Transradial Access in a Patient with Acute Myocardial Infarction: The Preferred Approach

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The transradial approach is now accepted worldwide as an alternative access site that reduces bleeding complications in patients undergoing percutaneous coronary interventions (PCI). Patients with ST-segment elevation myocardial infarction (STEMI) who undergo primary PCI present a particularly efficacious indication for the transradial approach due to the intensity of their anticoagulation. However, concerns regarding prolonged door-to-balloon (D2B) time in gaining access have limited use. We present a case report in which this approach was successfully used.

Case Report

A 63-year-old male smoker with hypertension and family history of premature coronary disease presented to an outside hospital, 18 miles from the Wake Heart Center, with 3 hours of substernal chest pressure radiating to his back, associated with diaphoresis. Two days prior, the patient had had one at-rest episode of similar symptoms lasting a few minutes. For 1 month prior, the patient had noticed worsened fatigue and dyspnea. Medical history included hypertension, cholecystectomy, and appendectomy but no coronary disease. The patient’s father had a fatal myocardial infarction (MI) at age 49. The patient had a 25-pack-a-year smoking history, but no alcohol or illicit-drug intake. The remaining systems review was negative. Medications included lisinopril/hydrochlorothiazide 20/25 mg daily, doxazosin 4 mg daily, and felodipine 10 mg daily. Upon physical examination, heart rate was 72 bpm, blood pressure 166/90, respiratory rate 16, and oxygen saturation 98% on a 2-liter nasal cannula. Lungs were clear. Heart rhythm was regular with no extra sounds or murmur. Extremities were warm with normal pulses. There were no signs of heart failure. Initial ECG showed normal sinus rhythm with ST-segment elevation inferiorly and reciprocal depression anteriorly. The patient received a 4000-unit heparin bolus, then infusion of 1000 units hourly, aspirin 324 mg orally, clopidogrel 600 mg orally, and sublingual nitroglycerin.

The patient was transferred to the Wake Heart Center and taken directly to the catheterization laboratory. ECG on cath lab arrival was unchanged, with continued inferior ST-segment elevation, and 3/10 self-rated chest pain. Versed 1 mg and benadryl 25 mg were administered intravenously. After local anesthesia with 1% lidocaine, a short 6 Fr radial sheath was placed in the right radial artery. Verapamil 3 mg was administered directly through the sheath. The heparin infusion was discontinued. Bivalirudin (Angiomax, The Medicines Company, Parsippany, New Jersey) bolus 0.75 mg/kg was administered intravenously and infusion of 1.75 mg/kg/hr was initiated without delay.

A 6 Fr Kimny guide catheter was advanced over a 0.35 guidewire into the ascending aorta. Angiography of the left coronary system revealed nonobstructive coronary disease (Figure 1). The same catheter was redirected to the right coronary which was occluded in its midportion with TIMI 0 flow (Figure 2). A 0.14 Forte guidewire was easily passed through the occlusion into the distal vessel, resulting in TIMI I flow. A grade 4 thrombus was visualized. Aspiration thrombectomy was performed using a 4 Fr 135 cm Fetch catheter (Medrad Inc., Warrendale, Pennsylvania) with resulting TIMI II flow. The patient’s heart rate dropped from 77 bpm to 41 bpm, and returned to 95 bpm after atropine 1 mg IV Abciximab 0.25 mg/kg bolus was administered intracoronary through the guide catheter; no intravenous infusion was initiated. Intracoronary nitroglycerin 200 mcg was given. A long 75% stenosis with TIMI III flow remained (Figure 3). The lesion was directly stented with a 3 x 23 mm PROMUS stent (Boston Scientific, Natick, Massachusetts) at 16 atmospheres for 27 seconds. Final angiography revealed no residual lesion with TIMI III flow (Figure 4).

The patient remained hemodynamically stable with complete resolution of the inferior ST-segment elevation. The radial sheath was removed and a TR Band

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Disclosure: Dr. Mann is a consultant with The Medicines Company, Terumo, and Boston Scientific.
(Terumo Interventional Systems, Somerset, New Jersey) applied; a total volume of 10 ccs air was required for patent hemostasis. ACT at the conclusion of the procedure was 380 seconds. The patient received 70 ml of iodixanol. Fluoro time was 9.3 minutes. The case duration was 35 minutes. D2B time was 28 minutes. Time from initial ECG at the outside hospital to balloon inflation was 57 minutes.

Bivalirudin was continued for 2 hours at 1.75 mg/kg/hr. The TR band was progressively deflated and completely removed 3 hours after the procedure without local bleeding or hematoma. The patient subsequently had a noncomplicated hospital course without bleeding or arrhythmias. Peak cardiac enzymes were CK 2070 MU/ML with 280 MB NG/ML and a troponin greater than 100 NG/ML. Transthoracic echocardiogram showed an ejection fraction of 55% with only mild inferior wall abnormality on the day of discharge. The patient was discharged on hospital day 3 to outpatient cardiac rehabilitation on clopidogrel 75 mg orally daily, aspirin 325 mg orally daily, lisinopril 20 mg daily, simvastatin 40 mg every night, and doxazosin 4 mg daily. A beta-blocker was not given secondary to resting bradycardia. Hematocrit at the time of discharge was unchanged at 37%.

