RESEARCH PAPER

SNARE-ASSISTED RADIAL–FEMORAL GUIDEWIRE EXTERNALIZATION FOR COMPLEX PRIMARY PERCUTANEOUS CORONARY INTERVENTION IN A PATIENT WITH ST-SEGMENT ELEVATION MYOCARDIAL INFARCTION AND CONCOMITANT ABDOMINAL AORTIC ANEURYSM: A CASE REPORT

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ABSTRACT

Accurate identification of the culprit vessel and distal target anatomy is critical for safe, effective primary percutaneous coronary intervention (PCI). In cases of collateralized total coronary occlusions, competitive collateral flow can impede visualization of the distal vessel, while contrast staining during wire crossing may raise concerns regarding wire-induced coronary perforation.[1-4] In this circumstance, Dual arterial access offers enhanced angiographic visualization of the distal vessel, supporting accurate assessment of wire position and vessel integrity.[1-3] However, concomitant aortic pathology, particularly abdominal aortic aneurysm, may hinder femoral catheter delivery and necessitate alternative procedural strategies. This case report details a 74-year-old woman presenting with acute inferoposterior ST-segment elevation myocardial infarction (STEMI). Coronary angiography from right radial access demonstrated total occlusion of the distal right coronary artery (RCA). During antegrade recanalization, localized contrast staining prompted suspicion of wire-induced perforation. A second arterial access was obtained via the right femoral artery to enable simultaneous dual coronary injection and independent evaluation of distal vessel integrity. However, femoral catheter advancement was unsuccessful beyond the abdominal aorta, and contrast injection revealed a previously unrecognized fusiform infrarenal abdominal aortic aneurysm (AAA). A hydrophilic guidewire was advanced from the radial access into the abdominal aorta, captured with a snare from femoral access, and externalized through the femoral sheath, establishing radial–femoral through-and-through guidewire access. This enabled RCA guiding-catheter engagement and dual coronary injection, followed by successful antegrade wire crossing, balloon predilatation, and guide-extension-assisted stent implantation. Successful revascularization was achieved, with restoration of TIMI grade 3 flow and no immediate complications. Snare-assisted radial–femoral guidewire externalization may provide a feasible bailout strategy when aortic pathology hinders femoral catheter advancement during complex primary PCI.

Keywords : Complex primary PCI, Contrast staining, Dual arterial access, Abdominal aortic aneurysm

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INTRODUCTION

Coronary collateral circulation has been reported in up to 23.6% of patients with ST-segment elevation myocardial infarction (STEMI) undergoing primary percutaneous coronary intervention (PCI), potentially indicating pre-existing chronic coronary disease.[5] Although collateral flow may help preserve myocardial perfusion during coronary occlusion, competitive filling can obscure the distal target vessel on single-catheter angiography, complicating guidewire crossing and assessment of vessel integrity.[2,5] When localized contrast staining occurs during difficult guidewire manipulation, guidewire-induced vessel injury or coronary perforation should be considered, prompting immediate reassessment of wire position.[4] In such cases, a second arterial access for injection of the collateral donor vessel can provide complementary angiographic views to clarify distal vessel anatomy and facilitate evaluation of wire position and vessel integrity. Although dual coronary injection is well established in chronic total occlusion (CTO) PCI, its application during primary PCI for acute coronary occlusion is less well documented, particularly when collateral-dependent filling limits visualization of the distal target vessel. When dual arterial access is required, the access strategy should be individualized according to patient anatomy, procedural requirements, and operator experience. Radial–femoral access is frequently used in CTO PCI, although biradial and bifemoral approaches are also feasible.[6,7,8] However, femoral access may be challenging in the presence of previously unrecognized aortoiliac pathology. An abdominal aortic aneurysm (AAA), although often asymptomatic, may impede femoral catheter advancement and necessitate an alternative access strategy during time-sensitive coronary intervention

CASE SUMMARY

A 74-year-old woman presented to the emergency department with a 2-hour history of typical angina, accompanied by diaphoresis and vomiting. The initial 12-lead electrocardiogram (ECG) showed ST-segment elevation in leads II, III, and aVF, with reciprocal ST-segment depression in leads V1–V4, raising

suspicion for posterior extension (Figure 1). Subsequent recording of the posterior leads demonstrated ST-segment elevation in V7–V9, confirming an acute inferoposterior STEMI (Figure 2). Her cardiovascular risk factors included active smoking and poorly controlled hypertension. She was hemodynamically stable on presentation, and the cardiovascular and pulmonary examinations were unremarkable. Laboratory investigations revealed elevated cardiac troponin I, while renal function and serum electrolytes were within normal limits.

