

Comparison of radial vs femoral approach in patients with st-segment elevation acute myocardial infarction in a code-stemi program

Abstract

Objectives: This study sought to assess whether transradial access improves clinical outcomes in patients with ST-segment elevation acute myocardial infarction (STEMI) compared with conventional transfemoral access.

Background: In patients with STEMI the radial approach for PCI has been suggested to improve the prognosis due to a lower rate of vascular complications in comparison with femoral approach.

Methods: This is a single-center, observational registry of all STEMI patients who underwent emergent coronary angiography between January 2016 to January 2017. The primary endpoint was the 30-day rate of net adverse clinical events (NACE), defined as a composite of death, MI, stroke, target vessel revascularization, BARC bleeding ≥ 3 and vascular complications. Secondary endpoints were 30-day individual components of NACEs and length of hospital stay.

Results: The primary endpoint of 30-day NACE occurred in 6.4 % of the radial group (n: 218) and 12.1 % of the femoral group (n: 182; $p=0.049$). Compared with femoral, radial access was associated with significantly lower rates of BARC bleeding ≥ 3 (0.9 vs 3.8%, $p=0.049$) and shorter intensive coronary unit stay (2.04 ± 2.3 vs 2.5 ± 2.56 , $p=0.001$). Mortality, stroke and myocardial infarction were similar in both groups. Multivariate regression analysis identified femoral approach as the only independent predictor of 30-day NACE (OR: 2.2; 95% CI: 1.0 to 4.7; $p = 0.032$).

Conclusion: In patients with STEMI undergoing emergent PCI, radial access reduces net adverse clinical events, through a reduction in BARC bleeding ≥ 3 . The study supports the preferential use of radial access for STEMI PCI.

Keywords: Radial, Femoral, ST-segment elevation acute myocardial infarction, Percutaneous coronary intervention, Bleeding

Volume 11 Issue 3 - 2018

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Received: May 14, 2018 | **Published:** May 23 2018

Introduction

Role of early primary percutaneous cutaneous coronary intervention (PCI) within 90 minutes of hospital contact is well recognized in ST-segment elevation myocardial infarction (STEMI). Transfemoral approach has been the access of choice for performing PCI in the United States for all indications.^{1,2} Since the introduction of transradial coronary intervention (TRI) by Kiemeneij and Laarman, it has been getting more popularity throughout the world.^{3,4} Compared with femoral access, radial approach decrease mortality and MACE and improves safety, with reductions in major bleeding and vascular complications across the whole spectrum of patients with ischemic heart disease.⁵

Recent data show a tendency of increasing use of radial access for STEMI, but most hospitals in the United States perform transfemoral intervention (TFI) for STEMI. In Europe rates of TRI are vastly higher, ranging from 50% to 80%.⁶ Almost 95% of patients will have successful TRI for STEMI, and crossover rates decline with operator experience.⁷ In the modern era, the advantage of radial access over femoral approach may be lower because new anticoagulant agents and smaller arterial sheaths that reduce bleeding risk.⁸ Accordingly, we did this study among patients with STEMI who were undergoing

emergent coronary angiography, in order to assess whether radial access is superior to femoral access.

Methods

This registry was conducted at Unidad Médica de Alta Especialidad, Hospital de Cardiología No. 34, Monterrey Nuevo León, México, a high procedural volume center with more than 3,000 coronary angiograms and 1,700 PCI per year. All patients in the study were consecutively enrolled between January 2016 and January 2017. Inclusion criteria were defined by acute coronary syndrome with ST segment elevation associated with sustained chest pain within 12 hours of symptom onset.

Patients were recruited either from the emergency unit of our institution or were referred from other hospitals for emergent PCI. Emergent PCIs were defined as primary, rescue or pharmacoinvasive PCI as follows: **primary PCI** was defined as mechanical coronary recanalization without previous thrombolysis or pretreatment by glycoprotein IIb/IIIa (GpIIb/IIIa) inhibitors; **rescue PCI** was defined as mechanical coronary recanalization when thrombolytic treatment has failed; **pharmacoinvasive PCI** was defined as mechanical coronary recanalization 3-24 hours after successful thrombolytic treatment, assessed by clinical and electrocardiographic criteria.

