Demographic Profile and Short-term Outcomes of Very Elderly Patients under- going Percutaneous Coronary Intervention for Acute Coronary Syndrome - A Retrospective Analysis

Deepika Mittal[1], Purushottam Mittal[2], Praveen Kothari[3], Meenaxi Sharda[4]

Abstract

Objectives-Optimum Revascularization strategy in very elderly population with Acute Coronary Syndrome (ACS) is currently unclear. There is reluctance on the part of physicians to recommend Percutaneous Coronary Interventions (PCI) in India because of financial constrains and fear of the complications. In this retrospective analysis we aimed to identify the demographic profile and acute outcomes of very elderly patients who have undergone percutaneous coronary intervention as compared to those treated conservatively.

Material and Methods -Out of total cohort of 198 patients more than 80 years of age, data of 45 patients (23%) who underwent percutaneous coronary intervention were retrospectively analyzed for demographic profile, treatment strategy and short term outcomes compared with 153 conservatively treated patients.

Results- Over a period of 3.5 year, 198 patients in the very elderly group were admitted with ACS. PCI was performed in 23% of them. Patients treated with PCI were younger (84 vs 87 year), had less number of diseased vessels (1.8 vs 2.4), better LV function at admission (EF 51.3% vs 43.0%) and had less co- morbidities. In-hospital and 1 month post discharge mortality was lower in patients treated with PCI (8.8% vs 22.2% and 11.1% vs 26.1%). They also had lower re-hospitalization rate for heart failure than those treated conservatively (8.9% vs 23.5%).

Conclusion- PCI may yield better results than conservative treatment strategy in carefully selected octogenarians with one or two vessel disease with preserved ejection fraction and minimal co-morbidities who are not at a very high risk of acute contrast induced kidney injury.

Key word- Acute Coronary Syndrome. Percutaneous Coronary Intervention. Very elderly patients

1. Assistant Professor, Department of community medicine. Coordinator, Medical Education Unit, Government Medical College, Kota, Rajasthan, India; 2. Chief Interventional Cardiologist, Sudha Hospital, Kota, Rajasthan, India; 3. Interventional Cardiologist, Sudha Hospital, Kota, Rajasthan, India; 4. Professor of Medicine. Head, Department of Geriatrics, Government Medical College Kota, Rajasthan, India.
Address for Correspondence: Dr Deepika Mittal 2, Jawahar Nagar, Kota, Rajasthan. India. 324005.
E-mail-drmittaldeepika@gmail.com

Introduction

The widespread availability of percutaneous coronary interventions (PCI) has changed the outcome of acute coronary syndrome (ACS) in general population[1]. But data on outcomes after PCI in very elderly are limited[2]. The reason being, very elderly patients, are frequently under-represented in clinical trials[3]. The mortality rate of patients with acute coronary syndrome remains high in the elderly[4]. Current studies have reported that invasive strategies in elderly patients with ACS are beneficial with lower in-hospital

mortality[5]. In the Indian scenario many eligible elderly patients are denied PCI either because of financial constraints or unwillingness of relatives due to fear of complications.[6]

Materials and Methods

Study Objective- In this retrospective analysis we aimed to identify the demographic profile and population characteristics of patients who had undergone percutaneous coronary intervention and assessed their short-term outcomes as compared to those who were treated conservatively.

Study design

Study Population: Analysis of Data from 1414 patients admitted to a tertiary cardiac care institute with the primary diagnosis of acute coronary syndrome (ACS), during a period of 3.5 years, from 1st January 2012 to 30th June 2015 was done. Out of these 1414 patients, 198 patients were in the age group of more than 80 years at the time of admission, as reported by the relatives. This cohort of 198 patients, who represented the 14% of total ACS patients, was analyzed retrospectively for the demographic profile, risk factors, and co-morbidities. Their treatment strategy and short-term outcomes were assessed.

Inclusion criteria: for diagnosis of Acute Coronary Syndrome were

1. Typical chest pain presenting for ≥20 min;
2. Ischemic electrocardiographic changes accompanied by the ST-segment deviation of 1 mm or more (0.1 mV) in at least two contiguous leads;
3. Troponin I positivity in at least one blood sample drawn 8 hours after the symptom onset.

