

Original Research Article

Hospital outcome of percutaneous coronary stenting in long segment lesions

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ABSTRACT

Background: Coronary heart disease is increasing at an alarming rate among elder people in Bangladesh. For long segment lesion in heart, percutaneous coronary intervention is now a common procedure with great success rate. The aim of this study was to assess immediate outcome of percutaneous coronary stenting of long segment lesions.

Methods: This prospective observational study was conducted at the Department of cardiology, National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh during the period from January 2005 to December 2006. The sample size was 100 patients undergoing PCI of long and short coronary lesions.

Results: No complications found in 82.0% and 88.0% of cases in group I and II respectively. Coronary dissection occurred in 6% and 4% cases in group I and II respectively. ST elevation and pathological Q were 46.0% in pre and 50.0% in post PCI period in group I. In group II patients 48.0% in pre and 52.0% in post PCI period showed ST elevation and pathological Q wave. ST depression and/or T inversion was 18.0% in pre and 16.0% in post PCI period in group I, in group II this value was 22.0% and 14.0% respectively. In group I patients, CK-MB increased from 24.33 ± 7.72 U/l in baseline to 43.30 ± 10.99 U/l 6-8 hrs after procedure and before discharge CK-MB decreased to 31.91 ± 11.17 U/l. In the group II patients, it increased from 25.42 ± 5.84 U/l in baseline to 39.38 ± 6.98 U/l 6-8 hrs after procedure and before discharge CK-MB decreased to 29.64 ± 8.21 U/l.

Conclusions: This study concludes that the immediate outcome of long segment coronary stenting is safe and highly effective.

Keywords: Percutaneous coronary stenting, Coronary heart disease, Long segment lesions

INTRODUCTION

Coronary heart disease is one of the leading causes of death in the developed world as well as in the developing countries like Bangladesh. National data on incidence and mortality of coronary heart disease are few in Bangladesh. The prevalence of coronary heart disease was estimated as 3.3 per thousand in 1976 and 17.2 per thousand in 1986 indicating five folds increase of the disease by 10 years.¹ Three small-scale population based studies showed

average prevalence of ischemic heart disease 6.5 per thousand population of Bangladesh.² Percutaneous coronary intervention is now a common procedure than it was 20 years ago.³ Coronary angioplasty with stenting has gained worldwide acceptance and has become the most common form of myocardial revascularization. Recently PCI have surpassed coronary artery bypass grafting as most common means for treating coronary artery disease, because of materials improvement, the use of stent and pharmacotherapy. Dating back to early experience with coronary stenting, long lesion (>20 mm) was identified as

a predictor of decreased procedural success and increased periprocedural complications. However, several investigators have questioned this relationship of lesion length and outcome. Ellis et al reviewed 350 patients with multivessel coronary disease retrospectively; lesion length did not emerge as a univariate predictor of procedural success. Although in the immediate pre-stent era longer lesions appeared to respond less favorably to balloon dilatation than shorter lesions, after the introduction of stents the problems of long segment coronary lesion have been decreased tremendously.⁴ In another study by Goldberg et al it was found that lesion calcification, presence of thrombus and lesion eccentricity affected procedural success adversely, but lesion length had no effects on PTCA outcome.⁵ It was also proved that the success of PTCA with stenting is independent of lesion morphology and can be done successfully in more complex lesions.⁶ Recent study showed that stenting of long segment coronary lesions (>20 mm) is safe with immediate procedural success and acceptable periprocedural complications in comparison with stenting of short segments coronary lesions.⁷ Percutaneous coronary intervention has been well established as a means for coronary revascularization in Bangladesh after its introduction in this country in the last decade. Safety and efficacy of the procedure has been observed, but data regarding long segment coronary intervention are still lacking. Every year a number of patients with long segment coronary lesion undergo percutaneous coronary intervention. So, a study assessing safety and efficacy of stent implantation in long segment coronary lesion may be justified.

Objective

To assess immediate outcome of percutaneous coronary stenting of long segment lesions. To assess procedural success and in-hospital outcome of long segment coronary stenting. To compare in-hospital outcome of stenting of long segment lesions with that of short segment lesions. To prove the safety of stenting of long segment coronary lesions.

