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Comparison between femoral access versus radial access in primary percutaneous coronary interventions

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Abstract

Introduction
The femoral approach for coronary angiography and angioplasty is used by most interventional cardiologists in both elective and primary Percutaneous coronary intervention (PCI) procedures. The use of transradial access has been increasing worldwide as it has fewer access site complications.

Aim
In this study, the author compared femoral versus radial approaches in patients with acute myocardial infarction undergoing primary angioplasty.

Patients and Methods
The study population consisted of 100 patients who presented to the author's center with acute ST-segment elevation myocardial infarction. The author divided the study population into two groups: group A that consisted of 50 patients in whom primary PCI was done through the transfemoral route and group B that consisted of 50 patients in whom primary PCI was done through the transradial route. The author compared complications in both groups.

Results
The author found that there was no significant difference between both groups regarding complications, namely, the major hematomas, the minor hematomas, the bleeding complications, pseudoaneurysm of the femoral artery, and loss of radial artery.

Conclusion
Under the light of the obtained results, the following conclusion could be drawn: first, both transfemoral and transradial approaches are feasible for performing primary angioplasty; second, there is an insignificant difference between the femoral approach and radial approach in patients with acute myocardial infarction undergoing primary PCI regarding complications, and third, operator should use the approach that is mastered.

Keywords: Coronary angiography, femoral access, myocardial infarction, percutaneous coronary interventions, radial access

Introduction

Percutaneous coronary interventions require accessing the arterial system percutaneously using the Seldinger technique through femoral, brachial, or radial artery approaches.

Because it is a sizable artery, the femoral was the preferred access site for the past 30 years, as it can accommodate larger sized catheters that may be needed in some complex procedures such as bifurcation and Chronic total occlusion Percutaneous Coronary Intervention procedures [1]. Access site bleeding is a common complication, especially when using glycoprotein IIa/IIIa inhibitors in primary PCI procedures.

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Recently radial access has gained popularity [2], due to safety, decreased associated access site complications, convenience for the patients, early ambulation, and hospital discharge. Still, many operators are not enthusiastic to use the radial artery access due to many reasons mainly the longer learning curve and the inability to perform some complex procedures that may

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require using larger catheters. Regarding complications, access site complications are less common in the radial approach because it is easily compressible that allows easier hemostasis. On the other hand, postprocedural arterial occlusion is more common in radial than femoral access [1]. Because of its convenience, patients always prefer transradial access. However, for the PCI operators, mastering the transradial access needs a long learning curve. The radial approach may prevent the use of some large devices that are used in interventions such as temporary pacemakers, intra-aortic balloon pumps. Based on the above data, we performed this study to compare the efficacy of radial versus femoral approaches in primary angioplasty in acute ST-elevation myocardial infarction.

Aim

The aim of this study is to compare the efficacy and complications of radial versus femoral routes for primary angioplasty in acute ST-segment elevation myocardial infarction.

Patients and methods

Our study was performed on 100 patients with ST-elevation myocardial infarction who presented to our center between June 2019 and June 2020. These patients were divided into two groups: group A that consisted of 50 patients in whom primary PCI was done through femoral route and group B that consisted of 50 patients in whom primary PCI was done through radial route.

Before the procedure, all patients signed a written informed consent according to the hospital protocol.

All patients were examined thoroughly. History for the presence of risk factors of Coronary Artery Disease (CAD), namely, diabetes mellitus, hypertension, hyperlipidemia, cigarette smoking, and family history of coronary artery disease, was interrogated. Clinical Examination, stressing on the measurement of Blood Pressure, auscultation for the presence of additional sounds and murmurs, and auscultation of the back for the presence or absence of rales leads to ECG, troponin, and cardiac enzymes.

Coronary angiography was performed according to the standard protocol. Coronary arteries were viewed in multiple projections. The major coronary arteries and their secondary branches were considered separately. Left main coronary artery, left anterior descending, circumflex, right coronary artery, and the main secondary branches such as diagonal, obtuse marginal, and posterior descending arteries were also considered.

The study population then underwent primary PCI to the culprit lesion. Before the procedure, an unfractionated heparin bolus at a dose of 70 UI/kg was injected.

Using other antithrombotic agents such as glycoprotein IIb/IIIa inhibitors, thrombus aspiration, and balloon predilatation was left to the operator's choice. If indicated glycoprotein IIb/IIIa inhibitor boluses were followed by 24-h infusion.

