

Primary angioplasty: worth the trouble?

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Abstract

Primary angioplasty is an increasingly common strategy for the treatment of patients with myocardial infarction. However, although the technique is associated with improved early reperfusion and prevention of recurrent ischemia compared with thrombolysis, this Case Report illustrates that performing primary angioplasty safely not only requires significant expertise and resources, but also introduces unique problems.

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Keywords: Acute myocardial infarction, bifurcation disease, clopidogrel, kissing balloons, primary angioplasty

Case report

A 57-year-old man presented to the local cardiac centre 4 h after the onset of typical cardiac ischemic pain. Clinical examination demonstrated a pulse of 75 beats/min, blood pressure of 130/80 mm Hg, a clear chest, and normal heart sounds. A 12-lead electrocardiogram (ECG) confirmed the diagnosis of acute anterolateral myocardial infarction (*Figure 1*). Morphine, oxygen, 300 mg aspirin and 600 mg clopidogrel were given before the patient was transferred to the cardiac catheter laboratory for primary angioplasty.

A 6-French sheath was inserted into the right femoral artery. A bolus dose of abciximab and 5000 units of heparin were administered. A diagnostic right Judkins catheter was used to intubate the right coronary artery, which contained non flow-limiting disease. There was no evidence of collateral filling of the left coronary arteries. Next, a 3.5-Voda left guide catheter was used to engage the left coronary system. After injection of contrast, the left anterior descending artery (LAD) was found to be occluded (*Figure 2*). A Luge angioplasty

guidewire was passed in to the vessel beyond the occluded segment, with little resistance. However, subsequent partial restoration of flow revealed that the guidewire was located in the first diagonal vessel, and not the LAD. Furthermore, the culprit lesion appeared to be situated at the origin of the bifurcation of the LAD and diagonal vessel (*Figure 3*). A second wire was therefore passed into the main vessel. Several balloon inflations were required to dilate this lesion before placement of drug-eluting stents. The diagonal stent was placed first, following which the guidewire within this vessel was removed. The LAD stent was then placed, crossing the diagonal and “crushing” the layers of the first stent in the process. After several high-pressure balloon inflations to compress the resilient culprit lesion, in addition to “kissing balloon” inflation simultaneously in the LAD and diagonal stents (*Figure 4*), Thrombolysis in Myocardial Infarction (TIMI) 3 flow was established in both the LAD and diagonal vessels (*Figure 5*). ST segments immediately resolved, as did the patient's symptoms. The patient was discharged after five uneventful days, with a life-long prescription for clopidogrel.

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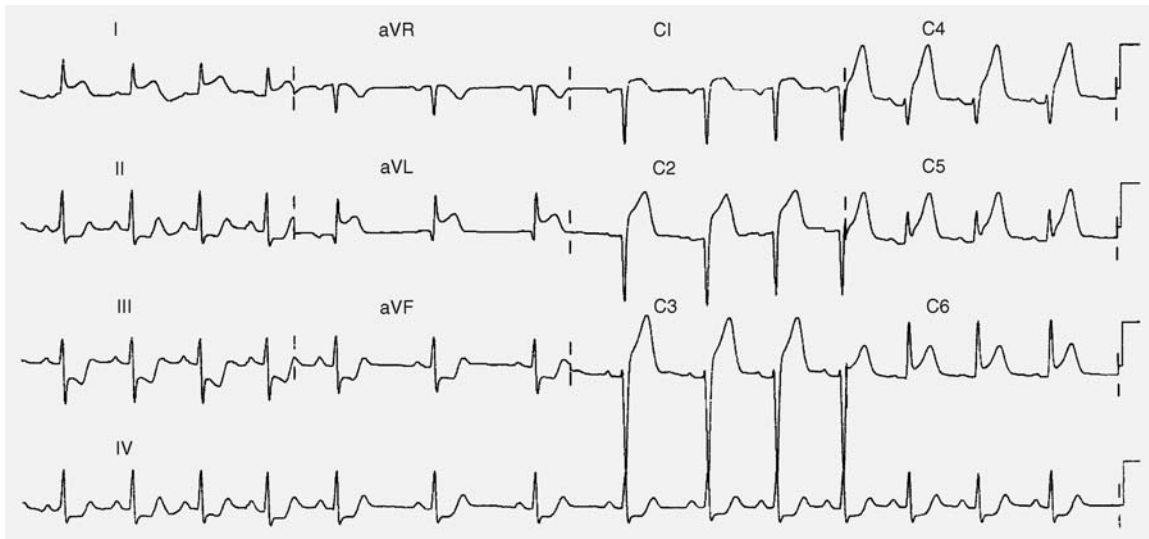


Figure 1. 12-Lead electrocardiogram showing anterolateral ST-segment elevation.

