Original Article

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Comparison of In-Hospital Outcomes of ST Elevation Myocardial Infarction in Patients Undergoing Transradial and Transfemoral Primary Percutaneous Coronary Intervention

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Key Words: *Ischaemic heart disease, STEMI, Percutaneous coronary intervention.*

Abstract

Background: *Primary percutaneous coronary intervention (PPCI) has been performed traditionally by using femoral approach. Transradial approach has become increasingly popular as it is likely to be less complicating, more comfortable and relatively cost effective having mortality and morbidity benefits. The aim of the study was to compare the in-hospital outcomes of transradial PPCI with that of transfemoral route.*

Methods: *A total of 80 patients with ST elevation myocardial infarction (STEMI) who underwent PPCI were enrolled in the study. Patients were divided in two groups. Group-I: transradial PPCI; and Group-II: transfemoral PPCI. All patients were followed up during the period of hospital stay and adverse outcomes were observed and compared between the groups.*

Results: *The result showed that bleeding took place in 2.5% patient of Group-I and 15% patients of Group-II. Vascular complications occurred in 2.5% and 12.5% patients of Group-I and Group-II, respectively. In Group-II, 7.5% patients died with none in Group-I. In Group-II, 37.5% patients experienced some sort of adverse outcomes whereas only 15% of the patients of Group-I did have such experiences ($p<0.05$). Bleeding and vascular complications were significantly more in Group-II ($p<0.05$). The mean hospital stay time was significantly lower in Group-I ($p<0.001$).*

Conclusions: *Transradial PPCI is safer than transfemoral approach in respect of procedural and post procedural complications including bleeding, vascular complications and mortality. So, transradial approach may be an attractive alternative to conventional transfemoral approach and can be practiced routinely for PPCI.*

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Introduction:

The main goal of STEMI management is rapid reperfusion to establish coronary blood flow to ischemic myocardium. Currently, there are three main reperfusion strategies: fibrinolytic therapy, primary percutaneous coronary intervention (PPCI) and fibrinolytic-facilitated PPCI.[1-3] The widespread use of PPCI dramatically improved the clinical outcomes of STEMI and it has become the preferred treatment of this condition.[2,4,5]

Coronary interventions have been traditionally performed using the femoral approach for arterial access since its inception in 1977 to till date due to the fact that its size makes arterial cannulation and catheter manipulation easy.[3,6] Despite these advantages, femoral access has several limitations. The femoral artery is

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relatively deep, especially in obese patients, and its proximity to the femoral vein and nerve is a potential source of iatrogenic injury.[7] In addition, prolonged bed rest is mandatory in this setting.[4] Especially under conditions of aggressive anticoagulation and antiplatelet treatment, vascular bleeding complications at the femoral puncture site can result in increased morbidity and duration of hospitalization.[8-10]

Transradial approach has become increasingly popular day by day because it is associated with decreased incidence of hemorrhagic and vascular complications, increased patient comfort, earlier ambulation, earlier hospital discharge, and cost reduction.[11] Transradial approach has some advantages over transfemoral approach. The radial artery is easily compressible, thus hemostasis is easier and haemorrhagic complications are significantly reduced.[12] Moreover, no major veins or nerves are located near the artery, minimizing risk of injury to these structures. Finally, post procedure bed rest is not required, permitting immediate ambulation, more comfort and early discharge which improve quality of life of patients and reduced hospitalization cost.[13-16] In Bangladesh no study was carried out regarding this issue. The aim of the present study was therefore to compare the in hospital outcomes of transradial and transfemoral PPCI.

Methods:

In the Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, this prospective observational study was conducted during the period from August 2016 to April 2017. By purposive sampling technique total 80 patients who underwent PPCI in NICVD during this period were selected. Study subjects were divided into two groups with 40 patients in each on the basis of route of interventions: Group 1: Transradial group; Group 2: Transfemoral group. Patients who received thrombolytic therapy were not included. Patients with chronic kidney diseases, chronic liver disease, chronic obstructive pulmonary disease, valvular heart disease, congenital heart disease, cardiomyopathy, malignancy were excluded from the study. No ethical violation was made in conducting the study.