METHODS

This prospective observational study was conducted at the Department of cardiology, National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh during the period from January 2005 to December 2006. The sample size was 100 patients undergoing PCI of long & short coronary lesions. Baseline characteristics like age, sex and cardiovascular risk factors. pulse, BP and co-morbid conditions were recorded. Investigations like 12-lead ECG, blood sugar, blood urea, serum creatinine, serum lipid profile, bleeding time, clotting time and echocardiography were done for each patient. Coronary angiography was followed by PCI with stenting as per American college of Cardiology (ACC/ American heart association (AHA) guideline for PCI. Stenting was done as an elective procedure. All the procedures were done

through the Rt femoral approach. All demographic, clinical, angiographic and laboratory data were recorded in a predesigned data collection sheet. All data were analyzed by using computer-based Statistical package for social science (SPSS) programme (version 1). The p value <0.05 was considered significant.

Inclusion criteria

Patients undergoing percutaneous coronary intervention with stenting of long segment lesions. Stable angina, unstable angina, and patient with post MI angina are included in this study. Patients with lesion length ≤ 20 mm were taken for comparison.

Exclusion criteria

Primary PCI. Patients with previous history of PTCA or CABG. Bifurcation lesions. CTO. Calcified lesions. Thrombus containing lesions. Co morbid conditions such as severe renal impairment and heart failure. Associated valvular heart diseases.

RESULTS

Table 1 shows that among 100 patients 87 patients were male and patients were female. The mean age of group I patients was 50.24 ± 12.49 years and that of group II patients was 49.25 ± 9.56 years.

Table 1: Demographic and baseline clinical parameters of the study subjects (n=100).

Parameters	Group I (n=50)		Group II (n=50)		P value
Age in years (Mean±SD)	50.24±12.49		49.25±9.56		^a 0.860 ^{NS}
	N	%	N	%	
Sex					
Male	42	84	45	90	^b 0.372 ^{NS}
Female	8	16	5	10	
Risk factors					
Smoking habits	33	66	36	72	^b 0.516 ^{NS}
Hypertension	28	56	26	52	^b 0.688 ^{NS}
Diabetes mellitus	18	36	22	44	^b 0.208 ^{NS}
Hyperlipidemia	8	16	12	24	^b 0.317 ^{NS}
Family history of CAD	8	16	4	8	^b 0.218 ^{NS}
Clinical diagnosis					
Post MI-angina	26	52	26	52	^b 1.00 ^{NS}
Stable angina	15	30	17	34	^b 0.656 ^{NS}
Unstable angina	9	18	8	16	^b 0.617 ^{NS}

^ap value reached from unpaired students' t test. ^bp value reached from chi-square test. NS=Not significant.

The percentage of male 13 male was 84% and 16% in group I and 90% and 10% in group-II respectively. Table 1 also reveals that smoking history was highest among the

risk factors for coronary artery disease (CAD) in both the groups (66% and 82% in group I and II respectively).

Table 2: Distribution of study people on the basis of artery stented, no. of vessel and types of stent (n=100).

Characteristics	Group I (n=50)		Group II (n=50)		P value
	N	%	N	%	
Artery stented					
LAD	24	48	20	40	0.420 ^{NS}
RCA	13	26	14	28	0.825 ^{NS}
LCX	6	12	7	14	0.8.6 ^{NS}
LAD+RCA	12	24	14	28	0.779 ^{NS}
LAD+LCX	6	12	5	10	0.749 ^{NS}
No. of vessel					
Single	32	64	30	60	0.680 ^{NS}
Double	18	36	20	40	
Total	50	100	50	100	
Types of stent					
Cobalt chromium	28	56	25	50	0.547 ^{NS}
Bare metal	14	28	15	30	0.825 ^{NS}
Titan	6	12	7	14	0.766 ^{NS}
Drug eluting	2	4	3	6	0.500 ^{NS}

p value reached from chi-square test. NS=Not significant.

Table 3: Distribution of anginal symptoms of study patients (n=100).

Angina	Group I (n=50)		Group II (n=50)		P value
	N	%	N	%	
Before stenting					
Asymptomatic	0	0	0	0	
Class I	4	8	3	6	0.695 ^{NS}
Class II	17	34	15	30	0.668 ^{NS}
Class III	16	32	19	38	0.529 ^{NS}
Class IV	10	20	11	22	0.806 ^{NS}
After stenting					
Asymptomatic	41	89.1	40	87	0.798 ^{NS}
Class I	0	0	4.3	4.3	0.153 ^{NS}
Class II	1	2.2	4.3	4.3	0.557 ^{NS}
Class III	2	4.3	2.2	2.2	0.557 ^{NS}
Class IV	2	4.3	2.2	2.2	0.557 ^{NS}

P value reached from chi-square and Fisher's exact test. NS=Not significant.

