

CLINICAL CASE UPDATE

Transradial Access and Bivalirudin Combination for Reducing Post-PCI Bleeding

Samir B. Pancholy, MD, FACP, FACC, FSCAI

Bleeding is the most common complication after percutaneous coronary intervention (PCI)¹ and has been shown to be a very significant adverse prognostic event, increasing short-term and long-term adverse outcomes.²⁻⁸ Access-site bleeding accounts for the majority of these hemorrhagic complications. Transradial access is associated with a very sizeable reduction in access-site-related bleeding.⁹⁻¹⁰ Patients undergoing transradial intervention are perceived to be immune to bleeding in general, although this subset's non-access-site-related bleeding is not expected to be lower. Here, we describe a patient who underwent transradial PCI using different adjunctive antithrombotic pharmacotherapy on two occasions, with differing bleeding outcomes.

Case Description

History

A 74-year-old white male with history of hypertension and hyperlipidemia presented with new-onset angina associated with mild-lateral ST-segment depression. Despite double product control and anticoagulation, his symptoms recurred. Troponin I was 4.4 ng/ml. He was brought urgently to the cardiac catheterization laboratory for coronary angiography. Baseline hemoglobin was 14.6 g/dl, with a platelet count of 251,000, glomerular filtration rate of 89 ml/min, and a normal electrolyte panel.

Cardiac Catheterization

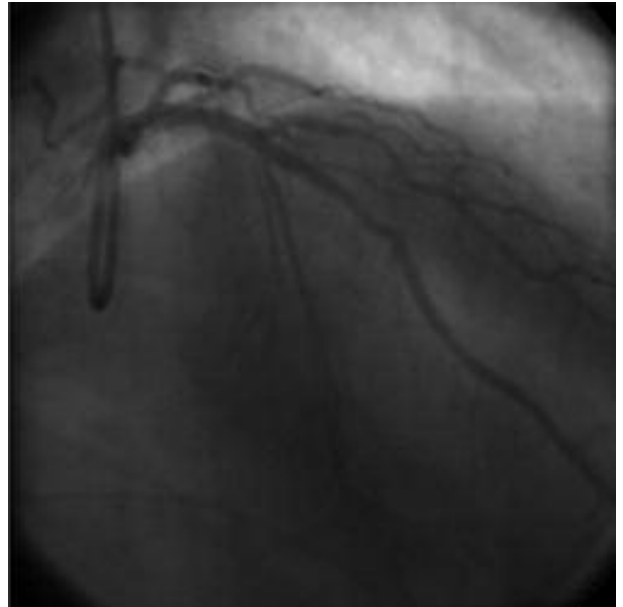
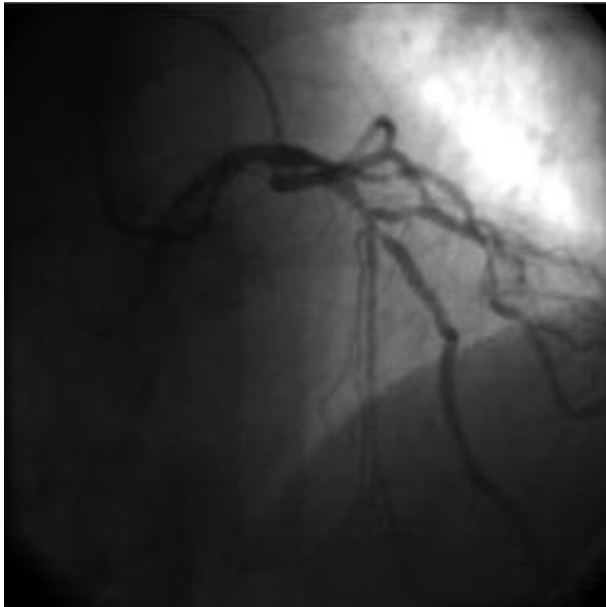
Cardiac catheterization was performed using a 6 Fr introducer sheath via right radial artery access. The procedure showed two-vessel disease with 90% stenosis of the left anterior descending artery and 80% long stenosis of the mid-right

coronary artery (RCA). Ad hoc PCI of the left anterior descending (LAD) artery was performed using 3.5 mm x 18 mm Zanolimus-eluting stent (Figures 1 and 2). Adjunctive pharmacotherapy included 70 U/Kg unfractionated heparin, abciximab 0.25 mg/kg bolus with 0.125 mcg/kg infusion, enteric-coated aspirin 162 mg once a day, and clopidogrel 600 mg loading dose followed by 75 mg once a day. Activated clotting time during the procedure was 245 seconds. The procedure was uneventful. The introducer was removed from the right radial artery, after which a compression band was applied for 2 hours. Abciximab infusion was maintained for 12 hours, and the patient was transferred to a telemetry unit with plans to monitor for 24 hours after the procedure.