ACS was diagnosed if any 2 of these criteria was fulfilled. Clinical data including socio-demographic variables, medical history, laboratory investigations and therapeutic procedure done were analyzed in detail. Course in the hospital with the final outcome at the time of discharge and one-month follow-up data was also recorded with the record of all the events during this period.

Coronary angiography and coronary intervention

All patients underwent non-invasive cardiac evaluation; coronary angiography was performed only after the patient and responsible relatives; both agreed to give informed consent for CAG and PCI. PCI was performed as per Appropriate Use Criteria (AUC) established by American Heart Association. Route of coronary angiography, PCI procedure (trans-radial or trans-femoral) and choice of the coronary stent was left to the operator.

A uniform policy of "Culprit vessel revascularization" in very elderly patients was followed. Non-culprit lesions were treated conservatively by cardiologist irrespective of severity.

Mortality and causes of death

In - hospital mortality was defined as any death during index hospitalization (usually 5 to 7 days).

Short-term mortality was defined as any death within one month from index admission or up to first follow-up, whichever was longer. For the patient who did not report to hospital after discharge or died elsewhere, the sequence of events was ascertained by telephonic interviews with the family and/or by examining the clinical records.

Statistical analysis

Continuous data were presented as mean ± SD; discrete variables were displayed as absolute values and percentages. Quantitative data were analyzed by Student's T-test. For qualitative data, Fisher's Exact Test was used. A *p*-value of <0.05 was considered statistically significant. Data were analyzed using Social Science Calculator (www.socscistatistics.com). Survival analysis was done by MedCalc version 15.8 Medcalc bvba.

Results

Demographic and Clinical Profile

Baseline characteristics of all patients are presented in Table 1. PCI was performed in 45 patients, 153 patients were treated conservatively. The proportion of males was higher in PCI group (85% vs. 50%). They were relatively younger (Mean age 84 vs. 87 yr). Most of them were residents of the urban area (66.7%) and fell in the high or upper-middle-income group. Financial categorization in income group was made according to Kuppuswamy socioeconomic scale updated as per February 2016 consumer price index.

The patients in PCI group presented earlier after the onset of symptoms (4.4 vs. 11.6 hrs), had better LV function on presentation (EF 51.2 vs 43.0%) and had less severe co-morbidities (Table 2). They also had higher creatinine clearance as estimated by Cockroft- Gault equation (40.6 vs.

33.7), lower bleeding risk and their CAD was less severe as assessed by the number of diseased vessels (1.8 vs 2.4).

Table 1. Demographic Profile

Characteristic	PCI (n-45)	Non- PCI (n-153)	p-Value
Age (years)	84 ± 3.8	87±6. 7	<0.01
Sex, male, *n* (%)	38(85)	76 (50)	<0.05
Educational status (Graduation or higher)	10(22.2)	25(16.3)	0.37
Urban Residential Setting	30(66.7)	42(27.4)	<0.05
High or upper middle Income group n (%)	36(80.0)	48(31.3)	<0.05

Table 2. Risk Factor and Co-Morbidities

Characteristic	PCI (n-45)	Non- PCI (n-153)	p-Value
Hypertension, *n* (%)	15(33)	30 (20)	0.068
Diabetes mellitus, *n* (%)	9 (20)	46(30))	0.25
Smoking	8 (17.8)	15(9.8)	0.18
Obesity	14(31.1)	25(16.3)	0.34
Sedentary/ Dependent Life	12(26.7)	38(24.8)	0.84
Dyslipidemia	NA	NA	
Co-morbidities			
Prior CVA n (%)	4 (8)	10(6.5)	0.53
Prior COPD n (%)	5 (11)	35 (23)	0.09
Prior GI Bleeding n (%)	5 (11)	20 (13)	1.0

NA-Data Not Available

The proportion of Patients with inferior Myocardial infarction was higher in PCI group, in our study only two octogenarians with cardiogenic shock underwent PCI.