All patients had been pretreated with acetylsalicylic acid plus a loading dose of Ticagrelor (180 mg) or Clopidogrel (600 mg) and were discharged on dual antiplatelets (Aspirin 100 mg once daily with Ticagrelor 90 mg twice daily or Aspirin 100 mg with Clopidogrel 75 mg once daily) and HMG CoA reductase inhibitors (atorvastatin 40 mg) therapy for more than 12 months at the discretion of the operator and depending on the stent implanted.

Before the procedure, bilateral femoral and radial pulses had been evaluated by a physician. For group A, transfemoral approach was used. After local anesthesia with 2% lidocaine, a 6F sheath was advanced over a 0.035″ guidewire, using the Seldinger technique. In group B patients, transradial approach was used. After local anesthesia using 2% lidocaine, the radial artery was cannulated with a 19-gauge needle, through which a 0.022″ guidewire was advanced and a 6F radial sheath was introduced over it. Vasodilating drugs mixture of 5 mg verapamil and 50 mg nitroglycerin was used. Hemostasis was achieved with external compression with the TR band. The patients were allowed to walk just after intervention in the transradial group and after 12 h in the transfemoral group unless indicated otherwise by their clinical condition.

The access time, procedure time, and fluoroscopic time were calculated.

Patients were clinically examined just after the procedure, before Cardiac Care Unit (CCU) discharge, and followed up 2 weeks after discharge for the presence of access site complications (hematoma, bleeding, pseudoaneurysms, and loss of pulse).

All results were tabulated and statistical analysis was performed using IBM compatible PC and using statistical software package, namely, SPSS. The results were analyzed by suitable statistical methods, which include, mean, SD, Student's *t* test. Data were considered significant at a *P* value less than 0.05, highly significant at a *P* value less than 0.001, and not significant at a *P* value more than 0.05.

Results

The work was done on 100 patients with ST segment Elevation Myocardial Infarction (STEMI); these patients were divided into two groups:

(1) Group A: it included 50 patients in whom primary PCI was done by transfemoral route; 22 patients were hypertensive, 18 patients were diabetics, 15 patients were smokers, 17 patients were hyperlipidemic, and 11 patients with a positive family history of coronary artery disease.
(2) Group B: it included 50 patients in whom primary PCI was done by transradial route; 24 patients were hypertensive, 17 patients were diabetics, 17 patients were smokers, 17 patients were hyperlipidemic, and 12 patients with a positive family history of coronary artery disease.

From the previous data shown in Table 1 and Figure 1 on studying the risk factors of coronary artery diseases among patients in the study, there was a significant difference between the two groups regarding hypertension, diabetes mellitus, cigarette smoking, hyperlipidemia, and positive family history of coronary artery disease.

Angiographic characteristics among group A and group B

(1) Group A: among patients in group A, we found 3 patients with normal coronary arteries, 26 patients with one-vessel disease, 14 patients with two-vessel disease, and 7 patients with multivessel disease.
(2) Group B: among patients in group B, we found 4 patients with normal coronary arteries, 24 patients with one-vessel disease, 15 patients with two-vessel disease, and 7 patients with multivessel disease.

From the previous data presented in Table 2 and Figure 2 on studying the angiographic characteristics of the patients in the study, we found no significant difference between the two groups regarding angiographic characteristics and severity of coronary artery disease.

Comparison of procedural parameters between the two groups

(1) Group A: among patients in group A, the mean access time was 5.4 min, mean fluoroscopy time was 6.1 min, and mean procedural time was 28.9 min.
(2) Group B: among patients in group A, the mean access time was 5.6 min, mean fluoroscopy time was 6.3 min, and mean procedural time was 28.5 min.

From the previous data presented in Table 3 and Figure 3 on studying the procedural parameters in the study, we found no significant difference between the two groups regarding procedural parameters, namely, the mean access time, the mean fluoroscopy time, and the mean procedural time.

Comparison of complications in between the two study groups

(1) Group A: among patients in group A, 2 patients had a major hematoma, 4 patients had a minor hematoma, 6 patients had bleeding complications, and 1 patient had a pseudoaneurysm.
(2) Group B: among patients in group A, 1 patient had a major hematoma, 3 patients had a minor hematoma, 4 patients had bleeding complications, and 1 patient lost the radial artery.

From the previous data presented in Table 4 and Figure 4 on studying the comparison between the two groups in the study, we found no significant difference between the two groups regarding complications, namely, the major hematomas, the minor hematomas, the bleeding complications, pseudoaneurysm of the femoral artery, and loss of radial artery.