Discussion

Rationale for primary angioplasty

Management of acute myocardial infarction in a clinical setting is focused upon urgent restoration of flow in order to abrogate permanent damage to the heart. The critical relationship between infarct size and time was established by seminal experiments that demonstrated myocardial necrosis appearing within just 3 h after coronary artery occlusion [1]. The underlying pathology in most cases of acute myocardial infarction is believed to be a ruptured atherosclerotic plaque leading to thrombotic occlusion of the vessel [2]. Hence thrombolytic treatment has been established as the cornerstone of reperfusion therapy for many years. Despite percutaneous coronary interven-

tion having been introduced in 1977 for the treatment of stable coronary lesions [3], and primary angioplasty being performed just 2 years later [4], the routine management of acute myocardial infarction has remained largely confined to thrombolysis.

Recently, however, evidence has emerged suggesting that mechanically augmented vessel opening has advantages over pharmacological means alone, irrespective of the agent used [5]. The patient reported here illustrates one of the possible mechanisms for this disparity. A significant residual obstruction to flow persisted, despite repeated intracoronary balloon inflations, ultimately requiring both stent deployment and balloon inflations within the stented segment in order to restore TIMI 3 (ie, normal) flow. Hence, the culprit lesion may not have been adequately treated

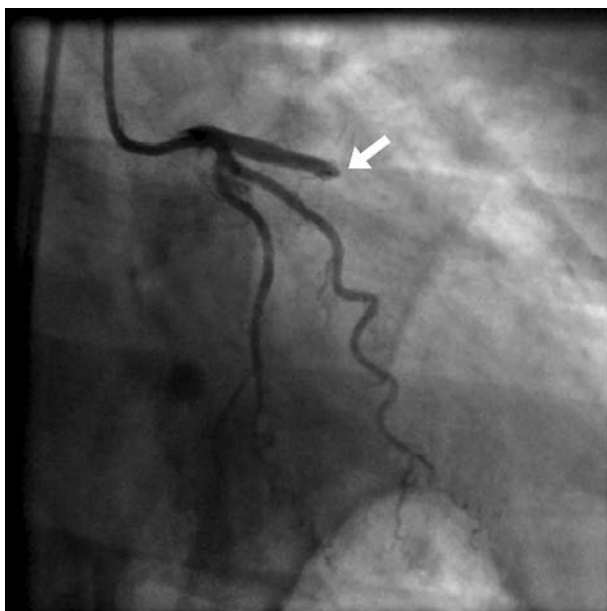


Figure 2. Occluded left anterior descending artery (arrow).

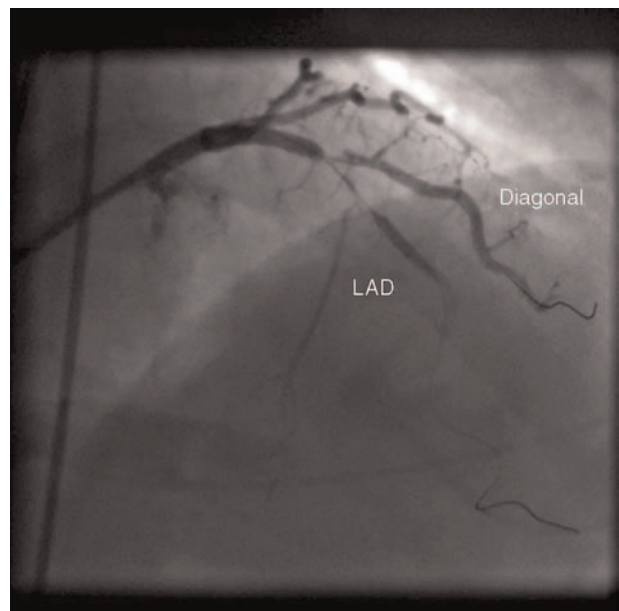


Figure 3. Bifurcation disease involving the left anterior descending (LAD) and diagonal vessels.

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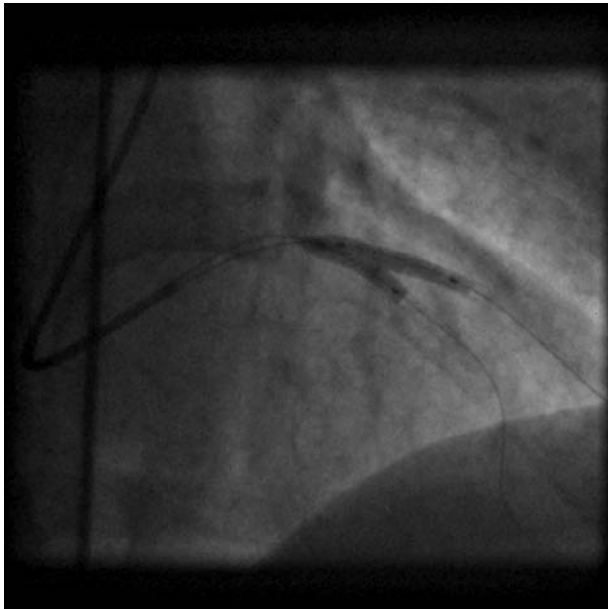


Figure 4. Kissing balloons after crush procedure.

