COMPARISON OF SHORT-TERM OUTCOMES OF STAGED VERSUS ONE-TIME MULTIVESSEL PCI IN ELDERLY

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ABSTARCT

Objective: To compare the short-term clinical outcomes of staged versus one-time multivessel percutaneous coronary intervention (PCI) in elderly patients.
Study Design: Cross-sectional study.
Place and Duration of Study: Three months study at Post Cath wards of Armed Forces Institute of Cardiology.
Material and Methods: We analysed the data of patients with multivessel percutaneous coronary intervention (PCI) who were enrolled in AFIC/NIHD. A total of286 eligible patients aged ≥ 60 were further categorized into "one-time" group (n=119) and staged PCI group (n= 48) according to intervention strategy. The primary endpoint was composite outcome of survival (discharged) or contrast induced nephropathy or stent thrombosis acute or subacute or cardiac death during 48to 72 hours follow-up.
Results: The estimated 48 to 72 hours composite rate of cardiac death was 1.9% in the staged PCI group and 2.2% in the "one-time" group. Multivariate analysis confirmed the benefit of staged PCI on the primary events in the elderly (co-morbids *p*= 0.007). Staged PCI was associated with more stable patients and the discharged rate was higher i.e., 39.9% than one-time PCI (33.6%). There was no difference in target vessel revascularization (1.1% vs. 1.1%).
Conclusion: In elderly patients with MVD, staged PCI might be an optimal strategy associated with reduced short-term cardiac death or major cardiovascular events compared with "one-time" PCI strategy, which needs further confirmation.

Keywords: Multivessel coronary artery disease, Percutaneous coronary intervention, Percutaneous trans luminal coronary angioplasty (PTCA).

INTRODUCTION

Multivessel coronary artery disease (CAD) is found to be present in approximately 40–70% of patients presenting with non-ST-segment elevation acute coronary syndromes (NSTE-ACS) undergoing coronary angiography. Multivessel coronary artery disease is defined by coronary obstruction ≥50% in more than one major epicardial branch or their branches. Age, diabetes, and chronic renal failure are the strongest predictors for multiarterial CAD. The extent of CAD is crucial for treatment decision-making and patient prognosis.1Incomplete revascularization with stenting is associated with an adverse impact on long-term mortality, and consideration should be given to either achieving, complete revascularizton or opting for surgery, or monitoring percutaneous coronary intervention patients with incomplete revascularization more closely after discharge[2].

The elderly comprise the fastest growing segment of the population. In 1990, the U.S. census estimated that there were >31 million persons over the age of 65, 25% of which had reported symptomatic coronary artery disease. The numbers of elderly are expected to increase by 65% by the year 2020[3]. Compared to the general population, elderly patients undergoing coronary revascularization have traditionally been more likely to present with more: complex lesions, unstable angina, comorbid conditions and lower ejection fractions. At least in part due to these facts elderly patients have traditionally had higher rates of procedure related death and complications when undergoing percutaneous

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trans luminal coronary angioplasty (PTCA) or coronary intervention (PCI) is the most common

Table: Baseline characteristics and outcomes in elderly patients presented with Multivessel coronary artery disease.