Coronary angiography and angioplasty procedures

Coronary angiography was performed in 68 patients. Out of these PCI was performed in 45 patients as 23 patients were not found suitable for PCI after the coronary angiogram, either because coronary anatomy was unsuitable for PCI (16 patients) or because the risk of contrast-induced kidney injury was estimated to be prohibitive following PCI (7 patients).

Table 3. Clinical Parameters

Characteristic	PCI (n-45)	Non- PCI (n-153)	p-Value
Symptom onset to hospitalization delay (h)	4.4 ± 2.9	11.6 ± 8.2	<0.05
Troponin I positivity n (%)	31 (68)	130 (85%)	0.027
Left ventricular ejection fraction (%)	51.3 ± 8.5	43.0 ± 9.2	<0.05
Average Heart rate (beats/min)	74.4±14.5	80.8±26.3	<0.05
Systolic blood pressure (mmHg)	110.1 ± 21.1	111.4 ± 24.4	>0.05
Est. creatinine clearance	40.6 ± 8.2.	33.7 ± 11.6	<0.05
Average Killip class	1.8±0.6	2.4±0.8	<0.05
Killip Class > 2 n (%)	7(15.5)	53 (35)	0.069
Cardiogenic Shock *n* (%)	2 (4.5)	18(11..8)	0.25
Infarct Location			
Anterior *n* (%)	20 (44)	100 (65)	0.015
Inferior *n* (%)	21 (47)	35 (23)	0.002
Posterior *n* (%)	4 (8)	18 (12)	0.78
Number of Diseased vessels	1.8 ± 0. 2	2.4 ± 0.3	<0.05

Angiographic success was 95.5%. There was a failure to cross the lesion in one case and failure to pass balloon in the second one. Clinical success was achieved in 91.1% cases. 2 patients died due to persistent cardiogenic shock after successful PCI. Stent implantation was done in 39 patients. Drug Eluting Stent implantation rate was low (62.7%) in consideration with anticipated requirement of dual antiplatelet therapy (DAPT) interruption due to the possible bleeding event and also to keep the cost of the procedure as low as feasible.

Reasons for choice of conservative management modality

The main factor for selecting conservative treatment option in this study was unwillingness of family members in 66 (51%) patients. Other causes were, documented pre- existing diffuse CAD not amenable to PCI in 26 (20%), baseline renal dysfunction in 16 (12.3%), High bleeding risk in 9 (7.0%) and multiple co-morbidity in 13 (10.0%). (Figure 1).
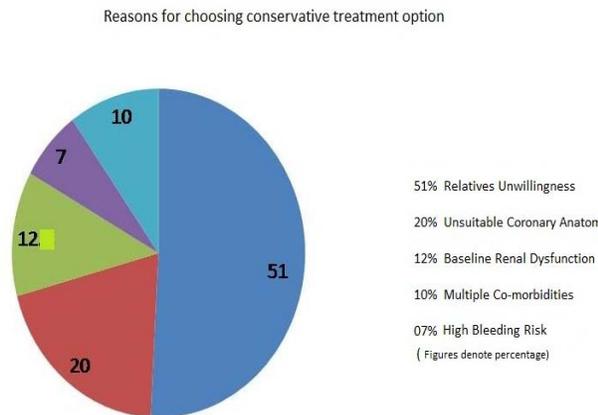

Reasons for choosing conservative treatment option

51% Relatives Unwillingness
20% Unsuitable Coronary Anatomy
12% Baseline Renal Dysfunction
10% Multiple Co-morbidities
07% High Bleeding Risk
(Figures denote percentage)

