Original Article

Radial or femoral access in primary percutaneous coronary intervention (PCI): Does the choice matters?

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ARTICLE INFO

ABSTRACT

Background: This study was conducted with the aim of providing a quantitative appraisal of clinical outcomes of trans-radial access for primary percutaneous coronary interventions (PCI) in patients with ST-segment evaluation myocardial infarction (STEMI).
Methods: In this study, we compared two propensity-matched cohorts of patients who underwent primary PCI via trans-radial (TRA) and trans-femoral access (TFA) in a 1:1 ratio. The profile of two cohorts was matched for gender, age, and body mass index, diabetes, hypertension, family history, and smoking. The outcomes of primary PCI were compared for the two cohorts which included all-cause in-hospital mortality, heart failure, re-infarction, cardiogenic shock, bleeding, transfusion, cerebrovascular accident, and dialysis.
Results: This analysis was performed on a total of 2316 patients with 1158 patients each in the TRA and TFA group. We observed significantly lower rates of mortality, 0.8% (9) vs. 3.5% (41); $p < 0.001$ and bleeding, 0.5% (6) vs.1.6% (19); $p = 0.009$ with shorter hospital stay, 1.61 ± 1.39 vs. 1.98 ± 1.5 days, in trans-radial vs. trans-femoral. However, both fluoroscopic time and contrast volume were significantly higher in the TRA as compared to TFA group 15.57 ± 8.16 vs. 12.79 ± 7.82 min; $p < 0.001$ and 143.22 ± 45.33 vs. 133.78 ± 45.97; $p < 0.001$ respectively.
Conclusions: Compared with TFA access, TRA for primary PCI is safe for patients with STEMI, it was found to be associated with a significant reduction in in-hospital mortality and bleeding complications.

1. Introduction

This is an era of innovation and change, frequent modification has occurred in primary PCI (percutaneous coronary intervention) treatment for STEMI (ST-segment evaluation myocardial infarction), from thrombolytics to angioplasty, balloon use to stent placement, bare-metal stents to drug-eluting stents so is the change in access. Trans-femoral access (TFA) was considered the route of choice for percutaneous procedures because femoral being the large size vessel, can accommodate large catheters, sheaths. The trans-femoral access was continued to be the technique of choice for primary PCI for STEMI over decades. As it was appeared to offer more predictable vascular anatomy, rapid arterial access, and the ability to provide temporary pacing and hemodynamic support when needed. However, data and evidence from large registry-based studies and clinical trials indicated that the TFA was found to be associated with increased access site bleeding complications, more so for emergency procedures, such as primary PCI, than elective procedures.[1,2] The bleeding complications, after PCI, increases the risk of significant ischemic consequences and one of the major causes of increased bleeding was due to increased use of antiplatelet and potent anticoagulant therapy.[3]

Trans-radial access (TRA) was introduced several decades ago by Campeau in 1989,[4] but received little adaptation among the interventional cardiologists due to pertinent challenges, such as small size of the artery, radial/brachial loop, arterial spasm, arteria lusoria and tortuous subclavian artery, availability of equipment specification for radial artery, and limited range in sizes of catheter.[5] In recent years, trans-radial arterial access gained overwhelming

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acceptability worldwide, even for the emergency procedures such as primary PCI,[6–8] owing to the fact that in trans-radial procedures, access site complications are slim to none, reduces peri-procedural morbidity and mortality, increases patient comfort, and reduces duration of hospital stay which in turn reduces treatment cost.[6,9–11]

TRA in patients with acute coronary syndromes (ACS) is reported to be associated with a significant reduction in 30-day mortality and better clinical benefit.[12–14] However, there is a dearth of data for STEMI patients, i.e. only 48% of STEMI patients recruited in MATRIX[12] trial similarly only 27% of STEMI patients recruited in RIVAL[13] trial. Therefore, all the patients included in this study were presented with STEMI and undergone primary percutaneous intervention. The aim was to provide a quantitative appraisal of clinical outcomes of TRA verses TFA for primary PCI in patients with STEMI.