Table 1:The distribution of risk factors among group A and group B

Item	Group A	Group B	*P*	Significance
HTN	22	24	0.231	Insignificant
DM	18	17	0.339	Insignificant
Smokers	15	17	0.229	Insignificant
Hyperlipidemia	17	17	0.411	Insignificant
Positive family history	11	12	0.239	Insignificant

DM, diabetes mellitus; HTN, hypertension.

Table 2: Angiographic characteristics among group A and group B

Item	Group A	Group B	*P*	Significance
Normal coronaries	3	4	0.311	Insignificant
One-vessel disease	26	24	0.219	Insignificant
Two-vessel disease	14	15	0.323	Insignificant
Multivessel disease	7	7	0.411	Insignificant

Table 3: The comparison of procedural parameters between group A and group B

Item	Group A	Group B	*P*	Significance
Access time (min)	5.4	5.6	0.311	Insignificant
Fluoroscopy time (min)	6.1	6.3	0.319	Insignificant
Procedural time (min)	28.9	28.5	0.411	Insignificant

Table 4: The comparison of complications between group A and group B

Item	Group A	Group B	*P*	Significance
Major hematoma	2	1	0.211	Insignificant
Minor hematoma	4	3	0.221	Insignificant
Bleeding complications	6	4	0.129	Insignificant
Pseudoaneurysm	1	0	0.061	Insignificant
Loss of radial artery	0	1	0.061	Insignificant

Discussion

Risk factors of coronary artery disease

Our results revealed no significant difference between the transfemoral group (group A) and transradial group (group B), which were in concordance with the results obtained by Bhat *et al*., Romagnoli *et al*., and Tewari *et al*., who also reported similar risk factor distribution of patients in their studies [3,4,5]. Our results were also in concordance with the results obtained by Kumar *et al*.[6] who compared transradial versus transfemoral route in acute STEMI.

Angiographic characteristics and severity of coronary artery disease

Our results revealed no significant difference between the transfemoral group (group A) and transradial group (group B) regarding angiographic characteristics and severity of CAD that were in concordance with the results obtained by Kumar *et al*.[6] who compared transradial versus transfemoral route in acute STEMI.

Procedural parameters

Our results revealed no significant difference between the transfemoral group (group A) and transradial group (group B)

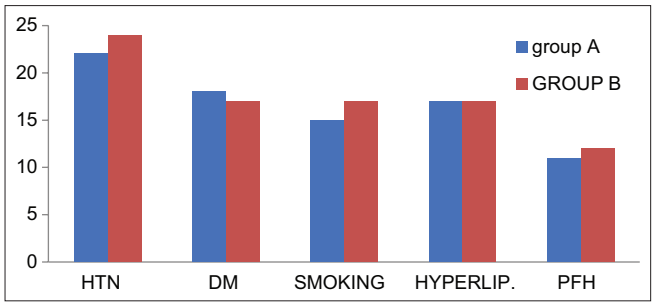

Figure 1: The distribution of risk factors among group A and group B.

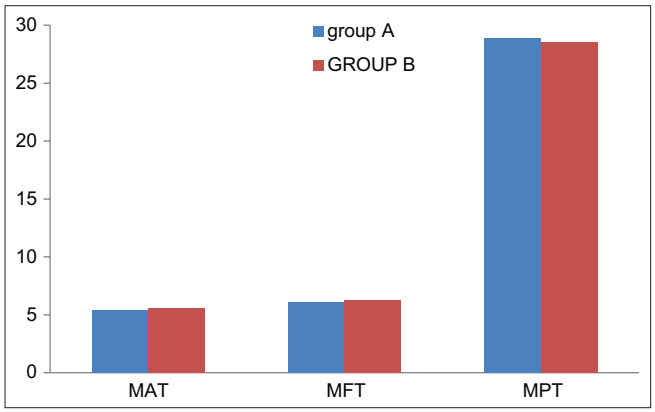

Figure 3: The comparison of procedural parameters between group A and group B. MAT, mean access time; MFT, mean fluoroscopy time; MPT, mean procedural time.

