

Successful Outcome with Transradial Primary Percutaneous Coronary Intervention During Cardiopulmonary Resuscitation

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ABSTRACT

Transradial access for ST Elevation Myocardial Infarction (STEMI) has been shown to reduce mortality, major adverse cardiac events and bleeding, when compared with femoral access. Often patients with STEMI present in the setting of cardiogenic shock and cardiac arrest. Prior published work has established the mortality benefit with early percutaneous coronary intervention in patients presenting with out of hospital cardiac arrests. However, the utility of transradial intervention in such patients is still under study. We present a case of transradial primary intervention performed during cardiopulmonary resuscitation for a patient who presented with an antero-septal MI.

Keywords: Acute myocardial infarction, Cardiac arrest, Radial approach

CASE REPORT

We present the case of a 50-year-old male, smoker, who presented with an acute antero-septal STEMI, 3 hours after the onset of index pain. He was taken to the cardiac catheterization laboratory (cath lab) for a primary angioplasty (Door to cath lab table time of 17 minutes). A 6F radial sheath was inserted in the right radial artery and the coronary angiogram was done (procedure duration of four minutes). The mid Left Anterior Descending (LAD) artery had a critical lesion, which was noted to be the likely culprit [Table/Fig-1]. Three minutes later, while discussing the urgent need for an angioplasty with the patient's relatives at the patient's request, he went into Ventricular tachycardia-fibrillation and cardiac arrest for which he received DC shock (100J), which was followed by asystole. Cardiopulmonary Resuscitation (CPR) was initiated as per Advance Cardiac Life Support (ACLS) protocol, and the patient was intubated. The patient received epinephrine boluses, and was defibrillated in between chest compression cycles. No attempt was made to insert a temporary pacemaker. Priority was given instead, to proceed to angioplasty to promptly re-vascularize the LAD.

During CPR, through the radial sheath, the left coronary artery was hooked with a 6F Judkins Left 3.5 guide catheter, and flow in the Left Anterior Descending artery (LAD) was restored with thrombosuction using an export catheter, and an intracoronary bolus of tirofiban, after the lesion in the LAD was crossed with a 0.014" BMW wire. A 3 x 24 mm drug eluting stent (Endeavor Sprint; Medtronic Inc.,) was deployed directly thereafter at 15 atmospheres (Supplementary [Video 1-5]), with resultant TIMI 3 flow [Table/Fig-2]. Door to balloon

time was 41 minutes immediately following this, an accelerated idio-ventricular rhythm was seen, as reperfusion occurred, followed by restoration of sinus rhythm. Return of Spontaneous Circulation (ROSC) took 13 minutes. Total time on the cath table was 49 minutes. The patient's dopamine and norepinephrine infusions were tapered off in the next 12 hours; he was extubated in 24 hours, and restarted on oral feeds and medications. His pre-discharge echocardiogram revealed a 35% ejection fraction and akinesis with preserved muscle thickness in the LAD territory. He was discharged three days after the procedure in stable condition. On follow-up at one and three months, he was totally asymptomatic and his left ventricular function was found to be completely normal without any regional wall motion abnormality.

DISCUSSION

We herein describe the first report of a primary transradial angioplasty for an acute myocardial infarction during CPR for cardiac arrest. Fortunately, our patient was already in a monitored setting with a 6F radial sheath inserted; thus we decided to go ahead with the angioplasty, as the initial hurdle of arterial puncture was already crossed (which can be extremely challenging in the setting of cardiogenic shock/cardiac arrest) [1]; and his survival depended on restoring flow in the LAD. The patient had no prior conduction blocks. There was no need to insert a temporary pacemaker, because ROSC largely depends on promptness of revascularization, which restores left ventricular function.

At present, the European society of Cardiology recommends primary angioplasty to be performed transradially; but only by experienced operators [2], who are facile with transradial PCI in Type A, B1, B2 (AHA/ACC lesion types) and are facile with PCI in Acute Coronary Syndromes (ACS) including NSTEMI cases [3].

Prompt revascularization is recommended for hemodynamic instability or life threatening arrhythmias and cardiac arrest in ACS, but performing a PCI in such situations and especially during CPR, with ongoing chest compressions, had its own challenges in this case:

a) Since the heart was at a standstill, the angioplasty wire did not move as usual; rather had to be pushed; b) In the setting of inadequate circulation in the coronaries, visualization was poor, often



[Table/Fig-1]: Mid LAD artery with culprit lesion.

[Table/Fig-2]: Stent positioned in the Mid LAD Artery with restoration of TIMI 3 flow.

with blurred images, with overlapped hands performing cardiac compressions; c) The latter also made hooking of the coronary ostia with the guide catheter and keeping it in place rather challenging, more so because the procedure was being done trans-radially. But it was important to persist with radial access because opting for alternate access could have had disastrous consequences because of delay in establishing flow in the infarct-related vessel. Also the risk of bleeding and groin haematoma would have been high because the patient had already been fully anticoagulated; d) The procedure was interrupted intermittently to allow DC shocks to be given.

e) We decided against the insertion of a temporary pacing wire, because it was wholly unnecessary as the most crucial goal was immediate revascularization and ROSC would follow; f) Intracoronary GPIIb/IIIa inhibitor administration directly delivered the drug into coronary arteries with blood stasis. In a cardiac arrest patient, this was better than giving an initial intravenous bolus which would have been ineffective because of inadequate circulation in the arrested heart undergoing chest compressions to maintain circulation. Once a normal sinus rhythm was restored, in turn with restoration of systemic circulation, intravenous tirofiban infusion was continued thereafter. Our case is unique, as it adds to the limited literature on transradial interventions during cardiac arrests in the following ways: the patient had an angioplasty via the radial route while CPR was being performed, and despite the enormous procedural challenges, we did not change access to a default femoral route, as is otherwise common among transradial operators on their learning curve.

We could not find any earlier published report of such a case done transradially during CPR, or a similar scenario where the radial sheath was already inserted. Because the arrest happened right after the coronary angiogram was completed, it was a procedural challenge to quickly engage the coronary with a guiding catheter, while CPR was being performed. Again the guide had to be kept engaged to be able to successfully cross the coronary occlusion with the angioplasty wire while the patient's chest was being rocked with chest compressions. The patient also was simultaneously intubated for mechanical ventilation.

A case series from Japan reported on the utility of transradial versus transfemoral angioplasty in patients with cardiac arrest [2]; but PCIs in this study were done on patients transported from other locations on Extracorporeal Membrane Oxygenator (ECMO) and not

during CPR although other reports [4-6] have also demonstrated a decrease in in-hospital mortality in post-cardiac arrest patients undergoing PCI soon after ROSC was achieved; these were patients who had 'out-of-hospital' cardiac arrest and not 'on-table' arrests, and were therefore not undergoing CPR at the time of their PCI. Information on access site used by operators in these reports was also lacking.

CONCLUSION

Ours is the first report of a successful transradial PCI done during CPR in the scenario of a STEMI and cardiac arrest. The key learning points are that; it is feasible to complete the angioplasty transradially, even with ongoing chest compressions and intubation, and there is no need to change access from radial to femoral in such a situation. In fact, such an attempt to convert to alternate access (crossover) may be catastrophic because of delays in restoration of flow in the occluded coronary and therefore in ROSC. Further, the risk of bleeding and groin haematoma is more because the patient is already fully anticoagulated during PCI.

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