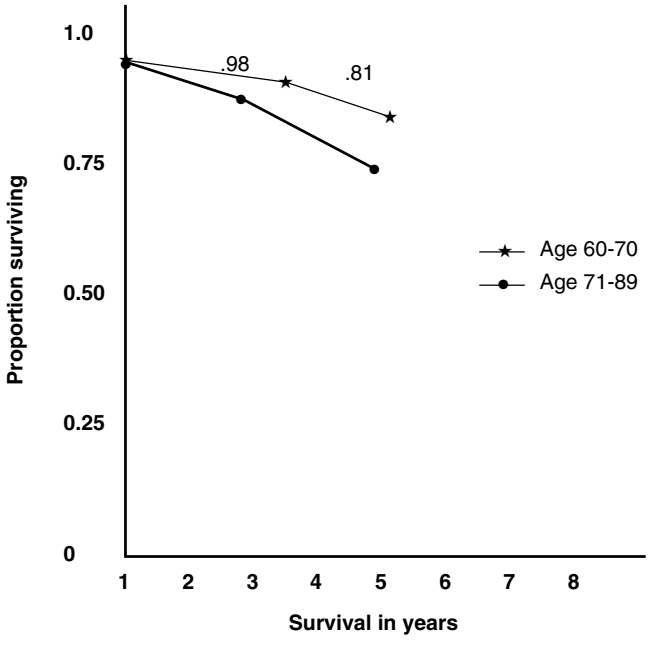

Figure 2 Survival in the elderly (review of 52 patients aged 60-70 and 18 patients aged 71-89)

Early Results

Several studies reported that increasing age is a risk factor for in-hospital and long-term mortality after bypass surgery.[9-12] Peterson and colleagues, in a study of 24,461 CABG patients aged 80 years or older, concluded that elderly patients faced high surgical risks and expensive hospital costs.[8]

Our study showed that in-hospital mortality rate in group B (elderly) was 6.3% (3/49) which was higher than that of previous reports (~3%).[11,12] This is probably due to a smaller size of sample (49 elderly patients) in this study.

Although mortality in elderly group was 1.5 times higher than that of the younger (A) group, it was not statistically significant (p = NS).

We observed that age was not an independent factor for in-hospital death and major complications. The 3 deaths in the elderly group were high-risk patients who presented with cardiogenic shock, acute MI and very poor LV function preoperatively.

The multivariate preoperative predictors of in-hospital death regardless of age included congestive heart failure, emergency surgery, cardiogenic shock, and the use of IABP pre-operatively, which were similar to previous reports.

Long Term Results

Our results demonstrated greater number of late deaths in the elderly (89% and 78% survival rates at 3 and 5 years respectively) than that in the younger age group (98% and 81% survival rates at 3 and 5 years respectively) (Figure 2).

These figure cannot match with previous report which was conducted among octogenarian groups, however it showed similar results to that of Japan.[13-22]

Limitations of Study

The sample size in this study was small; particularly the elderly group (B). It was also a retrospective review

of the performance of one single surgeon in a single unit which might affect operative results.

The fact that our cardiac unit is a tertiary referral unit where most of our patients would obviously be sent back to their cardiologists postoperatively, led to a relatively high incidence of lost track of follow-up and details of deceased patients, i.e. causes of death, etc.

CONCLUSIONS

In conclusion, successful surgical revascularization in the elderly can be performed with acceptable risks. Skillful hands, awareness and accurate assessment of pre-operative risk factors, individualization plus dynamic problem solving are all mandatory to optimize high success rate and low mortality and morbidity rate.

This study clearly shows that age is not sole independent factor to in-hospital death, it would be unjustified if advanced age is ignored at the time of and after CABG surgery.

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