Transradial Versus Transfemoral Approach for Primary Percutaneous Coronary Interventions in Elderly Patients

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ABSTRACT: Background. The use of transradial approach (TRA) in the STEMI setting is still debated because of the worry that TRA intervention can lead to a delay in the reperfusion time, especially in the elderly, where more advanced atherosclerosis is usually encountered. The aim of this study is to compare the reperfusion time between radial versus femoral approach in patients older than 75 years of age undergoing primary percutaneous coronary intervention (PCI). **Methods.** From January 2008 to December 2011, a total of 283 consecutive patients older than 75 years of age underwent primary PCI at our institution. Of these, 177 were treated using the TRA while the remaining 106 had the transfemoral approach (TFA). Demographic and procedural data including door-to-balloon time, time of arterial puncture, and inflation of the balloon were recorded. **Results.** Door-to-balloon time was 103.1 ± 58.4 minutes in the TRA group compared with 110.3 ± 62.4 minutes in the TFA group (*P*=NS). Time of arterial puncture was 10.6 ± 4.1 minutes in the TRA group compared with 12.1 ± 4.5 minutes in the TFA group (*P*<.01). Time of balloon inflation was 19.6 ± 8.7 minutes in the TRA group compared with 24.2 ± 14.9 minutes in the TFA group (*P*<.01). **Conclusions.** Our data suggest that the radial approach does not lead to a lengthening of the door-to-balloon time, suggesting the efficacy of this approach in STEMI patients without cardiogenic shock at presentation.

J INVASIVE CARDIOL 2013;25(5):254-256
Key words: access approach, door-to-balloon time, STEMI

The elderly population constitutes a growing subset of patients at high risk for ST-elevation myocardial infarction (STEMI) requiring primary percutaneous coronary intervention (PCI). Compared to their younger counterparts, these patients, due to the presence of numerous comorbidities, remain at higher risk of periprocedural adverse events mostly related to arterial access-site bleeding complications.[1-4] There is strong evidence that transradial (TRA) intervention reduces vascular complication as compared to the transfemoral (TFA) approach and appears of particular interest in primary PCI, where the need of potent adjunctive antithrombotic therapy including glycoprotein IIb/IIIa inhibitors exposes the STEMI population to higher risk of access-site bleeding complications.[5,6] However, even though the transradial approach has gained progressive acceptance in the last few years, its use in STEMI patients is still debated. In fact, there is still concern that the difficulties of obtaining vascular access due to the smaller size of the radial artery and in learning the technique of TRA intervention might lead to delay in reperfusion, especially in elderly patients, where more advanced atherosclerosis with tortuous aorta and subclavian arteries are usually encountered.[7] Thus, the aim of the current study is to evaluate the efficacy (expressed as door-to-balloon times) of radial versus femoral approach for elderly patients undergoing primary PCI.

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Disclosure: The authors have completed and returned the ICMJE Form for Disclosure of Potential Conflicts of Interest. The authors report no conflicts of interest regarding the content herein.

Manuscript submitted August 29, 2012, provisional acceptance given October 3, 2012, final version accepted December 12, 2012.

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Methods

From January 2008 to December 2011, a total of 283 consecutive STEMI patients older than 75 years of age underwent primary PCI at our institution. Of these, 177 were treated via TRA, while the remaining 106 were treated via TFA. No exclusion criteria were applied, except for those patients with planned TRA who required a cross-over to TFA. The analysis included patients with Killip class IV or cardiogenic shock at presentation. PCI was routinely performed with standard techniques via femoral or radial approach using 6 Fr right and left catheters. TFA was preferably used in cases of worst Killip classification at presentation using a 6 Fr sheath (Cordis); in TRA cases, the right radial artery was the preferred site, leaving the left radial artery only for patients with previous bypass graft (left internal mammary artery) and/or absence of right pulse; a 25-cm long hydrophilic sheath (Terumo) was inserted. Patients not preloaded with oral aspirin and/or clopidogrel received a loading dose of intravenous aspirin (500 mg) and clopidogrel (600 mg) as the standard practice in our catheterization laboratory. Intravenous heparin (70 UI/kg body weight) was administered before the procedure with subsequent boluses aiming at achieving an activating clotting time (ACT) between 250 and 300 seconds. The use of glycoprotein (GP) IIb/IIIa inhibitors was left to operator discretion. In case of bivalirudin administration, a 0.75 mg/kg bolus dose followed by a 1.75 mg/kg/hour intravenous infusion terminated immediately after the end of the procedure was administered. Demographic and procedural data, including door-to-balloon time, access time in catheterization laboratory, time of arterial puncture (defined as the interval between access in catheterization laboratory and the sheath introduction) and inflation of the balloon (as the interval between sheath introduction and guidewire crossing the culprit lesion) were recorded. The main outcome of interest was the time to dilatation. Postprocedural access-site "bleeding" was defined according to TIMI criteria[8] and hematoma was defined as an arterial puncture site swelling ≥5 cm. Statistical analysis comparing the two groups, with Student's t-test for continuous variables and chi-square test for categorical variables was performed using SPSS 15.0 software package (SPSS Inc).