The exclusion criteria included previous coronary artery bypass graft surgery (CABG) and cardiogenic shock (Killip class 4). The primary endpoint was the 30-day rate of net adverse clinical events (defined as a composite of death, MI, stroke, target vessel revascularization, BARC bleeding ≥ 3 and vascular complications). Secondary endpoints were 30-day individual components of NACEs and hospital length.

Arterial access

Choice of access was left to the discretion of the interventional cardiologist.

For radial-PCI (r-PCI), the skin overlying the radial artery was anaesthetized by local infiltration using 1-2 ml of lidocaine. After radial artery puncture, a 6 Fr sheath was inserted according to the Seldinger technique. Thereafter, a dose of 2.5 mg of verapamil was injected into the sheath in order to facilitate catheter progression and to prevent arterial spasm. The arterial sheath was removed after the intervention, and a compression device (TR Band; Terumo Medical Corporation, Somerset, NJ, USA) was applied for hemostasis.

For femoral-PCI (f-PCI), pulse quality of both femoral arteries was systematically assessed. If pulse quality was equivalent, the right femoral artery was preferred. A 6 Fr sheath was inserted following local anaesthesia with 10 ml of lidocaine. The sheath was removed 6 hours after the end of procedure and haemostasis was achieved by femoral manual compression for 10-15 min with subsequent pressure bandage and bag application for 4-6 hours.

PCI procedure

Written informed consent was obtained in the catheterization laboratory immediately prior to the invasive procedure.

Emergent r-PCI was performed in most cases (>95%) with a single JL 3.5 guiding catheter to minimize catheter exchanges and reduce radial spasm. With a single catheter one can shoot the non-infarct artery first and then begin the intervention in the culprit artery without having to change out the catheter. In this strategy, the procedure time reduces, which has a secondary benefit of reducing radiation exposure to the patient and operator. Emergent f-PCI was performed with standard 6 French guiding catheters (JL 4 and JR 4) after the coronary diagnostic procedure.

The choices of guide wires, individual PCI strategy (i.e., pre-dilation, direct stenting, and post-dilation), manual thrombus aspiration and the use of glycoprotein IIb/IIIa platelet receptor antagonists were left to the operator's discretion. Unfractionated heparin was dosed at 70–100 units per kg in patients not receiving glycoprotein IIb/IIIa inhibitors and at 50–70 units per kg in patients receiving glycoprotein IIb/IIIa inhibitors. All patients were pre-treated with acetylsalicylic acid (300mg) plus a loading dose of clopidogrel (300-600 mg) and were discharged on dual antiplatelet therapy for 12 months.

Definitions and data collection

STEMI patients were defined as having chest pain for at least 20 min with the following electrocardiography changes: ST-segment elevation 0.2 mV in 2 continuous precordial leads or 0.1 mV in 2 limb leads, new left bundle branch block, or electrocardiography changes compatible with true posterior MI.

Cardiac death was defined as any death due to cardiac cause,

procedure-related deaths, and death of unknown cause.

Stroke was defined as the occurrence of a new neurologic deficit, lasting >24h and in the presence of cerebral lesions as assessed by imaging procedures).

New myocardial infarction was defined as new ischemic symptoms lasting 20 min and new or recurrent ST-segment elevation or depression 1 mm in at least 2 contiguous leads, associated with a 20% increase of the cardiac biomarker values not attributable to the evolution of the index myocardial infarction.

Target lesion revascularization was defined as any revascularization procedure performed because of angiographic restenosis or thrombosis at the site of the culprit lesion, associated with clinical and/or objective evidence of inducible myocardial ischemia.

Stent thrombosis was classified using the Academic Research Consortium definition.

Major bleeding was defined as “Bleeding Academic Research Consortium “(BARC) score ≥ 3 . Type 3a: Overt bleeding plus hemoglobin drop of 3 to <5g/dL (provided hemoglobin drop is related to bleed); transfusion with overt bleeding. 3b: Overt bleeding plus hemoglobin drop ≥ 5 g/dL (provided hemoglobin drop is related to bleed); cardiac tamponade; bleeding requiring surgical intervention for control (excluding dental/nasal/hemorrhoid); bleeding requiring intravenous vasoactive agents. 3c: Intracranial hemorrhage (does not include microbleeds or hemorrhagic transformation, does include intraspinal) confirmed by autopsy, imaging, or lumbar puncture; intraocular bleed compromising vision. Type 4: CABG-related bleeding within 48 hours. Type 5a: Probable fatal bleeding. 5b: Definite fatal bleeding (overt or autopsy or imaging confirmation).