Post-procedural Course

The right radial access site was free of bleeding and showed no evidence of radial artery occlusion. The patient reported symptoms of hematuria with passage of blood clots when he voided. He denied pain, fever, or other complaints. Hemoglobin at the time of onset of symptoms was 12 g/dl, with a platelet count of 235,000. Electrocardiogram was unremarkable; post-PCI CK-MB was 7 IU/l; and troponin I was 3 ng/ml. Abciximab infusion had been off for a few hours. Enteric-coated aspirin and clopidogrel were continued. Urologic consultation was requested, and ultrasound imaging of the urinary tract did not indicate macroscopic pathology. The patient continued to pass clots after 12 hours of onset of symptoms, and a multilumen irrigation catheter was inserted in the urinary bladder with continuous bladder irrigation. Urine culture specimen was collected. Serial hemoglobin measurements were performed with hemoglobin at 10.1 g/dl on day 2 after the procedure. Hematuria subsided after 24 hours of bladder irrigation, and the catheter was removed. The patient developed orthostatic hypotension on attempted ambulation and was

From the Commonwealth Medical College and the Wright Center for Graduate Medical Education. Address for correspondence: Samir B. Pancholy, Associate Professor of Medicine, The Commonwealth Medical College, Cardiology Department, 150 N. Washington Avenue, Scranton, PA 18503. E-mail: pancholys@gmail.com.



Figures 1 and 2. In the first procedure, cardiac catheterization was performed using a 6 Fr introducer sheath via right radial artery access. *Ad hoc* PCI of the left anterior descending artery was performed using 3.5 mm x 18 mm Zanolimus-eluting stent.

treated with intravenous hydration using isotonic sodium chloride solution for 24 hours. Hemoglobin on day 4 after PCI was 9 g/dl. The patient gradually increased activity and was discharged to home on day 6 after the procedure.

Post-discharge Course

The patient continued treatment with beta blockade, HMG-CoA inhibitor, enteric-coated aspirin 162 mg, and clopidogrel. He gradually regained his strength and did not have further hematuria. He was evaluated in the outpatient clinic 1 week after discharge and seemed to be doing well. After discussing the second PCI, it was decided PCI of the RCA would be performed 1 week later.

Second Procedure

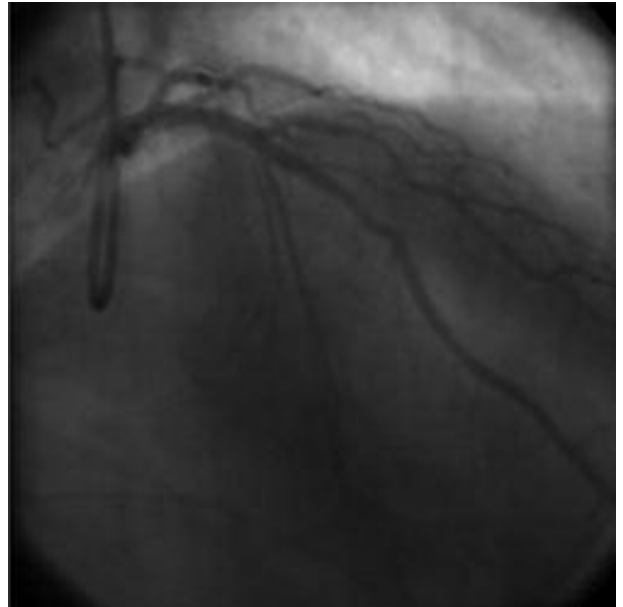
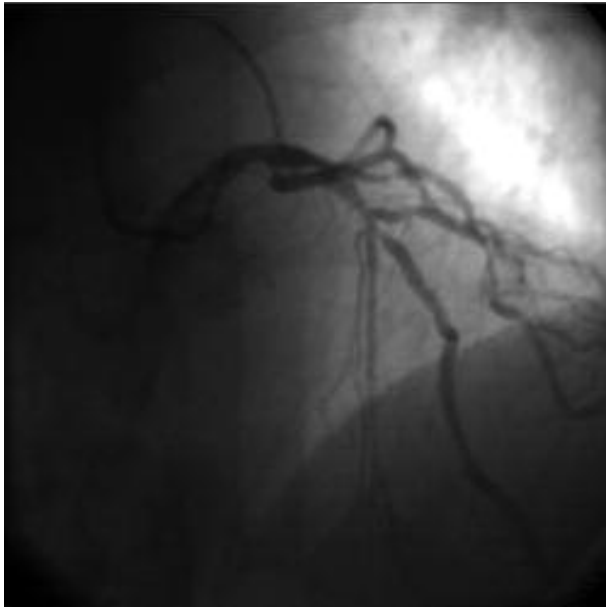
The right radial artery was accessed using a 6 Fr introducer sheath. A 6 Fr MAC 3.0 guiding catheter was used, and two Zanolimus-eluting stents were deployed with adjunctive therapy using bivalirudin (Figures 3 and 4). The patient was still on enteric-coated aspirin 162 mg once daily and clopidogrel 75 mg once daily. Post-procedure, the patient was monitored for 24 hours on a telemetry unit with no adverse events or instability. Hematuria did not recur. The access site was free of major complications. He was discharged in stable condition the day after the procedure.