Characteristics	Intervention Score		*p*-value
	One-time PCI N=119 (44.2%)	Staged PCI N=148 (55%)	
Age (Mean ± S.D)	67.62 ± 6.010 years	66.53 ± 5.21 years	0.010
Gender			
Male	102 (37.9%)	119 (44.2%)	0.255
Female	17 (6.3%)	29 (10.8%)	
CO-Morbids			
HTN	43 (16.5%)	35 (13.5%)	
DM	24 (9.2%)	28 (10.8%)	
DM+HTN	17 (6.5%)	41 (15.8%)	0.007
CKD	8 (3.1%)	8 (3.1%)	
DM+CKD	-	4 (1.5%)	
Previous PCI	12 (4.8%)	37 (14.9%)	0.003
Previous MI	45 (18.1%)	83 (33.5%)	0.006
LVEF ≤40%	14 (5.2%)	32 (11.9%)	0.037
Disease Extent			
2-vessel disease	3 8(14.2%)	48 (18%)	<0.001
3-vessel disease	16 (6%)	94 (35.2%)	
Stent number per patient			
1	49 (18.2%)	98 (36.4%)	<0.001
2	35 (13%)	50 (18.6%)	
3	30 (11.2%)	0	
4	5 (1.9%)	0	
OUTCOMES			
CI-AKI	9 (3.4%)	19 (7.1%)	
Acute-Stent Thrombosis	10 (3.7%)	12 (4.5%)	
Subacute- Stent Thrombosis	0	2 (0.7%)	0.023
TVR	3 (1.1%)	3 (1.1%)	
Death	6 (2.2%)	5 (1.9%)	
Discharged	90 (33.6%)	107 (39.9%)	

coronary artery bypass grafting (CABG)[3,4].

The elderly comprise an increasing proportion of patients with non–ST-elevation acute coronary syndromes (NSTE-ACS),4 and are more likely to have multivessel disease (MVD) compared with younger patients. Percutaneous method of revascularization in the elderly with MVD. After culprit vessel revascularization, the interventional cardiologist is forced to decide whether to expand the procedure to the remaining significantly narrowed vessels or to end it. However, the optimal strategy for elderly NSTE-ACS patients with MVD has not been well

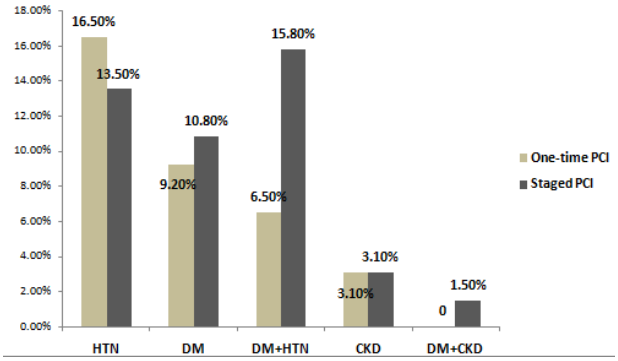
established. Previous observational analyses suggested that in patients with NSTE-ACS, multivessel PCI which allowed a more complete treatment of other potentially unstable plaques was superior to culprit vessel only PCI in terms of repeat revascularization. It remains unclear, however, whether the appropriate management for NSTE-ACS patients with MVD, especially for elderly patients, is staged PCI or "one-time" approach in the setting of culprit and non-culprit vessels revascularization[5].

Both risk factors MVCAD and elderly patient are predictors of poor outcomes in percutaneous coronary intervention as a revascularization strategy independently. Complete revas-cularization-PCI is an independent predictor of improved 12-month outcomes and therefore should be considered when it is feasible. Although more and more data have suggested a benefit for multivessel PCI during the index admission in patients with STEMI and MVD,5,6 not much data exist on the revascularization strategy for NSTE-ACS patients with MVD, especially elderly patients. Staged PCI is associated with the reduced short- and long-term ischemic risks in the elderly NSTE-ACS patients. The reasons may be multifactorial and partially explained as follows. Any PCI procedure is challenging to the elderly. Compared to the young, elderly patients have higher prevalence of complex coronary lesions, extensive coronary atherosclerosis, comorbidities and physiological impairment[6] "One-time" PCI treatment for the elderly presenting with NSTE-ACS may increase risks for procedural complications, longer procedural time and stent thrombosis in a heightened thrombotic and inflammatory state. On the contrary, PCI on the culprit lesion only and staged non-culprit PCI at a later date with the optimal medical treatment provides stabilization of the elderly patients and allows heart team to reassess the clinical and angiographic state[7].