Figure 1

In-hospital and short term Outcomes

In-hospital mortality was 8.8% in the PCI group as compared to 22.2% in conservatively treated group. During a follow-up period of 1 month, a total of 45 patients died. Patients treated with PCI had lower cumulative mortality than those without PCI (11.1% vs 26.1%) (Table 4). Survival probability was higher for patients undergoing PCI (Chart 1). There were no gender differences in the in-hospital mortality in any of the treatment arms but in the conservatively treated arm; 1-month post discharge mortality was higher among females.
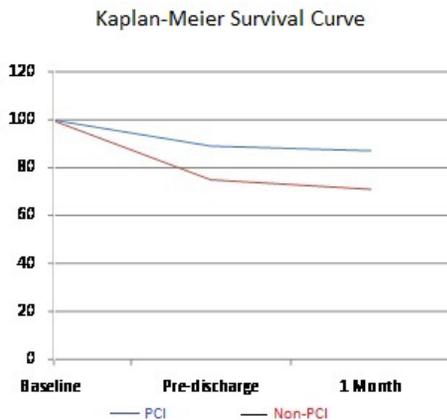

Kaplan-Meier Survival Curve

— PCI   — Non-PCI

Chart 1

Table 4. Procedural and clinical outcomes

Parameters	PCI (n-45)	Non- PCI (n-153)	p-Value
In-hospital Outcomes			
Death n (%)	4(8.8)	34 (22.2%)	0.04
CVA n (%)	1(2.2%)	5 (3.3%)	1.0
Acute kidney injury n (%)	13 (28.8%)	20 (13.7%)	0.02
Cardiogenic Shock n (%)	2 (4.4%)	27 (17.6%)	0.02
Major bleeding episode n (%)	3(3.3%)	7(4.5%)	0.69
Post Discharge outcomes			
Deaths n (%)	1(2.2%)	6 (3.9%)	1.0
Cumulative Mortality n (%)	5(11.1%)	40(33.1%)	0.04
Re-hospitalization for Heart Failure n (%)	4 (8.9%)	36 (23.5%)	0.03
CVA n (%)	1(2.2%)	7 (4.5%)	0.68
Renal failure n (%)	4(8.8%)	42 (27.4)	0.01
Dependent life style n (%)	2(4.4%)	54 (35.3%)	<0.05

Causes of in- hospital death in PCI group was the cardiogenic shock in 2 patients, the cardiac rupture in 1, and one patient died of CVA. An imaging study to ascertain the exact nature of CVA could not be done in this patient. In the conservatively treated group, 34 deaths occurred during index hospitalization due to following causes. 19 (55.9%) patients died due to multi-organ failure because of prolonged cardiogenic shock. Heart failure with severe COPD leading to the respiratory failure occurred in 9 (26.4%) patients. Refractory VT/VF occurred in 3 (8.8%) patients, and 3 (8.8%) patients died due to renal failure.

Mortality benefits of PCI were maintained up to 1 month of follow-up with only one additional death reported in this group, possibly due to subacute stent thrombosis. In the conservatively treated arm mortality continued to remain high with six other deaths reported in the follow-up period. Five patients did not return for follow-up after discharge and on telephonic contact, 2 of these were reported to be dead after an acute episode of chest discomfort and dyspnea.

Discussion

Coronary artery disease is a major cause of mortality and morbidity in very elderly population worldwide. There has been reluctance on the part of referring physicians and relatives for PCI procedures in these patients. The issues contributing to this includes the tendency for older patients to present late and with atypical symptoms or non-diagnostic ECG's. Relatives are often not confident about the procedural risk to benefit ratio. They are concerned about the presence of co-morbidities and increase bleeding risks.[7]

This retrospective analysis of the cohort of very elderly patients with acute coronary syndrome suggests that coronary interventions are feasible and safe in carefully selected patients. Recent studies of PCI in very elderly patients with non-ST elevation acute coronary syndrome have shown favorable in-hospital outcomes. In a nonrandomized observational study from GRACE registry of patients of more than 80 yrs of the age, in- hospital mortality was 7% in patients who underwent revascularization.[5] TACTICS TIMI-18 have shown that early invasive strategy in the elderly resulted in a reduction in the composite endpoint of death or nonfatal MI at 30 days (5.7% vs 9.8%; p=0.019) compared to conservative management.[8] The study was criticized for lack of standardization and poor precision of available troponin assays. Selection bias to revascularize only lower-risk patients is an inherent problem in retrospective observational studies. New York Registry of early invasive / initial conservative strategy in octogenarians was a retrospective analysis of PCI in very elderly. This registry had shown that in hospital mortality was significantly lower in elderly who underwent early invasive treatment (4.7 versus 8.6%).[9] Our study has shown higher mortality rates in both PCI and non PCI groups than above studies, because of baseline differences in the study cohort.