Access site complications were defined as pseudoaneurysms requiring closure, periprocedural access site bleeding requiring anticoagulation reversal, arteriovenous fistulas, and access site complications requiring surgical or percutaneous intervention.

Angiographic success after PCI was defined by the combination of a TIMI flow grade 3 and a reduction in the percentage diameter stenosis of 30%.

All data were recorded in a central database.

Data analysis

Data on 30-day outcomes were obtained by direct patient visit or contact with referring physician in the absence of any adverse event.

Continuous variables are presented as mean \pm SD. Categorical data are presented as number and percentage. Baseline and procedural characteristics as well as event rates in the two treatment groups were compared using the Fisher exact test or chi-square test for categorical variables, and the Student t test for continuous variables.

All variables were tested for bivariate association with NACEs, and nominally significant ($p < 0.05$) covariates were simultaneously forced into a Cox regression model to identify independent outcome predictors and to calculate their adjusted odds ratios (ORs) with associated 95%.

All statistical analyses were performed using SPSS 22 for Windows (SPSS IBM, Armonk, New York). A p value < 0.05 was considered statistically significant.

Results

Between January 2016 and January 2017, emergent coronary angiography was performed in 443 patients with STEMI. We included 400 patients who met the selection criteria. The access was by radial route in 218 patients (54%) and by femoral route in the remaining 182 (46%).

Baseline characteristics. There were no significant differences between the two study arms, except that more patients in the radial group had previous thrombolysis (33.9 vs 25.3%, $p=0.038$) (Table 1). Median mean age was 62 years and 77% of the patients were male. The most frequent location of AMI was anterior in 53% of the cases and 89.5% of the patients were in Killip class 1. The risk scores (TIMI and GRACE) were similar in both groups.

Table 1 Baseline Characteristics

	Overall (n=400)	Radial (n=218)	Femoral (n=182)	p Value
Age, yrs	62.25± 10.9	61.54±10.9	63.09±11.0	0.161
Male	310 (77.5%)	168 (77.1%)	142 (78%)	0.819
Diabetes	187 (46.8%)	98 (45%)	89 (48.9%)	0.431
Hypertensión	224 (56%)	114 (52.3%)	110 (60.4%)	
Dyslipidemia	112 (28%)	55 (25.2%)	57(31.3%)	0.177
Smoking	228 (57%)	123 (56.4%)	105 (57.7%)	0.798
AMI localization				0.429
Inferior	180 (45%)	92 (42.2%)	88 (48.4%)	
Anterior	212 (53%)	122 (56%)	90 (49.5%)	
Lateral	8 (2%)	4 (1.8%)	4 (2.2%)	
Killip Kimball class				0.153
I	358 (89.5%)	201 (92.2%)	157 (86.3%)	
II	29 (7.2%)	12 (5.5%)	17 (9.3%)	
III	13 (3.3%)	5 (2.3%)	8 (4.4%)	
Crossover	8 (2%)	7 (3.1%)	1 (0.6%)	0.07
Thrombolysis	120 (30%)	74 (33.9%)	46 (25.3%)	0.038
Baseline Cr, mg/dl	0.99±0.41	0.95±0.35	1.03±0.46	0.081
TIMI score	3.58±1.84	3.43±1.77	3.77±1.92	0.068
GRACE score	141±29.57	141±27.9	140±31.50	0.723

AMI, acute myocardial infarction; Cr, creatinine; TIMI, thrombolysis in myocardial infarction.

Angiographic and procedural characteristics. Were similar between the two study groups and are shown in the Table 2. There were no differences in the total ischemia time and door-to-balloon time. Fifty percent of the patients had ≥ 2 vessels disease. The culprit vessel was in Thrombolysis in myocardial infarction (TIMI) 0 flow in 52.5% of the patients. The baseline TIMI flow grade 0-1 was higher in the femoral group (66.5% vs 55%, $p=0.011$). The crossover rate was 3.1% in the radial group and 0.16% in the femoral group ($p=0.070$). PCI with stent was performed in 94.2% of the patients. The presence of thrombus and use of DES was more frequent in the femoral group (51.8 vs 64.3%, $p=0.002$ and 30.3% 45.1%, $p=0.002$ respectively), whereas direct stent implantation was more frequent in the radial group (15.8 vs 6.4%, $p=0.003$). The use of IIb/IIIa was performed in 46.4% of the cases and were comparable in both groups. Final TIMI flow grade 2-3 was obtained in 97.8% of the patients and the angiographic success was 88.3%.