Smoking history was followed by hypertension, diabetes mellitus, hyperlipidemia and family history of CAD. No statistically significant differences of risk factors for CAD were observed between the two groups of patients ($p>0.05$). The Table 1 reveal that in group I patients, highest percentage (52.0%) had post-MI angina followed by stable angina (30.0%) and unstable angina (18.0%). Similar pattern of diagnosis was noted in group II patients with highest percentage (52.0%) having post-MI angina

followed by stable angina (34.0%) and unstable angina (16.0%). Analysis revealed no statistically significant differences between two groups of patients ($p>0.05$). Table 2 shows the pattern of arterial stenting. In group I patients, highest percentage of arterial stenting was found in LAD (48.0%) followed by RCA (26.0%), LCX (12.0%), LAD + RCA (24.0%) and LAD+ LCX (12.0%). Whereas among group II patients, highest percentage of stenting was in LAD (40.0%) followed by RCA (28.0%), LCX (14.0%), LAD+ RCA (28.0%) and LAD+ LCX (10.0%). No significant ($p>0.05$) differences were observed between two groups.

Table 4: Distribution of the patients by complications during procedure and during in hospital follow up (n=100).

Complications	Group I (n=50)		Group II (n=50)		P value
	N	%	N	%	
Procedural complications					
No complication	41	82	44	88	0.602 ^{NS}
Coronary dissection	3	6	2	4	0.695 ^{NS}
In-stent thrombosis	1	2	0	0	0.341 ^{NS}
MI	1	2	2	4	0.646 ^{NS}
Heart failure	2	4	1	2	0.557 ^{NS}
VT/VF	0	0	0	0	
Failed PCI	2	4	1	2	0.557 ^{NS}
Complications during in hospital follow up					
Acute MI	1	2	2	4	0.557 ^{NS}
Hypotension	8	16	7	14	0.779 ^{NS}
Cardiogenic shock	2	4	1	2	0.557 ^{NS}
Heart failure	2	4	1	2	0.557 ^{NS}
Vascular access site complication	1	2	0	0	0.314 ^{NS}
Stroke	0	0	0	0	
Death	1	2	0	0	0.314 ^{NS}

Table 2 also shows that 32 patients (64.0%) were treated for single vessel stenosis and the rest were treated for double vessels stenosis in group I. In group II this value was 30 (60.0%) and 20 (40%) respectively and the differences were not statistically significant ($p>0.05$). Table 2 also shows that in group I patients, highest percentage (56%) received cobalt chromium, 28% bare metal stents, 12% titan and the rest 4.0% received drug eluting, whereas in group II patients, 50% received chromium, 30.0% bare metal stents, 14% titan and 6% received drug eluting. Table 3 reveals considerable improvement of angina after the procedure. All the patients were symptomatic before the procedure in each group. After the procedure 89.1% and 87.0% in group I and II respectively became asymptomatic. It was observed that 2.2% and 4.3% patients in group I and II respectively had class II symptom after the procedure. In case of class

III symptom, it was 4.3% in group I and 2.2% in group II patients and similar finding was found for class IV

symptom. Table 4 shows no complications in 82.0% and 88.0% of cases in group I and II respectively.

Table 5: Pre and post PCI ECG changes of the study subjects (n=100).

ECG	Pre stenting				Post stenting			
	Group I (n=50)		Group II (n=50)		Group I (n=50)		Group II (n=50)	
	N	%	N	%	N	%	N	%
Normal	4	8	3	6	4	8	4	8
ST elevation and pathological Q	23	46	24	48	25	50	26	52
ST depression and/or T inversion	9	18	11	22	8	16	7	14
T inversion only	0	0	1	2	1	2	2	4
LBBB	0	0	1	2	1	2	1	2

Table 6: Pre and post PCI CK-MB levels of study subject groups (n=100)

CK-MB levels	Group I (n=50)	Group II (n=50)	P value
	Mean±SD (U/l)	Mean±SD (U/l)	
Baseline	24.33±7.72	25.42±5.84	0.848 ^{NS}
6-8 hrs after procedure	43.30±10.99	39.38±6.98	0.142 ^{NS}
Before discharge	31.91±11.17	29.64±8.21	0.895 ^{NS}

P value reached from unpaired students' t test. NS=Not significant.