This study is aimed to assess the short term outcomes of multivessel PCI in elderly patients in our set up and to recommend a preferrable approach in elderly patients (multivesselpci or staged PCI).

MATERIAL AND METHODS

This study was approved by hospital ethical board and all patients provided written informed consent ensuring confidentiality and fact that



Graph-1: Comparison of co-morbids between patients underwent one-time and staged PCI

there is no risk involved to the patient while taking part in this study. After approval, cross-sectional comparative study design was used in elderly patients with multi-vessel disease and treated with PCI. Patients of age ≥ 60 years admitted to Post PCI wards for 48 to 72 hours after procedure were included in this study for a period of three months. Detailed information of clinical and angiographic characteristics, treat-ment strategies and clinical outcomes for all patients undergoing PCI was collected. All patients with, haemodynamic instability or cardiac shock, glomerular filtration rate (eGFR) <30 mL/min per 1.73 m2 or renal dialysis, chronic total occlusion, technical failure, during the index PCI and scheduled for staging were excluded in this study.

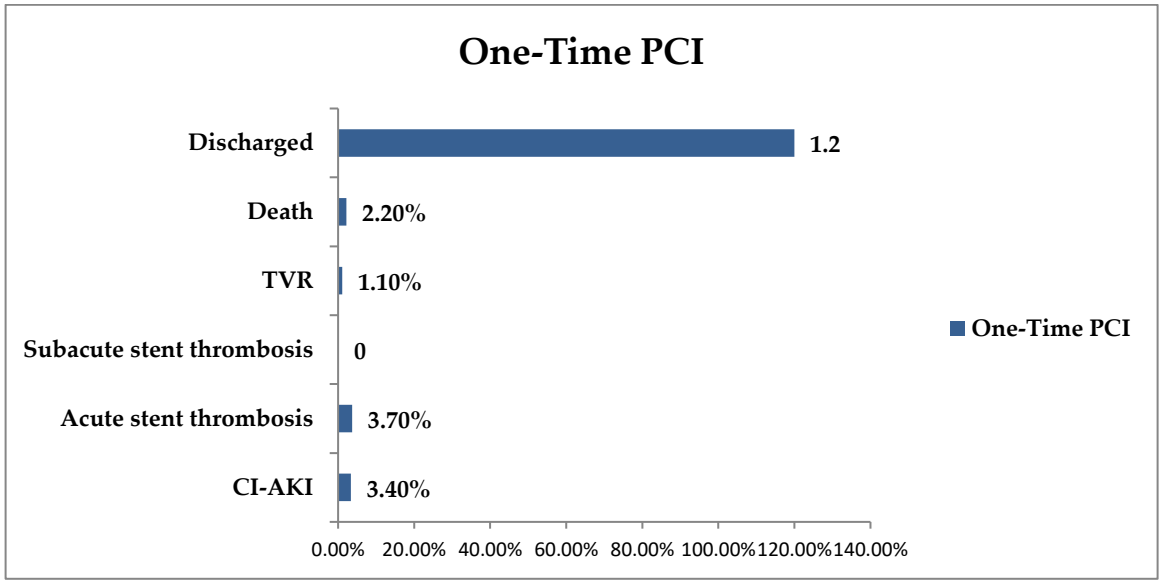
Baseline demographic information of the patient (age, sex, co-morbid) wastaken. A full medical history was collected. Blood and urine samples, a physical examination, a standard 12-lead electrocardiogram, an echocardiogram was taken during 48-72 hours post PCI in hospital stay. Continuous variables were expressed as mean and standard deviation (SD), and categorical variables were expressed as number and/or percentages. For group comparisons,

Pearson chi-square test or Fisher's exact test was used for categorical variables and independent t-test was used for comparing continuous variables.Statistical test was 2-tailed, and statistical analyses were performed with SPSS 23 software and *p*- value of 0.05 was taken as significant.