Clinical outcomes at 30 days. Are shown in Table 3. The primary end point of NACE at 30 days occurred in 36 patients (9%) and was significantly lower in the radial group compared to the femoral group (6.4% vs 12.1%, $p=0.049$). BARC ≥ 3 bleeding and vascular complications were significantly higher in the femoral group compared to the radial group (0.9% vs 3.8%, $p=0.049$). Two patients in the femoral group required surgical vascular exploration. There was a statistically significant decrease in the days of stay in the coronary care unit for the r-PCI group (2.04±2.30 vs 2.5±2.56, $p=0.001$) and total hospital stay (5.67±3.46 vs. 6.23±3.24, $p=0.005$). The rate of MI (0.5% vs 2.7 %, $p=0.061$), stroke (0.9% vs 0.5%, $p=0.671$), TVR (0.5% vs 2.3%, $p=0.123$) and death (4.6% vs 6%, $p=0.515$), were comparable in the 2 groups study.

Outcome predictors. Multivariate regression analysis identified femoral approach as the only independent predictor of 30-day NACE (OR: 2.2; 95% CI: 1.0 to 4.7; $p=0.032$).

Table 2 Angiographic and Procedural Characteristics

	Overall (n=400)	Radial (n=218)	Femoral (n=182)	p Value
Ischemic total time, min	324±201	318±187	332±216	0.482
Door to ballon, min	39.2±20.73	40.3±21.54	38.06±19.89	0.327
Severity of CAD				0.479
0 vessel disease	8 (2%)	6 (2.8%)	2 (1.1%)	
1 vessel disease	191 (47.8%)	104 (47.7%)	87 (47.8%)	
2 vessel disease	103 (25.8%)	59 (27.1%)	44 (24.2%)	
3 vessel disease	98 (24.5%)	49 (22.5%)	49 (26.9%)	
No. treated vessels				0.303
0 vessel	15 (3.8%)	8 (3.8%)	7 (3.9%)	
1 vessel	358 (91.3%)	191 (90.1%)	167 (92.8%)	
2 vessel	18 (4.6%)	13 (6.1%)	5 (2.8%)	
3 vessel	1 (0.3%)	0 (0%)	1 (0.6%)	
Culprit vessel				0.192
LAD	204 (52.0%)	115 (54.2%)	89 (49.4%)	
RCA	153 (39.0%)	75 (35.4%)	78 (43.3%)	
CX	34 (8.7%)	22 (10.4%)	12 (6.7%)	
RI	1 (0.3%)	0 (0%)	1 (0.6%)	
Baseline TIMI flow grade				0.011
0-1	243 (60.8%)	120 (55%)	123 (67.6%)	
2-3	157 (39.2%)	98 (45%)	59 (32.4%)	
Emergent angiography				0.001
PCI-primary	263 (65.8%)	132 (60.6%)	131 (72%)	0.016
PCI-pharmacoinvasive	79 (19.8%)	58 (26.6%)	21 (11.5%)	0.001
PCI-rescue	35 (8.8%)	14 (6.4%)	21 (11.5%)	0.071
Diagnostic	23 (5.8%)	14 (6.4%)	9 (4.9%)	0.527
Stenting	355 (94.2%)	191 (93.6%)	164 (94.8%)	0.399
Stent diameter, mm	3.22±0.48	3.23±0.46	3.21±0.49	0.713
Stent/patient ratio	1.59±0.82	1.55±0.81	1.63±0.84	0.387
Direct stenting	43 (11.5%)	32 (15.8%)	11 (6.4%)	0.003
Thrombus	230 (57.5%)	113 (51.8%)	117 (64.3%)	0.008
Calcium	21 (5.3%)	14 (6.4%)	7 (3.8%)	0.178
DES	148 (37.0%)	66 (30.3%)	82 (45.1%)	0.002
GPI IIb/IIIa	186 (46.5%)	103 (47.2%)	83 (45.6%)	0.743
Final TIMI flow grade				0.949
0-1	9 (2.3%)	5 (2.3%)	4 (2.2%)	
2-3	391 (97.8%)	213 (97.7%)	178 (97.8%)	
Angiographic succes	333 (88.3%)	183 (89.7%)	150 (86.7%)	0.228