After having matched the inclusion and exclusion criteria the patients were selected for this study. Eligible patients immediately underwent for coronary angiogram according to operator's choice of route of intervention. Following PPCI patients were monitored at Coronary Care Unit for at least 24 hours. Post-PCI development of in-hospital left ventricular failure along with common adverse outcomes were observed and recorded, i.e., bleeding, stroke, vascular access site complications, post-PCI ischemic chest pain, myocardial infarction with PCI, significant arrhythmia, acute stent thrombosis, repeat revascularization, contrast induced nephropathy, cardiogenic shock, cardiovascular death.

Nature of the data was explored. Summary statistics of symmetric continuous data, expressed as mean ± SD. Summary statistics for categorical variables were expressed as proportion or percentage. Comparisons between two groups were done by t-test. Correlation analyses were done by two-tailed Pearson's chi-square test. Fisher's exact test was carried out when cell frequency was <5. The prediction model was developed to correct for differences in patient and procedural characteristics treated by the radial and femoral route primary PPCI. In 95% confidence interval P-value of <0.05 was considered as significant. Analysis was conducted on SPSS 16.0 for windows operating system.

Results:

The mean age of the study patients was 50.3±11.4 years. The mean age difference was not statistically significant (p>0.05) between two groups (Table-I). Male patients were predominant in both groups (Figure 1). The ratio of male and female patients was 4.7:1.

Table-II compares the common risk factors for coronary artery diseases between two groups. Smoking was found 13 (32.5%) in the group I and 9 (22.5%) patients in the group II and statistically insignificant (p=0.31). Hypertension was found 15 (37.5%) and 20 (50%) in the group I and group II respectively. The association was statistically insignificant (p=0.26). Diabetes mellitus was found 18 (45%) and 22 (55%) in the group I and group II respectively with statistically insignificant (p=0.37) association.

Table-I

Distribution of the study patients according to age (N=80).

Age in years	Group I (n = 40)		Group II (n = 40)		Total (N=80)		p value
	Number	%	Number	%	Number	%	
<40	5	12.5	6	15.0	11	13.8	
40 – 49	12	30.0	9	22.5	21	26.2	
50 – 59	13	32.5	17	42.5	30	37.5	
≥ 60	10	25.0	8	20.0	18	22.5	
Mean±SD	50.8±13.1		49.8±9.6		50.3±11.4		0.69^{ns}
Range (min – max)	(22 – 76)		(30 – 71)		(22 – 76)		

Group I = Transradial approach, Group II = Transfemoral approach, ns = Not significant (p>0.05), p value reached from unpaired t-test

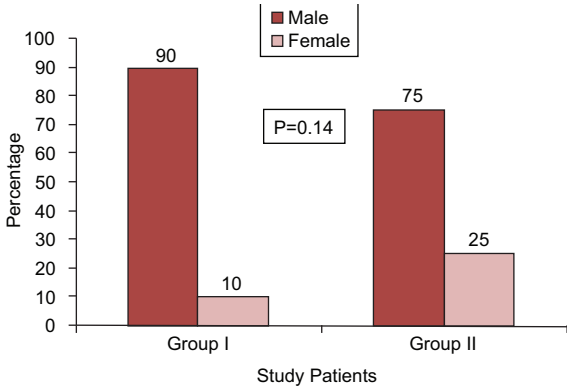

Fig.-1: *Sex distribution of the study patients (N=80).*

Table-II

Distribution of patients according to risk factors.

Risk factors`	Group I (n = 40)		Group II (n = 40)		Total (N=80)		p value
	Number	%	Number	%	Number	%	
Smoking	13	32.5	9	22.5	22	27.5	0.31^{ns}
Hypertension	15	37.5	20	50.0	35	43.8	0.26^{ns}
Diabetes mellitus	18	45.0	22	55.0‘	40	50.0	0.37^{ns}
Dyslipidaemia	7	17.5	11	27.5	18	22.5	0.28^{ns}
Family history of CAD	13	32.5	16	40.0	29	36.2	0.48^{ns}

Group I= Transradial approach, Group II= Transfemoral approach, ns = Not significant (p>0.05), s= Significant (p<0.05),p value reached from Pearson's Chi-square test and Fisher's exact test.