Table 7: Distribution of success of PCI in study subjects (n=100).

Success of PCI	Group I (n=50)		Group II (n=50)		P value
	N	%	N	%	
Angiographic success	46	92	47	94	0.695 ^{NS}
Procedural success	43	86	44	88	0.655 ^{NS}
Clinical success	41	82	40	80	0.685 ^{NS}

P value reached from Chi-square test. NS=Not significant.

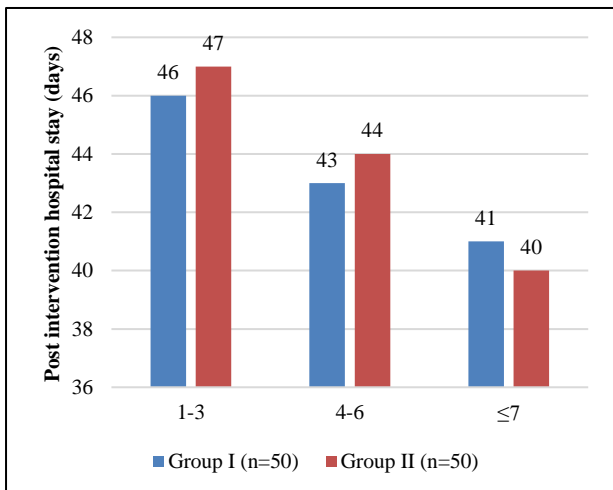


Figure 1: Distribution of the patients by hospital stays after stenting.

Hospital stay of post intervention were highest 1-3 days in both groups. But comparatively high in group-II. Coronary dissection occurred in 6% and 4% cases in group I and II

respectively. In-stent thrombosis developed in 2% of cases in group-I. MI occurred in 2% and 4% cases in group I and II respectively. Heart failure occurred in 4% in group I and 2.0% in group II group II patients. No patients developed VT/VF in both the groups. Failed PCI occurred in 4% in group I and 2.0% in group II. All values were not statistically significant between two groups (p>0.05). Table IV indicates that no statistically significant difference was found between two groups (p>0.05) by complications during in hospital follow up. Table 5 indicates that, in the group I patients 8.0% had normal ECG both before and after PCI; in case of group II patients, 6.0% had normal ECG before PCI but a post PC period this was 8.0%. ST elevation and pathological Q were 46.0% in pre and 50.0% in post PCI period in group I. In group II patients 48.0% in pre and 52.0% in post PCI period showed ST elevation and pathological Q wave. ST depression and/or T inversion was 18.0% in pre and 16.0% in post PCI period in group I, in group II this value was 22.0% and 14.0% respectively. None was found T inversion only in was pre and 2.0% in post PCI period in group 1, in group II 2.0% patients in pre and 4.0% in post PCI period developed T inversion. In group I, none was

found LBBB in pre but 2.0% in post-PCI period, LBBB was observed in 2% of cases in both groups in post PCI period. Table VI shows the pre and post PCI CK-MB status of the study patients. In group I patients, CK-MB increased from 24.33 ± 7.72 U/l in baseline to 43.30 ± 10.99 U/l 6-8 hrs after procedure and before discharge CK-MB decreased to 31.91 ± 11.17 U/l. On the other hand, in the group II patients it increased from 25.42 ± 5.84 U/l in baseline to 39.38 ± 6.98 U/l 6-8 hrs after procedure and before discharge CK-MB decreased to 29.64 ± 8.21 U/l. No significant statistical difference is found between two groups ($p > 0.05$). Table VII shows that, angiographic, procedural and clinical success in both groups is high and not statistically different between two groups ($p > 0.05$). Figure-1 reveals that average hospital stay in both groups is less than 7 days for most of the patients. Mean hospital stay period is not statistically different between two groups ($p > 0.05$).