Discussion

PCI has become the dominant modality used for revascularization in the United States. Major advances such as drug-eluting stents and potent anticoagulant and antiplatelet therapy have increased PCI applicability and the ability to treat complex substrates. Stenting has successfully eliminated adverse outcomes due to coronary dissection, letting post-procedural bleeding emerge as a major determinant of adverse outcome post-PCI.²⁻⁸ A large number of post-PCI bleeding events are related to access-site bleeding. However, non-access bleeding events are not infrequent and, when they occur, the clinical outcomes are not trivial, as they increase length of stay and cost of care. These non-access-site bleeds are thought to be determined by comorbidities and the use of adjunctive pharmacotherapy during and after PCI.

Choosing transradial access over transfemoral access could lower the incidence of access-site related complications. This has been demonstrated in randomized and registry settings.⁹⁻¹⁰ Although access-site complications are decreased, non-access-site bleeding is unaffected.

Choice of pharmacotherapy during PCI has been shown to significantly affect access- and non-access-site bleeding.¹¹ The ACUTY trial's analysis of the transradial patient subset demonstrated that transradial access decreased the incidence of access site bleeding, although the patients receiving heparin and glycoprotein IIb/IIIa receptor inhibitor continued to



Figures 3 and 4. In the second procedure, the right radial artery was accessed using a 6 Fr introducer sheath. A 6 Fr MAC 3.0 guiding catheter was used, and two Zotolimus-eluting stents were deployed with adjunctive therapy using bivalirudin.

exhibit a higher rate of non-access-site bleeding compared to those receiving bivalirudin.¹²

The case described above is a good example of the ability of potent antithrombotic therapy to unmask a substrate characteristic that initiates bleeding, frequently difficult to identify. Potent antiplatelet therapy administered during the procedure can decrease the effects of microembolization and elevation of biomarkers after PCI; however, its propensity for increasing post-PCI bleeding probably offsets the benefit of this favorable biochemistry. Therefore, this therapy has failed to demonstrate superiority from an overall outcomes standpoint when compared to bivalirudin. Bivalirudin not only provides the potent ischemic protection thanks to its mechanism of action as a direct thrombin inhibitor, but also ensures optimal protection against access-site and non-access-site bleeding. As non-access-site bleeding significantly adversely affects post-PCI outcomes,¹³ prevention of non-access-site bleeding is at least as important as, if not more important than, preventing access-site bleeding.

We believe the combination of transradial access and bivalirudin may be ideal to provide the most benefit in reducing major adverse cardiac events and post-PCI bleeding, as transradial access reduces access-site bleeding only, and bivalirudin reduces ischemic events and global bleeding (access-site and non-access-site bleeding).

Many radial operators feel obligated to use

heparin because it's proven to efficaciously prevent post-procedural radial artery occlusion. Bivalirudin has been shown to demonstrate comparable efficacy in preventing radial artery occlusion.¹⁴ A split-dose heparin strategy can be used with diagnostic catheterization with the option of administering bivalirudin for ad hoc PCI.¹⁵

Summary

Post-PCI bleeding has been shown to be a very significant predictor of major adverse cardiac events after PCI. In an effort to minimize access-site and non-access-site bleeding, a combination of transradial access and bivalirudin for antithrombotic therapy may provide the best post-PCI-bleeding outcomes.

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