2. Materials and methods

This observational study was based on data extracted from a prospectively collected data registry. After the institutional ethical review board approval, data for this study was extracted from the institutional submission to the National Cardiovascular Data Registry (NCDR) CathPCI Registry®. Data consist of the record of the patient undergone primary PCI at the National Institute of Cardiovascular Diseases (NICVD), the largest tertiary care cardiac center of Pakistan, and registered in CathPCI Registry® for quarter III 2017 till quarter I 2018. The primary PCI was defined as the emergency PCI for ST-Elevation MI (STEMI) or equivalent as per the NCDR definition. Diagnosis of STEMI was made based on the patients presenting concerns, electrocardiography (ECG), and cardiac enzyme assessment and confirmation of CAD was made on coronary angiography.

As per the ACC/AHA guidelines for the management of STEMI, all the patients diagnosed with STEMI were preloaded with soluble aspirin (300 mg), Clopidogrel (600 mg), and unfractionated Heparin adjusted according to body-weight. Glycoprotein IIb/IIIa inhibitor (tirofiban) as an IV infusion was administered in patients with high thrombus burden and few of other people who developed no reflow/slow flow phenomenon.

Study variables include patients demographic and medical history, such as gender, age at the time of the procedure, medical history of diabetes mellitus (DM), hypertension (HTN), smoking, and positive family history of premature CAD. Patients were categorized into two groups based on access for the procedure, trans-radial and trans-femoral, both the groups were matched for baseline characteristics using propensity matching method in the 1:1 ratio. Baseline profile of the patients for matching comprises of gender, age, and body mass index (BMI kg/m^2), history of diabetes mellitus, hypertension, family history, smoking, and CCS (Canadian Cardiovascular Society) classification of past two weeks. Study outcomes were taken as fluoroscopic time (minutes), contrast volume (ml), TIMI (thrombolysis in myocardial infarction) flow grade (post-procedure), length of stay, and in-hospital outcomes and complications such as all-cause mortality, re-MI, heart failure, cardiogenic shock, bleeding, transfusion, cerebrovascular accident (CVA), dialysis, and other vascular complications. The details of proforma and definition of the variables used for data collection are defined elsewhere in NCDR® CathPCI Registry® v4.4 Coder's Data Dictionary.[15]

The R platform version 3.5.1 and package "MatchIt" was used for the propensity matching of the trans-radial and trans-femoral group. After quality assessment of the data was converted to IBM SPSS (IBM Corp., Armonk, NY, US) version 21.0 for the analysis. The continuous variables were summarized as mean ± SD (standard deviation) and categorical response variables are expressed as percentages (%) [counts]. The baseline demographic and clinical characteristics were compared between the trans-radial and trans-femoral groups by applying the appropriate chi-square test and the Mann−Whitney U test. The criteria for statistical significance was taken as a p-value of less than or equal to 0.05.

3. Results

This analysis was performed on a total of 2316 patients in a 1:1 ratio of TRA and TFA for the procedure selected based on the propensity matching method. Both, TRA and TFA, groups, each consist of 1158 patients, were found to have a similar profile in terms of age, gender, body mass index (BMI), risk profile such as hypertension, diabetes, family history, and smoking, clinical presentation, and past cardiac history such as history of valvular or ischemic event, intervention, or surgery. Demographics, medical history, and presentation of the patients are presented in Table 1.

Both of the groups were similar in most of the variables of pre-procedural characteristics and angiographic profile, presented in Table 2. However, the percutaneous coronary intervention (PCI) in cardiogenic shock was more common for trans-femoral group 5.8% (67) vs. 2.1% (24); $p < 0.001$ and three-vessel diseases (3VD) was more commonly observed in the trans-femoral group, 27.5% (319) vs. 23.7% (274. Similarly, culprit left anterior descending artery (LAD) was more common in trans-radial group, 59.5% (689) vs. 51.6% (597), while, culprit right coronary artery (RCA) was more common in trans-femoral group, 36.9% (427) vs. 28.6% (331). Pre-procedural characteristics and angiographic profile by the procedural access are presented in Table 2.