CAD, coronary artery disease; LAD, left anterior descending artery; RCA, right coronary artery; Cx, circumflex artery; RI, ramus intermedius artery; Angiographic succes, TIMI flow grade 3 and/or residual stenosis < 30 %; PCI, percutaneous coronary intervention; DES, drug eluting stent; GPI, glycoprotein inhibitors TIMI, thrombolysis in myocardial infarction

Table 3 Clinical Outcomes at 30 days

	Overall (n=400)	Radial (n=218)	Femoral (n=182)	p Value
NACE	36 (9.0 %)	14 (6.4%)	22 (12.1%)	0.049
MACE	27 (6.8 %)	12 (5.5%)	15 (8.2%)	0.27
Death	21 (5.3%)	10 (4.6%)	11 (6%)	0.515
MI	6 (1.5%)	1 (0.5%)	5 (2.7%)	0.061
Stroke	3 (0.8%)	2 (0.9%)	1 (0.5%)	0.671
TVR	5 (1.3%)	1 (0.5%)	4 (2.3%)	0.123
BARC bleeding ≥ 3 and vascular complications	9 (2.3%)	2 (0.9%)	7 (3.8%)	0.049
CABG	14 (3.5%)	9 (4.1%)	5 (2.7%)	0.454
Stent thrombosis	5 (1.3%)	1 (0.5%)	4 (2.3%)	0.123
No reflow	23 (6.1%)	12 (5.9%)	11 (6.4%)	0.847
Hospital stay, days				
Total	5.92±3.37	5.67±3.46	6.23±3.24	0.005
CCU	2.25±2.44	2.04±2.3	2.5±2.56	0.001

NACE, net adverse clinical event (MACE + BARC bleeding ≥3 and vascular complications); MACE, major adverse cardiac events (cardiac death, myocardial infarction, stroke, target vessel revascularization; MI, myocardial infarction; TVR, target vessel revascularization; BARC, bleeding academic research consortium; CABG, coronary artery bypass graft surgery; CCU, coronary care unit

Discussion

The main findings of this study are as follows: in patients with STEMI 1) the use of radial compared with femoral access is associated with lower risk for major bleeding/major vascular complications 2) the radial approach was associated with a superior net clinical benefit 3) patients undergoing a transradial procedure need shorter intensive coronary care unit and hospital stays, 4) the rates of myocardial infarction, stroke and mortality are comparable with those of femoral Access

Percutaneous coronary intervention (PCI) is accepted as the optimal strategy to recanalise culprit coronary arteries in STEMI.^{9,10}

During PCI, it remains critical to control both ischemic and bleeding risks. Hemorrhagic and ischemic PCI-related risks are higher in patients with STEMI. Current antithrombotic and antiplatelet agents (ie, heparin, aspirin, glycoprotein IIb/IIIa inhibitors and P2Y12 inhibitors) have been developed to prevent ischemic complications. Although peri-PCI ischemic risk has been better controlled with combinations of antithrombotic therapies, they are associated with a relative increase in bleeding complications.^{11,12}

As PCI is routinely performed through the femoral approach, this medical regimen increases the risk of peripheral arterial complications due to access site trauma and delayed healing, associated morbidity and/or mortality rates, and subsequently prolongs bed rest duration.¹³

A large body of evidence has been accumulated showing that hemorrhagic complications constitute an important risk factor for a worse outcome in STEMI.¹⁴⁻¹⁶

The prevalence of major bleedings after PCI is 5–10%.¹⁶⁻¹⁸

Major bleeding in patients with acute coronary syndromes is associated with a 5-fold increase in risk of death. The association between major bleeding and death appears to be strong, consistent, temporal, and dose related (higher risk of death in those with more severe degrees of bleeding). Taken together, this is consistent with the conclusion that bleeding independently predicts death.