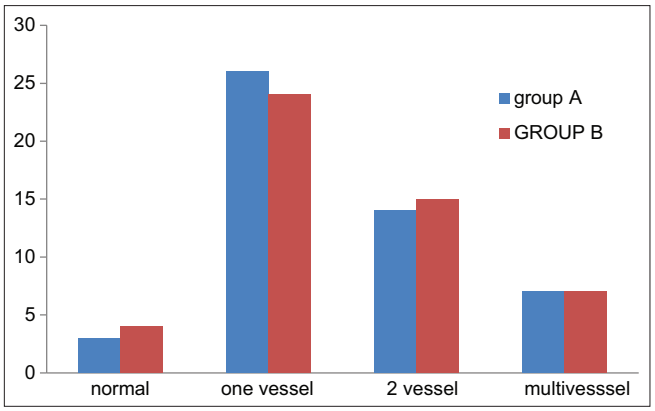

Figure 2: Angiographic characteristics among group A and group B.

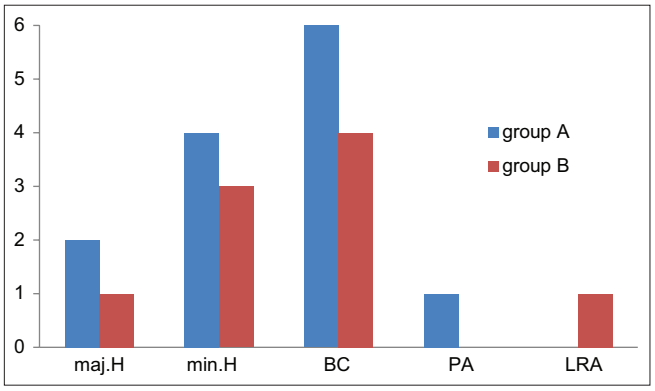

Figure 4: The comparison of complications between group A and group B. Maj. H, major hematoma; min. H, minor hematoma; BC, bleeding complications; PA, pseudoaneurysm; LRA, loss of radial artery.

regarding procedural parameters, namely, the mean access time, mean fluoroscopy time, and mean procedural time among the participants of both the study groups. Our results were in discordance with the results obtained by Bhat *et al*. The authors reported that the access time was more with the transradial approach compared with the transfemoral approach (6.0 ± 1.8 min versus 4.2 ± 0.70 min, the *P* value of < 0.0001). The total procedure time was also more in the transradial approach group compared with the transfemoral approach group (29 ± 11.3 min versus 27.3 ± 12.4 min, the *P* value of 0.03). Similarly, the total fluoroscopic time was more in the transradial approach compared with the transfemoral approach (6.4 ± 2.9 min versus 6.0 ± 2.5 min, *P* value 0.015) [3]. Our results were also in discordance with the results obtained by Kassam *et al*. Kiemeneij and Laarman also showed similar results concerning procedure time and fluoroscopic time [7,8]. Procedure success was higher in transfemoral PCI in an updated report from the US National Cardiovascular Data Registry as well. In the RIVAL trial, both radial and femoral approaches were safe and effective for PCI but the radial approach was associated with less incidence of local vascular complications; this was in concordance with our results [9].

Complications

Common complications observed in the present study included hematoma formation and bleeding complications. An insignificantly higher incidence of complications was seen among the patients of the transfemoral group (group A) in comparison with the patients of the transradial group (group B). Our results were in discordance with the results obtained by Bhat *et al*. and Romagnoli *et al*. who also reported a significantly higher incidence of complications in patients of the transfemoral group in comparison with the patients of the transradial group [3,4]. Choussat *et al*.[10] in their study found that access site bleeding was seen in 7.4% in the transfemoral group, whereas none had hematoma formation in the transradial group (*P* = 0.04). Agostoni *et al*.[11] in their study found that transradial group was associated with a significantly lower rate of complication, even at the cost of more procedure failure that is also in discordance with our results. The most probable explanation of this discordance is that the femoral route is the route of choice in the National Heart Institute in Egypt that renders the operators more expert in transfemoral than transradial route; in other words, the transfemoral route is mastered. Access site bleeding is an important risk factor for a poor outcome in ST-elevation acute coronary syndromes. Because of the association between bleeding, ischemic events, and mortality, operators should avoid iatrogenic hemorrhagic complications [12–14].

Recently, there are many risk scores for estimating the bleeding risk for each patient individually, but in cases of acute

myocardial infarction, the urge to go for primary PCI as soon as possible to limit the ischemic time and save the myocardium often limits the applicability of these scores [15].

Conclusions

In the light of the above-obtained results, the following conclusion could be drawn:

(1) Both transfemoral and transradial approaches are feasible for performing primary angioplasty.
(2) There is an insignificant difference between the transfemoral approach and the transradial approach in primary PCI for STEMI.
(3) The operator should choose his/her most convenient approach.

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Conflicts of interest

There are no conflicts of interest.

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