DISCUSSION

The present study was a prospective observational study conducted in the National Institute of Cardiovascular diseases (NICVD), Dhaka. The aim of the study was to observe the success and complications of stenting of long Segment coronary lesions. Successful procedural and clinical outcome with insignificant complications were observed. The procedural success and in-hospital outcome were assessed in terms of angiographic, procedural and clinical parameters. Complications like major adverse cardiac events (MACE) and minor complications were observed. The mean age of the patients in group I was 50.24 ± 12.49 years in comparison to 49.25 ± 9.56 years in the group II. The highest percentage of patients was in the age range of 45 to 54 year in both groups. Most of the patients were male in both the groups. Similar distribution was reported by Rahman et al.⁶ Number of lesions was highest in LAD (48%) followed by RCA (26%), LCX (12%), LAD with RCA (24%) and LAD with LCX (12%) in group I. This value was 40%, 28%, 14%, 28% and 10% for respective vessels in group II. So, the most common target vessel was LAD. This was consistent with study of Uddin et al in Bangladeshi population.⁸ The most frequent type of lesion was B followed by A. Type C lesion was excluded from study. There was no statistically significant difference between two groups regarding the type of lesions ($p > 0.05$). In the present study, patients underwent coronary stenting for post Mi angina for most of the cases followed by chronic stable angina and unstable angina. There was no statistically significant difference in distribution of clinical diagnosis between the study groups ($p > 0.05$). Stenting was done electively in all the study subjects. Symptomatic improvement was remarkable as evidenced by clinical success. Single vessel stenting was 64% and 60% in group and group respectively. Double vessel stenting was 36% in group I and 40% in group II. Each vessel received single stent. Cobalt chromium was the most common type of stent used, followed by bare metal, titan and drug eluting stents. Both groups were matched by the number of vessels stented and by the type

of stents. Angiographic success was achieved in 92% in group I and 96% in group II. TIMI-III flow in the distal vessels was achieved in 91.3% and 93.5% in group I and group II respectively which is consistent with the study done by Ali et al.⁹ Anginal symptoms subsided in most of the cases in each group after PCI. It was 89.1% and 87% in group I and group II respectively. After intervention CCS class IV symptoms were observed in 4.23% and 2.2% in group I and group II respectively. Procedural success rate was 86% and 88% in two groups respectively. So clinical success was obviously high and it was 82% and 80% in group I and group II respectively. Outcome is not statistically different in both groups ($p = 0.655$). This correlates well with the study on percutaneous coronary intervention by Rahman et al.⁶ During coronary intervention the incidence of coronary dissection was 6% and 4% in group I and group II respectively. 2% of study subjects in group I developed in-stent thrombosis. The incidence was correlated by the study of Rahman et al.¹⁰ Heart failure was observed in 4% and 2% of patients in group I and group II respectively. PCI was failed in 4% cases in group I and 2% cases in group I. So, the procedural complication was not statistically different between two groups ($p > 0.05$). After procedure 2% of patients in group I and 4% of patients in group I developed acute MI during in-hospital follow-up. Hypotension was seen in 10% and 8% of patients in group I and group II respectively. 4% of patients in group I and 2% of patients in group II developed cardiac failure. Vascular access site complication was not significant in either group. 2% of patients in group I developed bleeding from puncture site. During in-hospital stay, one (2%) patient in group I died. Similar incidence of mortality in long segment coronary stenting was observed by Surase et al.¹¹ The ECG changes were not significantly different in two groups following PCI. The level of post PCI CK-MB did not significantly differ between two groups.

Limitations of the study

Although the results of this study support the hypothesis, yet this has got some limitations. Study population was small. Follow-up was only during hospital stay. It is not a single operator-based study.

CONCLUSION

Percutaneous coronary intervention has emerged as an effective and safe method for coronary revascularization after the revolutionary work of Gruentzig in 1977. Since then, the technology has been successfully used worldwide. But safety of the procedure in long segment lesion was in question. Although favorable outcome has been reported, data regarding this are limited. In Bangladesh, a large number of patients are undergoing long segment coronary stenting, with this background a prospective observational study was conducted to observe the procedural and in-hospital outcome of long lesion coronary stenting. In the present study high angiographic, procedural and clinical success rate with minimum

complications were observed in long segment coronary stenting in comparison to short lesions. So, it may be concluded that the immediate outcome of long segment coronary stenting is safe and highly effective. Of course, this requires further study involving larger population and long-time follow-up.

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