Table 1. Baseline clinical characteristics.

	>75 years Radial (n = 177)	>75 years Femoral (n = 106)	*P*-Value
Age (years)	81.6 ± 4	83.3 ± 4	
Male	101 (57.1%)	45 (42.5%)	<.05
Female	76 (42.9%)	61 (57.5%)	<.05
M/F ratio	1.3	0.7	
Body mass index Mean ± SD Median	 25.8 ± 3.6 25.6	 25.7 ± 3 25.6	NS
Diabetes	36 (20.3%)	19 (17.9%)	NS
Dyslipidemia	72 (40.7%)	33 (31.1%)	NS
Hypertension	121 (68.4%)	60 (56.6%)	<.05
Smoking	6 (3.4%)	6 (5.7%)	NS
Previous MI	21 (11.9%)	10 (9.4%)	NS
Previous PCI	14 (7.9%)	11 (10.4%)	NS
Previuos CABG	6 (3.4%)	3 (2.8%)	NS
Congestive heart failure	5 (2.8%)	7 (6.6%)	NS
CVA/TIA	9 (5.1%)	6 (5.7%)	NS
PVD	18 (10.2%)	14 (13.2%)	NS
Killip 1	150 (84.7%)	55 (51.9%)	<.001
Killip 2	12 (6.8%)	11 (10.4%)	NS
Killip 3	7 (4%)	15 (14.1%)	<.01
Killip 4	8 (4.5%)	25 (23.6%)	<.001
IABP	5 (2.8%)	14 (13.2%)	<.001

MI = myocardial infarction; PCI = percutaneous coronary intervention; CABG = coronary artery bypass graft; CVA/TIA = cerebrovascular accident/transient ischemic attack; PVD = peripheral vascular disease; IABP = intra-aortic balloon pump.

Table 2. Baseline lesions characteristics.

	>75 years Radial	>75 years Femoral	*P*
Saphenous vein graft	4 (2.2%)	0	NS
Left anterior descending	92 (52.0%)	50 (47.2)	NS
Right coronary artery	52 (29.4%)	31 (29.2%)	NS
Left circumflex	23 (13.0%)	12 (11.3%)	NS
Left main	6 (3.4%)	13 (12.3%)	<.01

Data given as number (percentage).

Table 3. Procedural times.

Group	Pts	Door to Balloon (minutes)	Arterial Puncture (minutes)	Balloon Inflation (minutes)
Radial	177	103.1 ± 58.4 median, 86	10.6 ± 4.1 median, 10	19.6 ± 8.7 median, 18
Femoral	106	110.3 ± 62.4 median, 96.5	12.1 ± 4.5 median, 11	24.2 ± 14.9 median, 19
P-Value		NS	<.01	<.01

Results

Patients and procedural characteristics are summarized in Tables 1 and 2. There were no significant differences in age, body mass index. prevalence of diabetes, hypercholesterolemia, and cigarette smoking between the two groups. The TFA group had a larger number of females and the femoral artery was the preferred site for patients with worst clinical presentation (Killip IV and/or cardiogenic shock). The use of GP IIb/IIIa inhibitors was slightly higher in the TRA group (55.4% in TRA vs 50.9% in TFA; *P*=NS). Postprocedural access-site bleeding (according to TIMI criteria) occurred in 5 patients in the TFA group and in 2 patients in the TRA group (4.7% vs 1.1%, respectively; P=NS); hematoma of the access site occurred in 9 patients in the TFA group and in 3 patients in the TRA group (8.5% vs 1.7%, respectively; *P*<.01). The target vessels were well balanced in the two groups except for a higher prevalence of lesions located at the left main stem in the TFA group (3.4% vs 12.3%; *P*<.01), whereas all patients with lesions located at the level of any bypass graft were in the TRA group (2.2% vs 0; *P*=NS). In the entire population, the door-to-balloon time was 105.8 ± 59 minutes (median, 92 minutes), the time of arterial puncture was 11.1 ± 4 minutes (median, 11 minutes), and the time of balloon inflation was 21.2 ± 11 minutes (median, 18 minutes). Door-to-balloon time was 103.1 ± 58.4 minutes (median, 86 minutes) in the TRA group compared with 110.3 ± 62.4 minutes (median, 96.5 minutes) in the TFA group (*P*=NS). Time of arterial puncture was 10.6 ± 4.1 minutes (median, 10 minutes) in the TRA group compared with 12.1 ± 4.5 minutes (median, 11 minutes) in the TFA group (*P*<.01). Time of balloon inflation was 19.6 ± 8.7 minutes (median, 18 minutes) in the TRA group compared with 24.2 ± 14.9 minutes (median, 19 minutes) in the TFA group (*P*<.01) (Table 3, Figure 1).