Dyslipidemia was higher in group II than group I (27.5% vs. 17.5%) and the association was statistically insignificant (p=0.28). Family history of CAD had 13 (32.5%) and 16 (40%) in group I and group II respectively with statistically insignificant association (p=0.48).

The Table-III displays that the patients with anterior and inferior AMI were equally

distributed in group I and group II with statistically insignificant difference (p>1.05).

The Table-IV describes that vessel involvement among the study patients were almost similar with statistically insignificant difference between groups (p>0.05).

Table-V shows that the percentage of stenosis in culprit arteries were almost identical in between study groups (p>0.05).

There was no significant (p>0.05) difference between the groups in terms of the arteries involved with coronary interventions (Table-VI).

The TIMI flow presented almost identical (p>0.05) in group I and group II (Table-VII).

Table-VIII demonstrates that the hospital stay time was more in group II than group I patients which was about 6 days and 4 days, respectively. The mean difference was statistically significant (p<0.001).

Table-IX shows that bleeding occurred 1 (2.5%) in Group I and 6 (15%) in Group II patients, Vascular complications occurred in 1 (2.5%) and 5 (12.5%) patients Group I and Group II respectively. No death observed in Group I and 3 (7.5%) patients died in group II. So the bleeding and vascular complications were significantly occurred in Group II than in Group I with statistically significant (p<0.05) association. The occurrence of other adverse outcomes were not varied statistically significantly (p>0.05).

Out of 40 patients, 37.5% patients in group II experienced overall adverse outcome, on the contrary 15% of the patients in group I did have such experience. So, the Table-XII revealed that overall outcome were less in group I than group II which is statistically significant (p<0.05).

Table-III

Distribution of patients according to ECG diagnosis (N=80).

Clinical	Group I (n = 40)		Group II (n = 40)		Total (N=80)		p value
diagnosis	Number	%	Number	%	Number	%	
Anterior	21	52.5	21	52.5	40	100.0	1.00^{ns}
Inferior	19	47.5	19	47.5‘	40	100.0	1.00^{ns}

Group I= Transradial approach, Group II= Transfemoral approach, ns = Not significant (p>0.05), p value reached from Chi-square test

Table-IV

Distribution of patients according to coronary angiography (N=80).

No. of diseased	Group I (n = 40)		Group II (n = 40)		Total (N=80)		p value
Vessels	Number	%	Number	%	Number	%	
Single	26	65.0	27	67.5	53	66.2	0.81^{ns}
Double	11	27.5	11	27.5	22	27.5	1.00^{ns}
Triple	3	7.5	2	5.0	5	6.3	0.81^{ns}

Group I= Transradial approach, Group II= Transfemoral approach, ns= Not significant (p>0.05), p value reached from Chi square test and Fisher's exact test

Table-V

Percentage of stenosis in culprit artery (N=80).

Stenosis	Group I (n = 40)		Group II (n = 40)		p value
	Number	Percent (%)	Number	Percent (%)	
100%	33	82.5	32	80.0	0.77^{ns}
70 -99%	7	17.5	8	20.0	

Group I= Transradial approach, Group II= Transfemoral approach, ns = Not significant (p>0.05), p value reached from Chi Square test

Table-VI

Distribution of patients according to coronary interventions (N=80).

Intervention	Group I (n = 40)		Group II (n = 40)		Total (N=80)		p value
	Number	%	Number	%	Number	%	
LAD	21	52.5	20	50.0	41	51.2	0.81^{ns}
LCX	3	7.5	5	12.5	8	10.0	0.71^{ns}
RCA	14	35.0	15	37.5	29	36.2	0.81^{ns}
Multi vessel	2	5.0	0	0.0	2	2.5	1.00^{ns}

Group I= Transradial approach, Group II= Transfemoral approach, ns= Not significant (p>0.05), p value reached from Chi square test Fisher's exact test

Table-VII

Procedural outcome of the study patients according to TIMI flow after primary PCI (N=80).