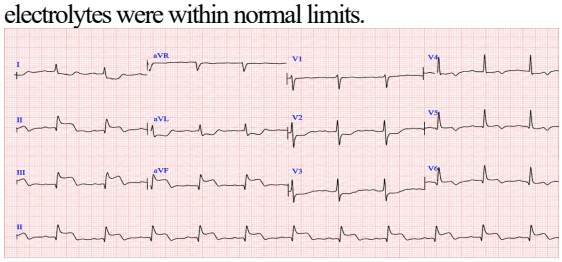


Figure 1. ECG demonstrating ST-segment elevation in leads II, III, and aVF, with reciprocal ST-segment depression in leads V1–V4, suggesting posterior involvement.

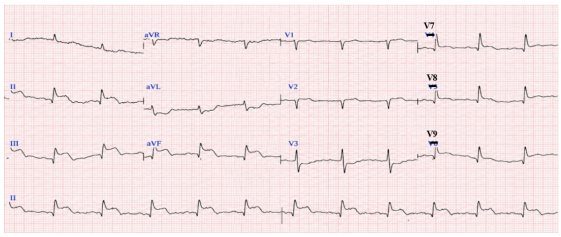


Figure 2. Posterior ECG demonstrating ST-segment elevation in leads V7–V9, consistent with posterior myocardial involvement.

The patient received dual antiplatelet therapy and was immediately transferred to the cardiac catheterization laboratory for primary PCI. Coronary angiography via radial approach revealed significant stenoses of the proximal left circumflex (pLCx) and proximal left anterior descending (pLAD) arteries, along with total occlusion of the distal right coronary artery (dRCA), with collateral filling from septal branches of the LAD (Figure 3).

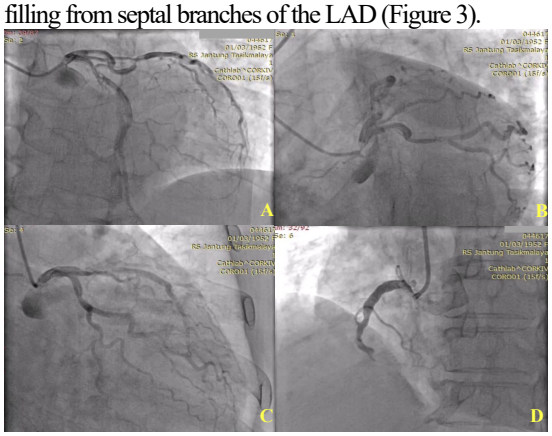


Figure 3. Coronary angiography demonstrating significant stenoses of the proximal LAD and LCx. (A) Left anterior oblique (LAO) cranial view. (B) LAO caudal view. (C) Right anterior oblique (RAO) caudal view. (D) LAO cranial view demonstrating total occlusion of the distal RCA.

During RCA wiring with a 0.014 AnyReach, we observed contrast staining. Wire perforation was also suspected at that time (Figure 4). To improve visualization of the distal RCA and facilitate assessment of distal vessel integrity, a second arterial access was obtained via the right femoral artery to enable simultaneous dual coronary injection.

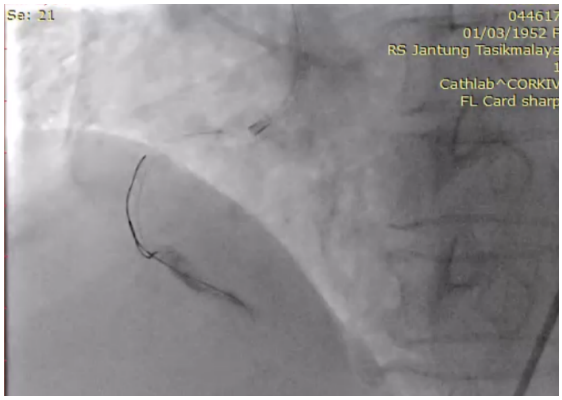


Figure 4. Coronary angiography demonstrating localized contrast staining.