Discussion

Radial artery access for coronary angiography was first described by Campeau in the late 1980s, with coronary intervention performed by this route shortly after.[9,10] Initial success rates with this approach were suboptimal, and its use in the STEMI setting was delayed for almost 10 years.[11] Improvements in materials and techniques have solved most of the transardial limitations, but its use in primary PCI is still debated. The main reason must be searched in practical considerations.[12] First, the small size and the incidence of radial artery spasm can lead to difficulties in obtaining vascular access. Moreover, the frequency of anatomical individual variations in radial, brachial, and subclavian circulation can result in more difficult access into the central arterial circulation and inadequate catheter seating.[13] These limitations are especially present in elderly patients, where more advanced atherosclerosis with tortuous aorta and subclavian arteries are usually encountered. Despite this, there is strong evidence that TRA intervention reduces vascular complications as compared with the TFA approach and appears of particular interest in the primary PCI setting, where the need for potent adjunctive anthitrombotic therapy exposes the STEMI population to higher risk of access-site bleeding

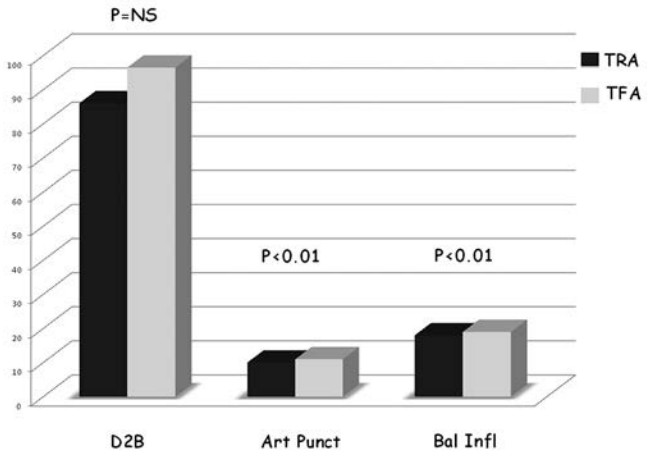

Figure 1. *Graph shows the comparison in door-to-balloon (D2B) time, time of arterial puncture (Art Punct), and time of balloon inflation (Bal Infl) between transradial (TRA) and transfemoral (TFA) groups.*

complications.[14] Therefore, the use of TRA may provide additional potential benefit in the elderly where the presence of numerous comorbidities exposes this population at higher risk of bleeding complications.[3-5,15] Therefore, there is still concern that transradial intervention can lead to delay in needle-to-balloon and reperfusion times. In contrast with this common belief, recent studies and meta-analyses have shown comparable door-to-balloon times between femoral and radial approach in skilled radial centers;[16-20] however, few data are present regarding the usefulness of transradial primary PCI in elderly patients. We found no significant difference in terms of reperfusion time between femoral and radial group with even a slightly non-significant advantage in the TRA group. Despite the small size and non-randomized nature of this study, and given the biases of choosing one approach over the other, we believe that the higher failure rates of TRA approach are strongly related to operator experience. The transradial approach performed by devoted radial operators rarely requires a cross-over to the transfemoral approach without a great difference in terms of time to dilatation. Moreover, we found a statistically significant advantage in terms of arterial puncture and time of balloon inflation in the TRA group, suggesting that the TRA approach can result in an easier and quicker approach in the hands of skilled operators. According to previous randomized trials, we also found a reduction in bleeding complications in the TRA group despite a slightly higher incidence of periprocedural GP IIb/IIIa inhibitor use. However, given the biases of the baseline characteristics between the two groups, our study is not statistically powered and no serious conclusions should be drawn regarding this point. Even though the total reperfusion time was comparable between the two groups, we cannot exclude that this could be partially influenced by the transportation time. One of the major limitations of our study is the fact that in patients with cardiogenic shock and/or worst Killip class at presentation, TFA was the preferred route; however, this could be partially counterbalanced by the fact that all patients presenting with a target lesion on any bypass graft were all treated via TRA. Moreover, patients with cardiogenic shock at presentation represent a fraction of the whole STEMI population, where such a route should be preferred, reserving the TRA for the entire remaining STEMI patients. Another certain limitation is that our study is non-randomized and well known to be susceptible to selection bias. Moreover, as previously stated, this analysis represents procedures performed in a medium/high-volume center and by interventional cardiologists highly devoted to the TRA, so it is possible that our results cannot be extended to low-volume centers and sporadic contact with radial intervention. In conclusion, our data suggest that the radial approach even in elderly patients does not lead to a lengthening of the door-to-balloon time, suggesting the efficacy of this approach in STEMI patients without cardiogenic shock at presentation.

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