TIMI flow	Group I (n = 40)		Group II (n = 40)		p value
	Number	Percent (%)	Number	Percent (%)	
0	0	0.0	0	0.0	
I	0	0.0	0	0.0	
II	5	12.5	7	17.5	0.53^{ns}
III	35	87.5	33	82.5	0.53^{ns}

Group I= Transradial approach, Group II= Transfemoral approach, ns = Not significant (p>0.05), p value reached from Chi Square test

Table-VIII

Comparison of the study patients according to hospital stay (N=80).

Hospital stay (days)	Study patients						p value
	Group I (n = 40)		Group II (n = 40)		Total (N=80)		
	Number	%	Number	%	Number	%	
≤ 5 days	32	80.0	13	32.5	45	56.2	
> 5 days	8	20.0	27	67.5	35	43.8	
Mean ± SD	4.4±2.2		6.3±2.9		8.4±3.7		<0.001^{s}

Group I= Transradial approach, Group II= Transfemoral approach, s = Significant (p<0.05), p value reached from unpaired t test

Table-IX

Comparison of the study patients by outcomes variables (N=80).

Outcomes variables	Group I (n = 40)		Group II (n = 40)		Total (N=80)		p value
	Number	%	Number	%	Number	%	
Recurrent ischemia	0	0.0	1	2.5	1	1.2	1.00^{ns}
Bleeding	1	2.5	6	15.0	7	8.8	0.04^{s}
Vascular complications	1	2.5	5	12.5	6	7.5	0.04^{s}
Death	0	0.0	3	7.5	3	3.8	0.07^{ns}
Cardiogenic shock	2	5.0	5	12.5	7	8.8	0.43^{ns}
Heart failure	1	2.5	3	7.5	4	5.0	0.61^{ns}
Significant arrhythmia	6	15.0	3	7.5	9	11.2	0.28^{ns}
Stroke	0	0.0	0	0.0	0	0.0	

Group I= Transradial approach, Group II= Transfemoral approach,ns= Not significant (p>0.05), s= Significant (p<0.05), p value reached from Chi-square test and Fisher's exact test

Table-XI

Comparison of patients by composite or overall adverse outcome (N=80).

Adverse in-hospital outcome	Group I (n = 40)		Group II (n = 40)		Total (N=80)		p value
	Number	%	Number	%	Number	%	
Present	6	15.0	15	37.5	21	26.3	0.02[s]
Absent	34	85.0	25	62.5	59	73.7	

Group I= Transradial approach, Group II= Transfemoral approach, s = Significant (p<0.05), p value reached from Chi Square test

Discussions

In this present study bleeding, vascular complications occurred significantly more in transfemoral approach than transradial approach. Here we found that death, bleeding and other vascular complications occurred less in transradial group in relation to transfemoral group. Other adverse in hospital outcomes were similar in both of the groups. Some previous studies showed a similar reduction in the rate of major bleeding and death.[17,18,19]

Out of 40 patients, 37.5% patients in group II experienced composite or overall adverse outcome, on the contrary 15% of the patients in group I did have such experience. So, in this study it was revealed that composite or overall adverse outcome were less in group I than group II with statistically significant association (p=0.02).

In this study it was observed that the mean hospital stay was significantly low in patient went for transradial approach (4.4±2.2) than that of transfemoral approach (6.3±2.9), which resembles with the mean hospital stay (5±3days vs. 8±6 days, p<0.05) observed by other studies.[20,21] More recently, the mean hospital stay was found to be 7.0 ± 7.9 vs. 7.9 ± 5.6 days; (p<0.005) for transradial PCI and transfemoral PCI respectively.[22] The increased length of hospital stay was probably due to delayed mobilization of the patient and increased rate of vascular complications in primary percutaneous coronary intervention by femoral route.

Limitations of the study

There are some facts to be considered which might have affected the result of the current study. It was a nonrandomized, single centre study and the study population was small in number. Hemostasis was achieved by using manual pressure in most of the patients.

Conclusion:

Our findings support that transradial primary PCI is safer than transfemoral in respect of procedural and post procedural complications including bleeding, vascular complications and mortality. More importantly, it has also shorter mean duration of hospital stay. Transradial procedure leads to improve quality of life after the procedure and thus gives much comfort to the patient. So, transradial approach may be an attractive alternative to conventional transfemoral approach and can be practiced routinely for PPCI.

Conflict of Interest - None.

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