An initial attempt to advance a 0.035 Ultraskin guidewire through a 6-Fr Judkins right (JR) 3.5 catheter from the right femoral artery was unsuccessful because of resistance within the abdominal aorta. Exchanging the JR catheter with a 6-Fr Multipurpose (MP) catheter did not facilitate guidewire passage. To identify the cause of the uncrossable abdominal aorta, contrast injection was performed, revealing a previously unrecognized fusiform infrarenal abdominal aortic aneurysm (AAA) measuring 4.79 × 4.49 cm, which prevented further catheter advancement (Figure 5).



Figure 5. Angiography demonstrating a fusiform infrarenal abdominal aortic aneurysm measuring 4.79 × 4.49 cm.

To establish a stable access route, an angled-tip 0.035 Terumo guidewire was advanced from the right radial artery through a 5-Fr Judkins left (JL) 3.5 catheter into the abdominal aorta. A MemoPart snare was introduced through a 6-Fr multipurpose (MP) catheter via right femoral access to capture the distal tip of the guidewire, which was then externalized through the femoral sheath, establishing a radial–femoral guidewire rail. Using this rail, the MP catheter was exchanged for a 6-Fr JR 3.5 catheter, which was advanced to engage the RCA ostium. The 5-Fr JL 3.5 catheter was then repositioned at the left coronary ostium. Simultaneous contrast injection through both catheters provided adequate visualization of the distal RCA through septal collaterals arising from

the LAD artery, facilitating antegrade guidewire crossing of the occlusion (Figure 6).



Figure 6. LAO cranial view demonstrating septal collateral from the LAD filling the distal RCA.

A 0.014 AnyReach guidewire was successfully advanced across the occlusion and positioned in the distal posterior descending (PDA) artery. Balloon predilatation was performed with a Sapphire balloon 2.5x15 mm, improving vessel patency, although residual stenosis of approximately 50–60% remained. Because the EvroSure 3.5x42 mm stent could not initially be advanced to the distal RCA, an ExpressMan guide-extension catheter was introduced through the 6-Fr JR catheter to provide additional coaxial and backup support. The stent was subsequently advanced and deployed from the mid to distal RCA. Final angiography demonstrated TIMI grade 3 flow, minimal residual stenosis (<10%), and a small residual thrombus at the PDA ostium (Figure 7).

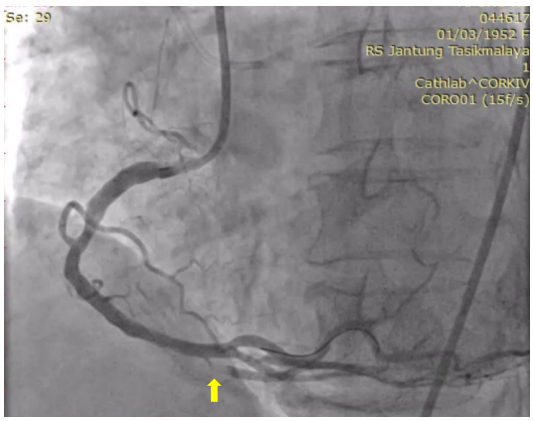


Figure 7. Final angiography demonstrating TIMI grade 3 flow with minimal residual stenosis (<10%) and a small residual thrombus at the PDA ostium (arrow).

The procedure was completed without peri-procedural complications. Enoxaparin 60 mg was administered subcutaneously twice daily for 3 days to prevent thrombus propagation, following an individualized assessment of the patient's ischaemic and bleeding risks. After clinical stabilization, the patient was advised to undergo vascular surgical evaluation and computed tomography angiography to assess aneurysm anatomy and determine suitability for elective endovascular aneurysm repair (EVAR).

DISCUSSION

In complex coronary occlusions, adequate visualization of the distal target vessel is essential for guidewire selection, confirming wire position, and safely crossing the lesion.[1,2,3] In the present case, the total RCA occlusion was accompanied by established septal collateral filling from the LAD, suggesting pre-existing chronic coronary disease and an acute-on-chronic occlusive process. Coronary collateral circulation compensates for coronary occlusion and may preserve myocardial perfusion. Its development is associated with chronic ischemia and hypoxia-induced signaling pathways, including hypoxia-inducible factors and angiogenic growth factors.[5,9,10,11] However, despite their potential protective role, collateral vessels may limit distal vessel visualization on single-catheter angiography because of competitive filling.[2] In this case, this limitation, along with localized contrast staining during difficult guidewire crossing, raised concern for guidewire-induced distal vessel injury or coronary perforation.[4] These findings prompted a second arterial access to enable simultaneous injection of the collateral donor vessel and improve delineation of the distal RCA. This complementary visualization facilitated assessment of guidewire position and distal vessel integrity and helped distinguish localized contrast staining from more extensive contrast extravasation suggestive of coronary perforation. Although dual coronary injection is well established in CTO PCI, particularly when collateral circulation limits visualization of the occluded vessel, its application as an adjunct to primary PCI in acute total coronary occlusion is less well described.

