ORIGINAL ARTICLE

Door-to-balloon time in radial versus femoral approach for primary percutaneous coronary intervention in patients with ST-segment elevation myocardial infarction

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Abstract   Primary percutaneous coronary intervention (pPCI) is considered the preferred reperfusion strategy for patients presenting with ST-segment elevation myocardial infarction (STEMI). This study compares the door-to-balloon (D2B) time between transradial vs. the transfemoral approach in patients presenting with STEMI.

Methods: A retrospectively collected catheterization laboratory database was reviewed for the consecutive patients presenting with a STEMI. Specific time parameters were recorded, and our composite end points were time to revascularization, angiographic success, short term clinical success, and procedural vascular complications.

Results: Radial PCI (r-PCI) was performed in 33 patients (67.3%) and in 16 patients (32.7%) PCI was done through femoral artery (f-PCI). No significant difference was observed in the pre-catheter and catheter laboratory times. Mean times from emergency room door-to-catheter laboratory time for r-PCI vs. f-PCI were 82.48 ± 37.42 and 76.29 ± 34.32 min, respectively ($P = 0.636$). The mean time from patient arrival to the cardiac catheter laboratory-to-balloon inflation was 34.56 ± 14.2 in the r-PCI group vs. 33.12 ± 12.56 min with the f-PCI group ($P = 0.215$). The total D2B time was not significantly different between r-PCI vs. f-PCI groups (100.32 ± 36.3 vs. 97.31 ± 30.37 min, respectively, $P = 0.522$). Angiographic success rates were observed in 92.1% of the patients for

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r-PCI, and in 87.5% for f-PCI ($P = 0.712$). There were no vascular complications in both groups. *Conclusions:* Patients presenting with STEMI can undergo successful pPCI via radial artery without compromising patient care.

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1. Introduction

Current practice guidelines consider primary percutaneous coronary intervention (pPCI) the preferred reperfusion strategy for patients presenting with ST-segment elevation myocardial infarction (STEMI), conditional on the timely performance of the PCI procedure.[1] On the basis of current American College of Cardiology/American Heart Association guidelines,[2] door-to-balloon time (D2B) has become a reportable core measure of quality and correlates with outcomes in high-risk and early presentation patients.[3] Periprocedural bleeding remains a major limitation of primary PCI because of the need to administer potent antithrombotic agents.[4] Previous data have established the strong association between major bleeding after PCI and increased mortality.[5–8] Substantial efforts have been made to reduce the occurrence of periprocedural bleeding, from using vascular closure devices to the use of antithrombotic agents associated with a lower bleeding risk.[9,10] Radial access during PCI has emerged as a promising alternative to femoral access, as the primary PCI using the radial approach was associated with a fourfold reduction in major bleeding.[11] Radial artery access for diagnostic cardiac catheterization received interest through the work of Campeau[12] twenty years ago, and subsequently for intervention procedures by Kiemeneij et al.[13] Since then, there has been widespread adoption of transradial techniques outside of the United States.[14] Parts of Europe and Japan do 40% or more of their cases using the radial artery, but in the United States estimates are in the low single digits (2%), although those United States cardiologists and radiologists who have learned the radial technique tend to use it for many, if not most, of their patients.[15] Reasons stated for slow acceptance in the United States include a lack of training in the radial approach, greater difficulty manipulating catheters, difficulty in achieving radial access, uncertain radiation exposure, and a learning curve for performing cardiac catheterization through the wrist.[16] These arguments against the use of the radial artery imply that greater time may be required to perform cardiac catheterization using the radial artery. This importance of time may be greatest for patients presenting with STEMI as survival directly relates to reperfusion times (door-to-balloon).[17–19] For patients undergoing primary PCI for acute STEMI, potential differences between radial PCI (r-PCI) and femoral PCI (f-PCI) in D2B times have not been widely evaluated. This study compares the transradial vs. the transfemoral approach time in the intervention for patients presenting with STEMI.

2. Methods

A retrospectively collected catheterization laboratory database of consecutive patients presenting with a STEMI over a 23 months period (starting from March 2007 till the end of January 2009) at a tertiary care hospital (Cardiothoracic Department, Spedali Civili, Brescia University, Italy) was reviewed for this analysis. We reviewed and studied patients who presented to our hospital by ST-segment elevation myocardial infarction according to the definition of Joint European Society of Cardiology/American College of Cardiology Committee 2007.[20–24] STEMI was identified by ECG either in the hospital or in the field, and cardiac catheterization laboratory staff was directly notified by the emergency medicine physician. All patients received aspirin, clopidogrel, unfractionated heparin, glycoprotein IIb/IIIa (abciximab), and other anti-ischemic medications before or during the procedure according to clinical decision of the attending physician and treating interventionalist.

The study population was stratified according to arterial access used to perform pPCI into 2 groups; radial group and femoral group (r-PCI vs. f-PCI). The choice between femoral or radial artery access was left to the discretion of the operator. Attending operators and technical staff were experienced at the transradial and transfemoral arterial access. The radial approach is the default strategy at the Brescia catheterization laboratory – Spedali Civili. In accordance with institutional policy, the femoral approach was favored for patients with negative findings on the Allen test,[12,25] and for patients with coronary artery bypass grafts (CABG). Radial arterial access was achieved in a standard fashion using commercial micropuncture kits. Intra arterial nitroglycerine (200 mcg) was used as the primary antispasmodic. PCI was performed using 6 Fr guiding catheters. At procedure completion, the sheath was removed immediately and a compression by hemostatic band was installed for 3 h. Femoral procedures were done using vascular sheaths, which were placed using the Seldinger's technique. PCI was performed using 6 Fr guiding catheters. After the end of the procedure, the sheath was removed in the intensive care unit 4–5 h after the procedure and manual compression was performed for a minimum of 15 min or until satisfactory hemostasis had been achieved. This was followed by placement of a compressive bandage for 6 h. Closure devices were not used. Access was considered successful once the sheath was inserted into the artery. Crossover between initial access approaches was also recorded and access was stratified based on the first route of access attempted.

Specific time parameters were recorded: time from emergency room arrival-to-patient arrival in catheter laboratory (cath. lab.), time from patient arrival in catheter Laboratory-to-balloon inflation and total D2B time (interval from the first emergency room arrival-to-the first attempt at opening the artery by aspiration thrombectomy, balloon inflation, or direct stenting in the infarct-related artery "IRA").

American college of cardiology/American heart association task force on performance measures stated that "the goal of pPCI is to restore flow in the IRA".[26] As we sought to determine whether the radial approach was associated with a successful pPCI without increasing the time to revascularization, our composite end points were the time from emergency room door to revascularization, angiographic success, short term clinical success[27] (relief of signs and/or symptoms of