Comparatively better post-procedure in-hospital outcomes were observed in TRA group with significantly higher TIMI flow grade III, 98.3% (1138) vs. 95% (1100); $p < 0.01$ and significantly lower rates of mortality, 0.8% (9) vs. 3.5% (41); $p < 0.001$, heart failure, 0.3% (3) vs. 1.1% (13); $p = 0.012$, and bleeding, 0.5% (6) vs.1.6% (19); $p = 0.009$. Also, the length of hospital stay was lesser for the TRA group, 1.61 ± 1.39 vs. 1.98 ± 1.5 days, as compared to the TFA group. However, both fluoroscopic time and as contrast volume were significantly higher in the TRA group as compared to the TFA group with mean ± standard deviation of 15.57 ± 8.16 vs. 12.79 ± 7.82 min; $p < 0.001$ and 143.22 ± 45.33 vs. 133.78 ± 45.97; $p < 0.001$ respectively. The stratification of patients by cardiogenic shock revealed that rate of post procedure heart failure was not statistically significant between transradial and transfemoral access in patients without cardiogenic shock while mortality rate, rate of bleeding, length of hospital stay, fluoroscopic time, and as contrast volume remained significant. In-hospital outcomes by the procedural access stratified by cardiogenic shock are presented in Table 3.

The mortality rate by procedural access stratified by various influential characteristics is presented in Fig. 1. Mortality rate was found to be unanimously higher in TFA as compared to TRA for the patients with cardiogenic shock (28.4% vs. 12.5%, $p = 0.097$), multivessel diseases (5.6% vs. 1.1%, $p = 0.002$), culprit LAD (3.2% vs. 1.2%, $p = 0.010$), and culprit RCA (3.3% vs. 0.0%, $p < 0.001$).

4. Discussion

In this study we compared two propensity match cohort of STEMI patients who underwent primary PCI therapy via TFA or TRA for the procedure, and it was found that trans-radial access is associated with better outcomes in terms of reduced mortality, myocardial infarction risk, decrease risk of bleeding and other vascular complications, requiring few transfusions of blood ambient at a risk of increasing contrast volume and radiation dose than trans-femoral access.

Table 1
Demographic and clinical characteristics by the procedural access.

Characteristics	Total	Trans-radial	Trans-femoral	[a]p-value
Base (N)	2316	1158	1158	-
Gender				
Male	2032 (87.7%)	1012 (87.4%)	1020 (88.1%)	0.612
Female	284 (12.3%)	146 (12.6%)	138 (11.9%)	
Age (mean ± SD) years	54.05 ± 10.88	54.01 ± 10.87	54.09 ± 10.89	0.858
Up to 40 years	245 (10.6%)	129 (11.1%)	116 (10%)	0.38
41–60 years	1395 (60.2%)	698 (60.3%)	697 (60.2%)	0.966
More than 60 years	676 (29.2%)	331 (28.6%)	345 (29.8%)	0.522
BMI (mean ± SD) kg/m²	26.2 ± 4.65	26.29 ± 4.53	26.11 ± 4.76	0.337
Risk profile				
Hypertension	1027 (44.3%)	517 (44.6%)	510 (44%)	0.77
Diabetes	570 (24.6%)	293 (25.3%)	277 (23.9%)	0.44
Smoker	634 (27.4%)	315 (27.2%)	319 (27.5%)	0.852
Family History of CAD	69 (3%)	36 (3.1%)	33 (2.8%)	0.714
Dyslipidemia	484 (20.9%)	246 (21.2%)	238 (20.6%)	0.683
Angina classification in past 2 weeks				
CCS I	1182 (51%)	593 (51.2%)	589 (50.9%)	0.868
CCS II	289 (12.5%)	143 (12.3%)	146 (12.6%)	0.85
CCS III	419 (18.1%)	201 (17.4%)	218 (18.8%)	0.359
CCS IV	426 (18.4%)	221 (19.1%)	205 (17.7%)	0.391
Prior cardiac history				
Prior myocardial infarction	155 (6.7%)	80 (6.9%)	75 (6.5%)	0.678
Prior heart failure	12 (0.5%)	5 (0.4%)	7 (0.6%)	0.563
Valvular Surgery	2 (0.1%)	1 (0.1%)	1 (0.1%)	>0.99
Prior PCI	61 (2.6%)	23 (2%)	38 (3.3%)	0.052
Prior CABG	4 (0.2%)	0 (0%)	4 (0.3%)	0.045[b]
Prior cardiovascular disease	27 (1.2%)	11 (0.9%)	16 (1.4%)	0.333
Prior peripheral artery disease	7 (0.3%)	3 (0.3%)	4 (0.3%)	0.705

SD = standard deviation, CAD = coronary artery disease, PCI = percutaneous coronary intervention, CABG = coronary artery bypass grafting, CCS= Canadian cardiovascular society classification.
[a] Mann–Whitney U test or t-test or chi-square test.
[b] Significant at 5%.