Major bleeding also is associated with an increased risk of recurrent ischemic events, including MI and stroke, and this association remains evident after adjustment for baseline differences and major bleeding propensity. The association between major bleeding and death, MI, or stroke is biologically plausible. Major bleeding is likely to lead clinicians to discontinue effective antithrombotic drugs which in turn could increase the risk of MI, stroke, and cardiovascular death.¹⁵

Blood transfusions have also been associated with increased mortality in patients undergoing PCI or with ACS.^{19,20} Periprocedural bleeding can be categorized into access site and non-access site related. Although non-access site bleeding confers a worse prognosis than access site-related bleeding, the latter still represents a significant proportion of bleeding events.²¹ In patients with acute coronary syndrome, access site-related bleeding represents 30% of the total bleeding events, and this value reaches 50% in STEMI patients.⁸ The transradial approach is a safe alternative to femoral access, which virtually eliminates access site-related bleeding and can directly impact on outcomes after primary PCI for STEMI.

Despite concerns, it is worthwhile to explore some explanations for the superiority of transradial PCI. Several anatomic features give the wrist an advantage over the groin. With the redundant vascular supply of the hand via the ulnar, median, and interosseous arterial branches, loss of a radial pulse has fewer consequences than loss of the common femoral artery pulse, which can be considered as the “left main” of

the leg. Moreover, there are fewer potentially life-threatening vascular complications associated with radial access than with femoral access. Femoral closure-device infections are associated with 6% mortality and retroperitoneal hematomas with 7% mortality.²²⁻²⁴

Despite the use of a vascular closure device, the femoral arterial access is still associated with a higher rate of access site bleedings, consisting mostly of intermediate to large hematomas.²⁵ Plausible explanations for the beneficial effects of radial access on mortality reduction are therefore the reduction in major vascular complications, major bleeding, and avoidance of subsequent blood transfusions.^{5,26} The potential benefits of the radial approach compared with femoral access have been suggested by multiple individual studies and meta-analyses over the course of the past 20 years.

In the RIVAL (Radial Versus Femoral Access for Coronary Intervention) trial 7,021 patients with ACS (unstable angina, non-ST-segment elevation myocardial infarction, and ST-segment elevation myocardial infarction [STEMI]) and planned PCI were randomized to either radial or femoral access (n=3,507 and 3,514, respectively). The primary outcome, defined as the composite of death, MI, stroke, and non-coronary artery bypass grafting-related major bleeding at 30 days, was not significantly different between the radial versus femoral approach (3.7% vs. 4.0%, p=0.50).

In the subgroup of STEMI patients, the radial access arm met primary outcome criteria (3.1% vs. 5.2%, p=0.026) and was associated with significantly lower mortality (1.3% vs. 3.2%, p=0.006).²⁷ The RIFLE-STEACS (Radial Versus Femoral Randomized Investigation in ST-Elevation Acute Coronary Syndrome) trial randomized 1,001 STEMI patients to PCI with radial or femoral access (n=500 and 501, respectively). The primary outcome—composite of cardiac death, stroke, MI, target lesion revascularization, or bleeding at 30 days—was significantly lower in the radial group (13.6% vs 21.0%, p=0.003). Major adverse cardiac events were also lower (7.2% vs. 11.4%, p=0.029) owing mainly to differences in cardiac death (5.2% vs. 9.2%, p=0.020). Non-coronary artery bypass grafting-related major bleeding was reduced with the radial approach (7.8% vs. 12.2%, p=0.026), driven by a 62% reduction in access-site bleeding (2.6% vs. 6.8%, p=0.002).²⁸

In the STEMI-RADIAL (ST Elevation Myocardial Infarction Treated by Radial or Femoral Approach—Randomized Multicenter Study Comparing Radial Versus Femoral Approach in Primary PCI) trial, patients with STEMI undergoing primary PCI were randomized to radial or femoral access (n=348 and 359, respectively). In the primary outcome of bleeding or access-site complications at 30 days the radial access was associated with 80% less bleeding and access-site complications compared with femoral access (1.4% vs. 7.2%, p=0.0001). The composite rate of adverse events was also significantly lower in the radial group (4.6% vs. 11.0%, p=0.0028). However, there was no difference in major adverse cardiac events (3.5% vs. 4.2%; p=0.7) or mortality (2.3% vs. 3.1%, p=0.64) between the 2 groups.²⁹