Historically octogenarians undergoing PCI have consistently shown higher rates of noncardiac complications including stroke and renal failure compared to younger cohorts.[10,11,12] With the increased adoption of trans-radial access and better contrast agents it has been possible to improve the outcomes and limit the complications.[13] Trans-radial route was used in 78% cases in our study.

The beneficial results of PCI are retained in the form of improved survival rate and lower re-hospitalization rate on short-term follow-up. The present study has shown the advantage of PCI regarding reduced re-hospitalization rate after PCI (8.9 vs 23.5%). PCI also has a favorable impact on functional status and quality of life.[14] It has been suggested that absolute benefits of PCI may be even higher in elderly due to their high baseline risk.[16] Data from the western population are suggestive that percutaneous coronary interventions offer survival advantage up to age 85 years.[15] Many elderly patients are unsuitable for emergency revascularization due to the presence of multiple co-morbidities, some of them lead dependent life due to neurological and orthopedic disabilities.[16] Patient and family preferences remain the main reason for not opting invasive modality. Family members are often not convinced about the safety of the invasive procedure in frail elderly patients. To guide the relatives in decision-making, there is a need for clinical trials dedicated to the very elderly population or enrolling an adequate number of elderly patients in routine randomized trials. It has been suggested that functional and symptom outcomes should be incorporated as measures of treatment effect. Even the therapies that provide no significant reduction in the mortality can be considered in the elderly if substantial functional benefit is observed.[17,18]

In the present study, the patient population is not similar in both groups regarding financial resources. A financial constraint remains a limiting factor. Although invasive management is associated with increased initial cost, it may be later balanced by reduced cost of recurrent hospitalization due to refractory heart failure in medically managed patients.[19] Cost effectiveness has been demons-trated for invasive PCI management of octogen-arians presenting with ACS.[20]

Acute coronary syndrome does not present with typical symptom in elderly and the time to admission from AMI onset is longer than in young patients.[21] In present study invasively treated patients presented significantly early to the hospital than conservatively treated patients, this time, the delay might have contributed to worsening hemodynamic status of patients thereby making them unsuitable for the invasive procedure. The risk of contrast-induced nephropathy always remains a concern in view of often present baseline renal dysfunction in the form of low creatinine clearance. The importance of carefully selecting patients who will benefit without exposing them to the risk of procedure-related complications cannot be overemphasized. Elderly patients are ideal targets for minimally invasive interventions, and a policy of only culprit lesion revascularization may be a best suitable PCI strategy in very elderly population.

If family members are convinced about substantial evidence for safety and mortality benefits and cost effectiveness of this treatment

modality in the long term, the acceptance of procedure in very elderly patients may be increased.

Limitations

The present study is a retrospective analysis. There was selection bias between the invasively treated arm and conservatively manage arm depending on the patient's preference and physician's assessment of procedural risk. The sample size is too small to draw a firm conclusion regarding the applicability of observed data on general population, an inherent limitation of data collected from a single center.

The difference in outcome between ST-segment-elevation and non-ST elevation MI was not analyzed. Acute coronary syndrome is a heterogeneous condition with short-term outcome varying widely between ST elevation and NonST Elevation Ml. Similarly, data were not analyzed regarding infarct location and coronary artery involved.

Conclusions

Percutaneous coronary interventions are feasible and safe in carefully selected very elderly patients with one or two vessel disease and mild LV systolic dysfunction and may provide an advantage in the in-hospital outcome and short-term survival.

Recommendation

Data generated from a single institute may not be sufficient to draw a statistically significant conclusion due low case volume. There is a need to pool data from multiple institutions to generate a large body of evidence on this rapidly expanding cohort of ACS patients.

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