Table 2
Pre-procedural characteristics and angiographic profile by the procedural access.

Characteristics	Total	Trans-radial	Trans-femoral	[a]p-value
Base (N)	2316	1158	1158	-
PCI in cardiogenic shock	91 (3.9%)	24 (2.1%)	67 (5.8%)	<0.001[b]
Intra-aortic balloon pump	10 (0.4%)	3 (0.3%)	7 (0.6%)	0.205
Thrombus	1850 (79.9%)	930 (80.3%)	920 (79.4%)	0.604
Bifurcation Lesion	615 (26.6%)	307 (26.5%)	308 (26.6%)	0.962
Lesion complexity				
Non-High/Non-C Lesion	1298 (56%)	650 (56.1%)	648 (56%)	0.933
High/C Lesion	1018 (44%)	508 (43.9%)	510 (44%)	
Lesion length (mean ± SD) mm	19.17 ± 8.54	19.12 ± 8.45	19.22 ± 8.64	0.784
Number of diseased vessels				
None	20 (0.9%)	9 (0.8%)	11 (0.9%)	0.123
Single vessel disease	935 (40.4%)	490 (42.3%)	445 (38.4%)	
Two-vessel disease	768 (33.2%)	385 (33.2%)	383 (33.1%)	
Three-vessel disease	593 (25.6%)	274 (23.7%)	319 (27.5%)	
Culprit artery				
Left anterior descending artery	1286 (55.5%)	689 (59.5%)	597 (51.6%)	<0.001[b]
Right coronary artery	758 (32.7%)	331 (28.6%)	427 (36.9%)	
Circumflex	249 (10.8%)	127 (11%)	122 (10.5%)	
Ramus	7 (0.3%)	4 (0.3%)	3 (0.3%)	
Left main	16 (0.7%)	7 (0.6%)	9 (0.8%)	
Pre-procedural TIMI				
TIMI - 0	1618 (69.9%)	820 (70.8%)	798 (68.9%)	0.773
TIMI - 1	370 (16%)	177 (15.3%)	193 (16.7%)	
TIMI - 2	170 (7.3%)	84 (7.3%)	86 (7.4%)	
TIMI - 3	158 (6.8%)	77 (6.6%)	81 (7%)	
Glycoprotein IIb/IIIa inhibitors	1997 (86.2%)	1024 (88.4%)	973 (84%)	0.002[b]

SD = standard deviation, TIMI = thrombolysis in myocardial infarction.
[a] Mann–Whitney U test or t-test or chi-square test.
[b] Significant at 5%.

The uniqueness of this study among other large studies with same objectives is that all the patients included in this study were presented with STEMI, who are at high risk of thrombosis because of high thrombogenic milieu and at increase bleeding risk as a consequence of multiple antithrombotic therapies. Conversely, other major studies, such as RIVAL[13] ($n = 7021$) and MATRIX[12]

Table 3
In-hospital outcomes by the procedural access.