The choice of vascular access should balance the risk of access-site complications with the procedural requirements of complex PCI. The 2018 European Society of Cardiology/European Association for Cardio-Thoracic Surgery Guidelines on myocardial revascularization recommend transradial access (TRA) over transfemoral access (TFA) for PCI, irrespective of clinical presentation, given the lower risk of access-site bleeding and vascular complications associated with radial access.[6,7,8] Accordingly, TRA is the preferred access strategy for most PCI procedures. However, complex PCI, particularly chronic total occlusion (CTO) interventions, may require dual arterial access to facilitate simultaneous coronary injection and optimize distal vessel visualization.[1-3] In CTO PCI, radial–femoral access has traditionally been used more frequently than biradial access; in a contemporary multicenter study, secondary femoral access was used in 79% of cases compared with 21% using a secondary radial approach.[6] Guidewire selection and crossing strategy should also be adapted to the anatomical and procedural circumstances, with operator experience influencing technique selection.

However, in the present case, an unrecognized fusiform infrarenal AAA complicated secondary femoral access and impeded catheter advancement through the

abdominal aorta. Forceful advancement through the aneurysmal segment could increase vascular risk; therefore, an alternative technique was required to establish stable second arterial access while maintaining the ability to perform dual coronary injection and achieve timely reperfusion. To overcome the anatomical limitation imposed by the AAA, a long hydrophilic guidewire was advanced from the radial artery into the abdominal aorta and subsequently captured with a snare introduced through the femoral sheath. Externalization of the guidewire established a radial–femoral guidewire rail, allowing controlled advancement of the coronary catheter despite the challenging aortic anatomy. This approach enabled dual arterial access without compromising the planned reperfusion strategy and may be a useful bailout technique when aortic pathology limits conventional femoral catheter advancement.

The incidental discovery of an AAA during primary PCI underscores the importance of subsequent vascular evaluation once the acute coronary syndrome has been stabilized. Cross-sectional imaging, preferably computed tomography angiography, together with vascular surgical assessment is essential to characterize aneurysm morphology and size, evaluate anatomical suitability for endovascular or open repair, and determine the need and timing of elective intervention. Immediate repair is not indicated for all AAAs, and management should be individualized according to aneurysm diameter, growth rate, morphology, symptoms, and overall operative risk. Current Society for Vascular Surgery (SVS) recommendations support repair of fusiform AAAs at established diameter thresholds, generally ≥5.5 cm in men and ≥5.0 cm in women, as well as symptomatic or ruptured aneurysms, and selected cases of rapid expansion or saccular morphology.[12,13,14] Conversely, small, asymptomatic AAAs are generally managed with structured surveillance, as randomized trials have not demonstrated a survival benefit from early elective repair compared with surveillance for AAAs below the conventional repair threshold.[13] In this case, definitive treatment of the AAA was deferred until the acute myocardial infarction had stabilized, given the aneurysm's diameter of 4.79 × 4.49 cm and the absence of aneurysm-related symptoms; further vascular evaluation is planned to determine the appropriate treatment strategy.

CONCLUSION

This case highlights the importance of a flexible and individualized vascular access and procedural strategy during complex primary PCI. In the setting of localized contrast staining and inadequate distal vessel visualization due to competitive collateral flow, dual arterial access provided complementary angiographic views that facilitated distal vessel assessment and safe recanalization. When an infrarenal AAA obstructed femoral catheter advancement, snare-assisted radial–femoral guidewire externalization provided a feasible bailout strategy for establishing stable dual arterial access and successfully completing PCI. This case emphasizes the need to reassess guidewire position and distal vessel integrity when contrast staining occurs and to adapt procedural strategies to evolving anatomical challenges.

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