RESULTS

For the present analysis, Out of 286 patients, 17 (5.9%) lost to follow-up while 119 (44.2%) patients with one-time PCI and 148 (55%) patients with staged PCI were followed up for 48 to 72 hours after intervention. As noted in table-I, staged patients had higher prevalence of risk factors, previous MI and triple-vessel disease was associated with more staging. In addition, this group tended to have more stents implanted and longer hospital stay. Medications at discharge were similar between the groups. Most patients took dual antiplatelet treatment consistent with standard recommendation.

After generating a propensity score, 269 of the 286 patients who underwent staged PCI were matched with a patient respectively who underwent "one-time" PCI. As noted in table, composite rate of cardiac death or MI at 48 to 72 hours did not differ significantly between the two study groups, but it presented a trend in favour of staged PCI (2.2% in one-time PCI, 1.9% in staged PCI). Additional variables that were independently correlated with primary events during 48 to 72 hours follow-up were presented in table-I. Graph-I presents the association of co-morbids among elderly patients who underwent one-time versus staged intervention. The association of short-term outcomes in multivessel coronary artery disease patients in both groups of intervention is presented in graph 2a and 2b. when outcomes of these two groups were compared, staged intervention showed remarkably high percentage of patients who are stable and discharged during our study period of 48 to 72 hours.



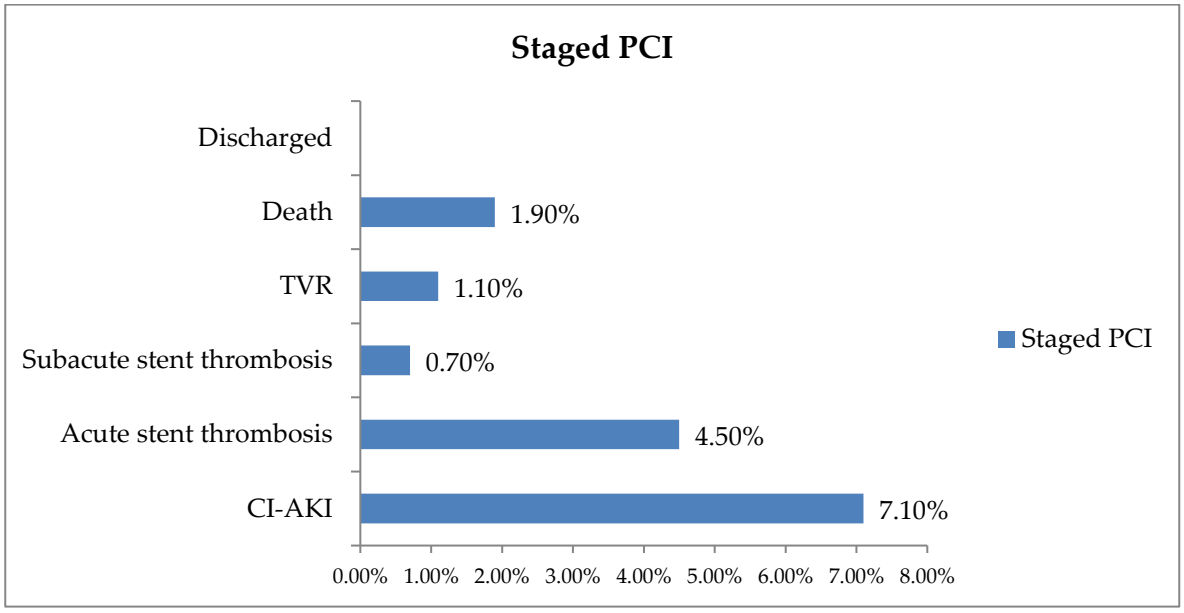
Graph-2a: Presentation of clinical outcomes in patients with one-time intervention