The recently published MATRIX trial (Minimising Adverse Haemorrhagic Events by Transradial Access Site and Systemic Implementation of Angiox) randomised 8404 patients undergoing angioplasty. This large trial included 2,002 (24%) STEMI patients. After 30 days, the first coprimary outcome of major adverse cardiac events occurred in 369 (8.8%) patients with radial access and 429 (10.3%) patients with femoral access, with a RR of 0.85 (95% CI 0.74–0.99; p=0.0092). The second coprimary outcome of net adverse

clinical events was experienced by 410 (9.8%) patients with radial access and 486 (11.7%) patients with femoral access, with a formally significant RR of 0.83 (95% CI 0.73–0.96; p=0.0092).³⁰

A meta-analysis of 8 randomized control trials and 13 retrospective studies comparing TRI with the TF approach in 8,534 STEMI patients showed marked reductions in major adverse cardiac events (44% relative risk reduction [RRR]), mortality (45% RRR), and major bleeding (68% RRR) compared with TF.³¹ Another meta-analysis of 10 randomized controlled trials (3,347 patients) showed that TRI was associated with improved survival and reduced vascular complications/hematoma, whereas a nonsignificant trend toward reduced major bleeding with TRI was found.³² Because the benefit for TRA seems also linked to the experience of the centers, it appears logical from a health perspective to continue promoting education in TRA to expand the number of sites proficient with TRA techniques.³³

The current STEMI guidelines of the European Society of Cardiology give a I-A recommendation for radial primary PCI if performed by an experienced radial operator.³⁴ The last STEMI guidelines of the ACCF/AHA just declare that radial access should be considered whenever feasible.³⁵

In our trial, we found a large reduction of major bleeding and access site complications in the radial group, and this correlated with a superior clinical benefit. Possible explanations for this beneficial effect on outcome seem to be the lower rate of bleeding-related hemodynamic compromise, need for blood transfusion, and lifesaving drug discontinuation. The significant reduction of intensive care unit stay in our study has also been found in the RIFLE-STEACS trial and has been associated with earlier hospital discharge. Because prolonged bed rest itself seems to be a predictor of worse prognosis in coronary artery disease, the possibility of a more rapid mobilization as a result of the decrease in access site complications might have also played a role in the outcome difference. Further investigation is required to evaluate whether the radial approach could be linked with a reduction in hospital-acquired infections and/or thrombophlebitis and pulmonary embolism.

There has been some reluctance to adopt radial access during primary PCI because of potential problems such as delayed reperfusion caused by longer patient preparation, longer time to gain vascular access, and potentially more difficult catheter manipulation via the radial artery. Our study demonstrates that for high-volume radial centers with experienced operators those issues are eliminated and are irrelevant. The exclusion of those who are not ideal candidates for radial approach and the ability to handle specific vascular access difficulties (e.g., unfavorable anatomic variants) are necessary to avoid harmful treatment delays in treating STEMI patients. Indeed, there is some evidence that the more expert the operator is with radial access, the more patients will benefit from the use of radial approach.

One of the major concerns regarding the use of the transradial approach in the setting of AMI is the possible delay in achieving reperfusion, which is a strong correlate of survival. Door to balloon time (40.3±21.54 vs 38.06±19.89 minutes; p=0.327) and total procedural time (318±187 vs 332±216 minutes; p=0.482) were similar in patients who underwent either radial or femoral PCI in our study. These findings support the use of radial access as the default approach for emergent coronary angiography followed by PCI in STEMI patients and strongly support a change in the “femoral first” paradigm to a “radial first” approach.

Limitations

The first limitation of our study is that it is a retrospective study, single-center, nonrandomized study and therefore it was not possible to account for all confounding influences. Second, we cannot apply the results of this trial to hospital, where TRI is not frequently performed. Third, patients with cardiogenic shock were excluded from the study. In patients with shock, the femoral approach is usually preferred, as the radial artery is more difficult to palpate and cannulate.

Conclusion

In patients with STEMI undergoing invasive emergent PCI, radial as compared with femoral access reduces major adverse cardiovascular events, through a reduction in BARC bleeding ≥ 3 and target vessel revascularization. The study supports the preferential use of radial access for STEMI PCI.

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