Characteristics	Total	Transradial	Transfemoral	[a]p-value
Overall				
Base (N)	2316	1158	1158	–
Fluoroscopic time (minutes)	14.18 ± 8.11	15.57 ± 8.16	12.79 ± 7.82	<0.001[b]
Contrast volume (ml)	138.5 ± 45.88	143.22 ± 45.33	133.78 ± 45.97	<0.001[b]
Post procedural TIMI III flow	2238 (96.6%)	1138 (98.3%)	1100 (95%)	<0.001[b]
Mortality	50 (2.2%)	9 (0.8%)	41 (3.5%)	<0.001[b]
Myocardial infarction (MI)	12 (0.5%)	5 (0.4%)	7 (0.6%)	0.563
Heart failure	16 (0.7%)	3 (0.3%)	13 (1.1%)	0.012[b]
Cerebrovascular accident	1 (0%)	1 (0.1%)	0 (0%)	0.317
Dialysis	2 (0.1%)	0 (0%)	2 (0.2%)	0.157
Other vascular complications	9 (0.4%)	1 (0.1%)	8 (0.7%)	0.019[b]
Transfusion	11 (0.5%)	3 (0.3%)	8 (0.7%)	0.131
Bleeding	25 (1.1%)	6 (0.5%)	19 (1.6%)	0.009[b]
Length of stay (days)	1.79 ± 1.45	1.61 ± 1.39	1.98 ± 1.5	<0.001[b]
Patients presented in cardiogenic shock				
Base (N)	91	24	67	-
Fluoroscopic time (minutes)	13.37 ± 7.27	16.09 ± 10.42	12.4 ± 5.54	0.032[b]
Contrast volume (ml)	136.26 ± 47.5	149.58 ± 39.17	131.49 ± 49.54	0.110
TIMI III flow	85 (93.4%)	22 (91.7%)	63 (94%)	0.689
Mortality	22 (24.2%)	3 (12.5%)	19 (28.4%)	0.119
Myocardial infarction (MI)	2 (2.2%)	0 (0%)	2 (3%)	0.392
Heart failure	12 (13.2%)	2 (8.3%)	10 (14.9%)	0.413
Transfusion	1 (1.1%)	0 (0%)	1 (1.5%)	0.547
Bleeding	4 (4.4%)	0 (0%)	4 (6%)	0.221
Length of stay (days)	2.29 ± 2.05	1.88 ± 1.68	2.43 ± 2.15	0.254
Patients not in cardiogenic shock				
Base (N)	2225	1134	1091	-
Fluoroscopic time (minutes)	14.21 ± 8.14	15.56 ± 8.11	12.81 ± 7.94	<0.001[b]
Contrast volume (ml)	138.6 ± 45.83	143.09 ± 45.46	133.92 ± 45.76	<0.001[b]
TIMI III flow	2153 (96.8%)	1116 (98.4%)	1037 (95.1%)	<0.001[b]
Mortality	28 (1.3%)	6 (0.5%)	22 (2%)	0.002[b]
Myocardial infarction (MI)	10 (0.4%)	5 (0.4%)	5 (0.5%)	0.951
Heart failure	4 (0.2%)	1 (0.1%)	3 (0.3%)	0.298
Cerebrovascular accident	1 (0%)	1 (0.1%)	0 (0%)	0.327
Dialysis	2 (0.1%)	0 (0%)	2 (0.2%)	0.149
Other vascular complications	1 (0%)	1 (0.1%)	0 (0%)	0.327
Transfusion	10 (0.4%)	3 (0.3%)	7 (0.6%)	0.184
Bleeding	21 (0.9%)	6 (0.5%)	15 (1.4%)	0.039[b]
Length of stay (days)	1.79 ± 1.45	1.61 ± 1.39	1.98 ± 1.5	<0.001[b]

TIMI = thrombolysis in myocardial infarction.
[a] Mann–Whitney U test or t-test or chi-square test.
[b] Significant at 5%.

($n = 8404$), the STEMI patients consisted of only 27% and 48% of the study sample respectively. The RIFLE STEACS[14] ($n = 1001$) being the first randomized trial included 100% STEMI population and compared the trans-radial vs. trans-femoral differences. To the best of our knowledge, this is the largest study from the South Asian region reporting comparative assessment of TRA and TFA for the primary PCI procedure in patients with STEMI.

In order to attain comparability and to minimize the effect of confounding factors the two cohorts were matched for various important characteristics using propensity matching method. Both, trans-radial and trans-femoral, cohorts had similar profile in terms of age (54.01 ± 10.87 years vs. 54.09 ± 10.89 years; $p = 0.858$), male gender (87.4% vs. 88.1%; $p = 0.612$), body mass index (26.29 ± 4.53 km/m^2 vs. 26.11 ± 4.76 km/m^2; $p = 0.337$), prevalence of hypertension (44.6% vs. 44%; $p = 0.77$), diabetes (25.3% vs. 23.9%; $p = 0.44$), positive family history (3.1% vs. 2.8%; $p = 0.714$), and smoking (27.2% vs. 27.5%; $p = 0.852$).