**Discussion**

The present case report describes the successful management of a patient with acute myocardial infarction (AMI) using primary PCI performed from the radial approach. The successful outcome was the result of expeditious referral from an outside hospital and a short D2B time with rapid reperfusion using contemporary pharmacologic agents, one catheter, thrombectomy, and direct stenting.

The Reperfusion of Acute Myocardial Infarction in Carolina Emergency departments (RACE) project is a collaborative effort of ER physicians/nurses and emergency medical personnel in North Carolina to initiate guideline based therapy and rapid transfer of patients with AMI to regional PCI centers with 24/7 cath lab coverage. The outside hospital-to-balloon time of 57 minutes in the present case is a testament to the project's success.

The major benefit of the transradial approach is elimination of access site bleeding complications, which makes it particularly applicable to patients with intensive anticoagulation. A concern with transradial access has been prolongation of D2B time. However, several studies in patients with STEMI have demonstrated reduced bleeding without prolongation of D2B times with radial as compared to femoral access. Indeed, in the present case, which was performed by an experienced radialist, D2B time was only 28 minutes. Completion of the transradial learning curve is a prerequisite for undertaking these procedures. It is noteworthy that the use of the Kimny catheter for both angiography and intervention in this case avoided time-consuming catheter exchanges.

Several studies demonstrated a significant mortality associated with PCI-related anemia and bleeding; these analyses established efficacy of bivalirudin independent of bleeding. In HORIZONS-AMI, bivalirudin significantly reduced cardiac and all-cause mortality after stenting for MI compared with heparin plus GPIIb/IIIa, and these findings were at least in part due a significant reduction in major bleeding. Other studies confirmed
the consistent reduction in bleeding in patients with acute coronary syndromes undergoing PCI with the use of bivalirudin anticoagulation as opposed to heparin + glycoprotein (GP) IIb/IIIa platelet antagonist.\textsuperscript{14–17} Furthermore, bleeding was a powerful predictor of mortality.

Access-site bleeding complications are significantly reduced in patients with acute coronary syndromes undergoing PCI from the transradial as compared to transfemoral approach.\textsuperscript{18,19} This reduction in major bleeding is seen even in patients in whom bivalirudin is used for anticoagulation.\textsuperscript{20} However, approximately 20% to 30% of patients in the previously mentioned trials will have anemia caused by heparin-induced non-access-site bleeding.\textsuperscript{21,22}

A recent paper using the combined REPLACE-2, ACUITY and HORIZONS database finds that two-thirds of TIMI bleeding complications are non-access, and that these are associated with a fourfold increase in mortality. Further, the hazard ratio of a non-access-site bleed was twice that of an access bleed: "Randomization to bivalirudin versus heparin + [GP IIb/IIIa] resulted in 38\% and 43\% relative reductions in major/minor and TIMI major bleeding ... (p < 0.0001 for both),” and significantly reduced access-site and non-access-site bleeding.\textsuperscript{23} Thus, the combination of transradial access with bivalirudin may significantly reduce the likelihood of all major bleeding in these patients. This hypothesis is currently being evaluated by the ongoing EASY-B2B trial.\textsuperscript{24}

Mechanical thrombectomy was performed in the patient with a large thrombus burden.\textsuperscript{25,26} The use of transradial access did not preclude using an extraction catheter. Indeed, the only current limitation of transradial access in patients undergoing PCI is a 6 Fr catheter size, and virtually all contemporary interventional procedures can be performed through these catheters.

The routine use of glycoprotein IIb/IIIa antagonists before primary PCI is now considered “of uncertain benefit.”\textsuperscript{26} The trials supporting the routine use of GP IIb/IIIa antagonists for primary PCI were conducted before the era of dual-antiplatelet therapy, and more recent data comparing GP IIb/IIIa versus placebo in STEMI patients receiving dual-antiplatelet therapy showed no difference in MACE and infarct size.\textsuperscript{26} However, the selective use may be indicated in patients with a large thrombus burden or in patients who have not received thienopyridine loading.\textsuperscript{26} The intracoronary administration of bolus only abciximab has theoretical advantages and may reduce no reflow and infarct size, though this has not been demonstrated in randomized trials.\textsuperscript{27–30}

The present case report demonstrates the utility of transradial access in managing a patient with AMI undergoing primary PCI. The combination of transradial access with bivalirudin anticoagulation was employed to minimize the possibility of PCI-related bleeding. The procedure was completed with a short D2B time. Interventionalists are encouraged to adopt the transradial technique.

References

24. Bertrand O. Personal communication.