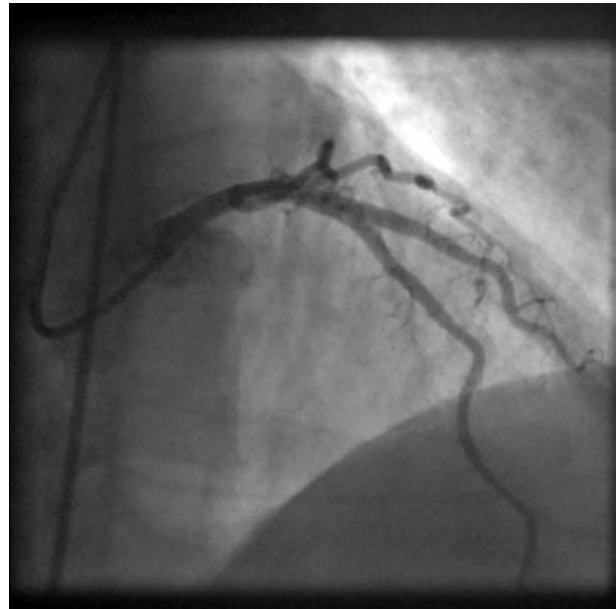


Figure 5. Final angiographic result.

with thrombolysis, despite full dispersion of the thrombus. This observation may explain the significant reductions demonstrated in those receiving primary angioplasty compared with thrombolysis for recurrent ischemia and recurrent non fatal myocardial infarction in both the short term (within 4–6 weeks) and longer-term (6–18 months) [5]. However, either strategy appears to confer similar benefits if applied within 3 h of the onset of pain, suggesting that the prompt administration of thrombolysis, such as by an ambulance crew, may be as effective as primary angioplasty in restoring perfusion. Nevertheless, after 3 h of the onset of pain, as in this patient, those receiving primary angioplasty instead of thrombolysis appear to obtain an overall benefit with respect to mortality [5]. Perhaps in light of these observations, the Department of Health has invested £1 million to determine the feasibility of implementing primary angioplasty as a nationwide strategy [6]. Furthermore, treatment of acute myocardial infarction by percutaneous coronary intervention is now enshrined in the most recent European Society of Cardiology guidelines [7].

Technical problems specific to primary angioplasty

Although primary angioplasty may seem to be an effective treatment for thrombotic coronary occlusion, this Case Report highlights several technical considerations that require further discussion.

Overall strategy

Unlike elective angioplasty, in the case of primary angioplasty the vessel to be treated has not been

visualized. Therefore the choice of initial catheter is determined primarily by the ECG, in order that the non culprit vessel may be imaged first. This strategy allows for the distal part of the occluded vessel to be revealed if collaterals are present. If the distal vessel cannot be seen, the possibility of encountering complex lesions should be considered, such as a bifurcation disease in this patient. Furthermore, the absence of forward flow may result in the guidewire advancing into an unwanted territory, such as a side branch, the vessel intima, or even outside the vessel. Currently, there are no trials that have investigated the optimum strategy for treating bifurcation lesions in acute myocardial infarction, although this patient demonstrates that techniques such as the “crush” [8] can be safely adapted from an elective situation, if the bifurcation angle is less than 50° and kissing balloons are used [9].

Antiplatelet agents

In our patient, clopidogrel was given in a dose of 600 mg as opposed to 300 mg. Although no trials have determined if the greater dose is superior in the context of myocardial infarction, platelet inhibition appears to be more effective during elective angioplasty when 600 mg is used [10]. Data from the only randomized trial comparing these doses in an elective setting suggest that there is less periprocedural myocardial injury with the greater dose, without increased bleeding complications [11]. Abciximab is also believed to be less than beneficial in the short term, by reducing target-vessel revascularization, although these benefits are not seen after one year, perhaps reflecting a lack of effect upon restenosis [12].

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Choice of stent

Data from two recent large trials [13,14] have indicated that drug-eluting stents may be used safely in primary angioplasty, and reduce the likelihood of repeat revascularization. However, given the cost of the prolonged treatment with clopidogrel that is necessitated by their use, and the corresponding bleeding risk, indications for the use of these stents should perhaps not exceed those used in elective cases.

Conclusion

Primary angioplasty is being recognized as a treatment that is superior to thrombolysis for some patients with myocardial infarction. This may account for the large national investment in the development of primary angioplasty as a 24 h service. However, establishing coronary flow in recently occluded vessels introduces challenges unique to this strategy, many of which will require further investigation before the widespread use of primary angioplasty can be advocated. ■

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