In this study, the overall mortality rate was 2.2%, while it was 0.8% and 3.5% in TRA and TFA groups respectively ($p < 0.001$). We have noticed certain subgroups of patients including patients with cardiogenic shock, culprit LAD, culprit RCA, and patients having multivessel involvement had high mortality rates, however,

comparatively reduced mortality rates were observed unanimously for all the subgroups of patients with trans-radial access for the procedure.

This mortality difference was also seen in other studies, RIVAL study reported that in the subgroup of high volume radial centers the primary outcome of 30 days MACE was lower between trans-radial vs. trans-femoral (1.6% versus 3.2%; hazards ratio [HR], 0.49; 95% CI, 0.28–0.87).[13] In MATRIX trial all-cause mortality was 3·7% vs. 4·4% (hazards ratio [HR], 0·84; 95% CI, 0·68–1·04) in trans-radial vs. trans-femoral group respectively.[12] In particular, in RIFLE STEACS, TRA was associated with significantly lower rates of cardiac mortality as against TFA (5.2% vs. 9.2%, $p = 0.020$).[14] The mechanism behind the decrease in mortality associated with TRA is not clear. This can be attributed to the reduced bleeding rates in the trans-radial approach, as multiple studies have shown bleeding in post percutaneous intervention patients is associated with worse outcomes.[3]

This study also showed that bleeding was 0.5% in trans-radial vs. 1.9% in trans-femoral, $p < 0.001$, especially access site. Other vascular complications and requirement of blood transfusion were also high in trans-femoral access patients, such advantages have also been seen in past studies comprising more than 100
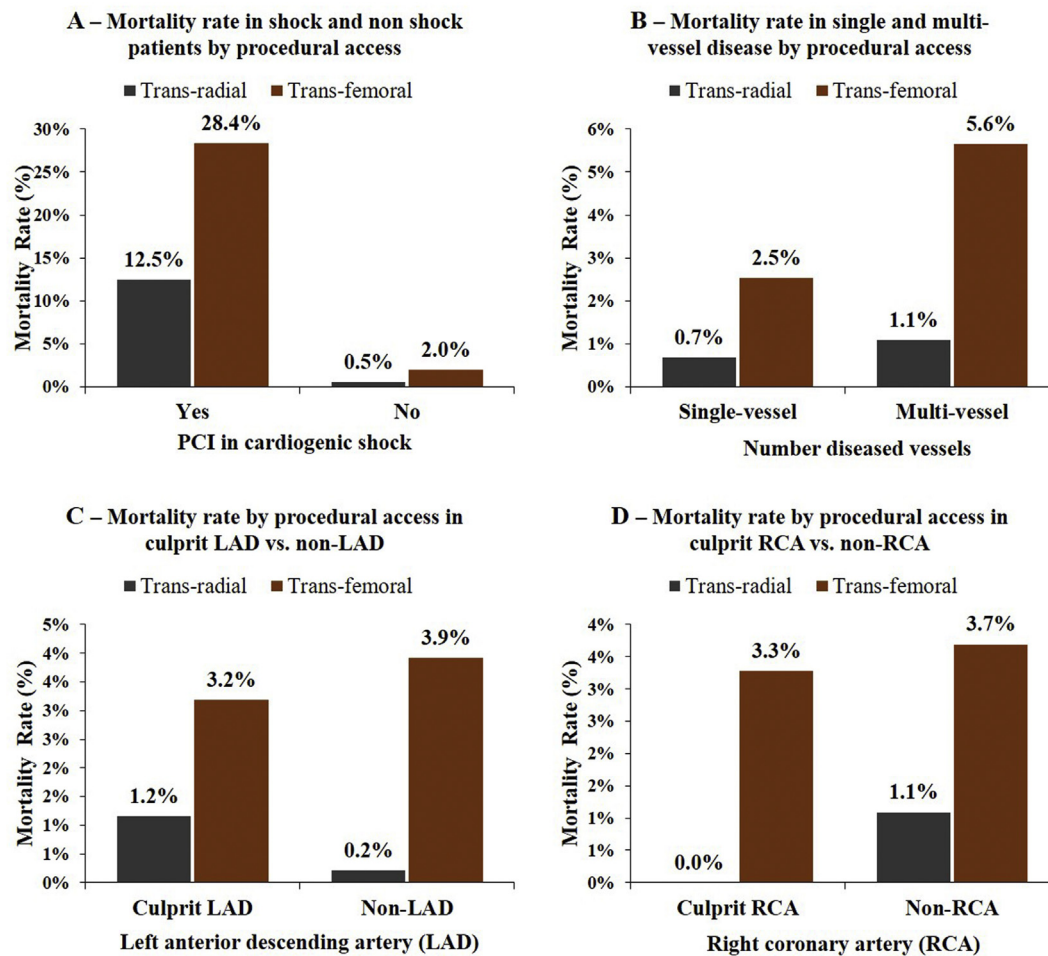
Fig. 1. Mortality rate by procedural access stratified by cardiogenic shock (A), number of diseased vessels (B), culprit LAD (C), and culprit RCA (D).