DISSCUSION

The present study revealed that in elderly patients with MVD, staged PCI resulted in lower composite of cardiac death or MI despite a lack of impact on TVR (same result in one-time PCI). Although, in our registry, there was a reduced trend of stent thrombosis in elderly patients who underwent one-time PCI but the rate of stable patients was much higher in staged PCI. Elderly patients with MVD benefit from interventional therapies combined with optimal medical therapies. However, with respect to clinical outcomes, periprocedural complications of

intervention as well as the long-term ischemic risk remain higher in elderly patients with multivessel PCI than in younger patients. For elderly people who tend to have poor condition and concomitant comorbidities, multivessel coronary artery disease is a critical issue that requires physicians to consider appropriate treatment strategies. Although more and more data have suggested a benefit for multivessel PCI during the index admission in patients with MVD, not much data exist on the revascularization strategy especially for elderly patients. Hannan, et al[8] analyzed the cohort of NSTE-ACS patients (5193 patients in total) and explored the "one-time" complete revascularization in the index hospitalization versus PCI of the culprit lesion only with staged non-culprit PCI for complete revascularization in a subsequent admission. At 48 to 72 hours study, there was no significant difference in all-cause mortality as a short-term outcome between the two groups. However, data for other clinical endpoints such as cardiac death, MI, and TVR after procedure were not available in this study. Moreover, the staged PCI group did not include the patients who underwent staged PCI during the index hospitalization. To date, we are not aware of any evidence to evaluate the effect of revascularization, i.e., culprit-only versus multivessel revascularization and one-time versus staged multivessel revascularization, in elderly patients with NSTE-ACS and MVD.

In the absence of evidence comparing multivessel PCI with staged PCI approach for NSTE-ACS patients, the clinical practice is mixed among various choices. A published American survey reported that for NSTE-ACS patients with MVD, 42% of cardiologists would opt for treatment of both culprit lesion and non-culprit lesions at initial setting, 37% would treat non-culprit arteries in a staged procedure and 14% would opt for treatment of the culprit lesion only at initial setting and subsequent medical therapy without coronary revascularization unless the patient developed persistent ischemia or symptoms[9]. We found that staged PCI is associated with the reduced short- and may be long-term ischemic risks in the elderly NSTEACS patients. The reasons may beincompletely explained as follows. Any PCI procedure is challenging to the elderly[10,11]. Compared to the young, elderly patients have higher prevalence of complex coronary lesions, extensive coronary atherosclerosis, comorbidities and physiological impairment[10,11]. "One-time" PCI treatment for the



Graph 2b: Presentation of clinical outcomes in patients with one-time intervention

elderly presenting with double or triple vessel disease may increase risks for procedural complications, longer procedural time and stent thrombosis in a heightened thrombotic and longer hospital stay[12,14]. An analysis of 1726 patients with an average age of 62.6 enrolled in the multicenter German Cypher Stent Registry database showed that management of >1 lesion during the same intervention was identified as an independent predictor of the combined endpoint of death from any cause, myocardial infarction, stroke or TVR after PCI[15]. Taken together, staged PCI should be considered as a preferred strategy in elderly patients. Our study has several limitations. First, the choices of one-time or staged PCI were not based on a randomization but at physicians' discretion, which resulted in obvious selection bias. Attempts were made in order to minimize the effects of selection bias, such as eliminating patients with clinical characteristics that made them clearly inappropriate for "one-time" procedure [i.e., severe renal dysfunction (eGFR <30 mL/min per 1.73m^2), technical failure or major complications during the first part of a staged procedure], analyzing data with multivariate regression and propensity score matching. However, results should still be interpreted with caution due to potential bias. Second, the experience and technique of the operator was very important, but very difficult to measure. Third, the study was not sufficiently powered to compare the short-term incidences of stent thrombosis and the composite of cardiac death at defined period of time between groups in a single centered study.

In conclusion, staged PCI might be an optimal strategy, associated with reduced cardiac death or MI, for elderly cardiac patients with MVD, compared with one-time PCI strategy after adjustment, which needs further confirmation.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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