randomized trials showed a significant drop of 89% (0.3% vs. 3.0%, $p < 0.001$) in entry site bleeding complications, 80% in transfusions and 31% in death.[16,17] Recently published report of NCDR for 2007—2012 (N = 2,820,874 procedure) comparing TRA and TFA approach confirms the overall high success rates (94.7% vs. 93.7% adjusted OR 1.13, $p < 0.001$) and fewer vascular complications (0.16% vs. 0.45% adjusted OR 0.51, $p < 0.001$) [8]. RIVAL trial showed the rate of non-CABG-related major bleeding at 30 days was 0·7% for the patients in the TRA group as compared to 0.9% for the patients in the TFA group (HR 0.73, 95% CI 0.43—1.23; $p = 0.23$).[13] The study further reported that large hematoma at 30 days was observed in 1.19% of patients in the radial group vs. 3.01% in the femoral group (HR 0.40, 95% CI 0.28—0.57; $p < 0.0001$).[13] Similarly, pseudoaneurysm needing closure occurred in seven (of 3507) vs. 23 (of 3514) in the radial group and femoral group respectively (HR 0.30, 95% CI 0.13—0.71; $p = 0·006$).[13]

Overall advantages of trans-radial have also been advocated by three large meta-analysis[16—19] trans-radial access in STEMI patients for primary percutaneous intervention is associated with similar door to balloon time and lower rates of bleeding and vascular complication in the presence of triple antithrombotic agents,[8,20—22] and reduced 30 day mortality[12—14] as compared to trans-femoral approach.

Radial artery compared to femoral is superficially easy to puncture and compress, hence reduces the risk of bleeding, absence of major veins around the radial artery so the risk of arteriovenous fistula formation is low, and satellite radial nerve making puncture-related nerve injury almost impossible. Trans-radial access also provides more comfort to the patient, rapid ambulation, reduces hospital stay and cost.

Trans-radial access has also been reported to be associated with improvement in survival of patients with cardiogenic shock.[23—25] It has been reported to be independently associated with lower in-hospital MACE, major bleeding, and 30-day mortality.[23] However, the mechanism behind prognostic advantages of TRA in cardiogenic shock is not clear. Some of the studies have postulated that decrease in access site and non-access site bleeding in trans-radial patients has been associated with improved outcomes in patients with cardiogenic shock.[25] Similar to these past studies, we have also observed a decreased, but insignificant, bleeding and mortality in TRA groups of cardiogenic shock patients as compared to TFA.

Although biasness was suppressed by adopting the propensity matching method, however, the non-randomized nature of the study design is the biggest limitation of this study. Secondly, only post-procedure in-hospital outcomes were available, therefore, short and long term impact could not be assessed. Finally, due to lower number of patients and differences in base size, no concise conclusion can be made about outcome differences between trans-radial and trans-femoral access in high-risk subgroups such as cardiogenic shock. Further multicenter randomized clinical trials are warranted to validate the study findings in this particular subset of patients.

5. Conclusion

Compared with trans-femoral access, trans-radial access for primary PCI is safe and effective for patients with STEMI. The trans-radial access was found to be associated with a significant reduction in post-procedure in-hospital mortality and bleeding complications.

Disclaimer

None to declare.

Source of funding

None to declare.

Declaration of Competing Interest

All authors have none to declare.

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