CASE REPORT

'Mechanical thrombectomy alone' as a definite therapy for rescue angioplasty

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SUMMARY

Coronary reperfusion strategies for acute ST segment elevation myocardial infarction (STEMI) include primary percutaneous coronary intervention (PCI), intravenous thrombolytic agents and recently mechanical thrombectomy alone during PCI, the latter reserved for those without significant residual disease post-thrombectomy. We describe the success of 'mechanical thrombectomy alone' in two young patients undergoing rescue angioplasty at our institution. Both patients were thrombolysed for inferior STEMI. During rescue PCI, post-thrombus aspiration, mild underlying atherosclerotic burden was detected in both patients, thus possibly obviating the need for further balloon angioplasty or stenting. Cost and compliance with long-term dual antiplatelet therapy (DAPT) was an additional factor to avoid stenting. Both patients received aspirin, clopidogrel, heparin and additional standard therapy for myocardial infarction (MI). Medication compliance was ensured by providing 1 month DAPT at no extra cost. Short-term follow-up at 1 and 3 months, for both patients was uneventful. Two-year, long-term follow-up, available for one patient has been uneventful.

BACKGROUND

Acute STEMI is usually the consequence of plaque rupture, resulting in thrombotic occlusion of coronary flow. Underlying atherosclerotic disease in affected coronary segments is non-obstructive and more frequently, mild in severity. Time-dependent restoration of coronary flow is associated with greater myocardial salvage. Primary PCI is the preferred approach. However, owing to restricted availability of primary PCI in emerging economies and in rural areas of Western economies, reperfusion with IV thrombolytic is more frequently employed in such settings. Following IV thrombolysis, however, full patency of infarct-related artery (IRA) has not been achieved in up to 50% of patients.^{1 2} Failure of thrombolytic agent to reach a systemic lytic state,³ organised thrombus or predominantly platelet-rich thrombus are factors that may account for these shortcomings.

Efficacy of repeat thrombolytic administration after initial failure is disappointing. Mechanical revascularisation with PCI (rescue PCI) is preferred for thrombolytic failure. In such situations despite preserved flow in the IRA, lesions with >50% angiographic stenosis are stented, while lesions <50% are usually left for medical management. Thrombus aspiration prior to stenting of the IRA is a class IIa recommendation in STEMI. Consequent

to its impact on angiographic reduction of lesion severity, success with mechanical thrombectomy without stenting as a definitive therapy during primary PCI for STEMI, in those with mild residual disease was good in a small series of patients.⁴⁻⁶ To our knowledge there is no reported experience with such an approach in patients undergoing post-thrombolytic PCI. Our initial experience on selected patients, mechanical thrombectomy alone during primary PCI was associated with good angiographic and clinical outcomes.

MERLIN trial showed that rescue PCI is associated with improved event-free survival and revascularisation.³ Facilitated PCI (routine immediate PCI after fibrinolysis) failed to demonstrate similar impact.⁷ Despite successful coronary reperfusion with initial thrombolytic therapy some advocate routine angiography with PCI guided by anatomy (early PCI),⁸⁻¹⁰ whereas others suggest coronary angiography and PCI influenced by symptoms or when ischaemia is provoked with activity.¹¹

CASE PRESENTATION**Patient #1**

A 40-year-old man with a history of tobacco use as his only cardiac risk factor received intravenous metalase for inferior STEMI at an outside facility. Upon arrival at our institution, 90 min later, coronary reperfusion was evidenced by resolution of ST elevation and clinical symptoms. He was kept on dual antiplatelet therapy and intravenous heparin. His blood pressure was 110/60 mm Hg and heart rate 74 beats/min. His physical examination was essentially normal. Overnight recurrent episodes of chest pain associated with bradycardia and brief runs of non-sustained ventricular tachycardia prompted emergent coronary angiography which revealed 90% stenosis in mid to distal left circumflex artery (figure 1A). Normal (thrombolysis in myocardial infarction (TIMI) 3) antegrade flow was, however, present. Mild non-obstructive disease was seen in other coronary arteries. Successful clot retrieval was performed with an 'export catheter'. Post-thrombectomy residual mild disease (<30% luminal stenosis) was left without stenting (figure 1B). Subsequent hospital course was uneventful. Echocardiography prior to discharge showed posterolateral hypokinesis with preserved overall left ventricular ejection fraction of 60%.

Patient # 2

A 43-year-old man with tobacco use as his only cardiac risk factor was transferred to our cardiac catheterisation lab within 2 h of receiving

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Figure 1 (A) Angiogram post-thrombolytic therapy shows large thrombus burden with underlying stenosis (arrow). (B) Shows mild residual stenosis post-thrombectomy (arrow head).

thrombolytic therapy for inferior STEMI. Despite resolution of ST segment elevation patient continued to have chest pain. Clinical examination revealed the patient was in moderate distress, exhibited stable vital signs and normal physical examination. During rescue PCI, a dominant right coronary artery had 70% proximal vessel thrombotic stenosis but good (TIMI 3) antegrade flow was present (figure 2A). After thrombus aspiration with 'export catheter', residual 40% stenosis (figure 2B) was not mechanically intervened. Rest of his coronary arteries had mild non-obstructive disease.

INVESTIGATIONS

Complimentary assessment of their overall general health was performed. This showed normal chest x-ray, blood count, serum electrolytes, kidney, renal and liver function tests. Serial cardiac biomarkers and ECG showed a pattern consistent with an evolving acute myocardial infarction. Echocardiogram in both patients showed preserved left ventricular (LV) systolic function with mild hypokinesis in the respective vascular territory affected by the MI. Valves and other cardiac structures were normal.

DIFFERENTIAL DIAGNOSIS

Patients presenting with chest pain and ECG changes should prompt physicians of serious medical conditions as aortic dissection, acute pericarditis, myo-pericarditis and pulmonary embolism. At times diffuse ST elevation owing to early repolarisation pattern in patients with non-cardiac chest pain may be mistaken for critical conditions.

Figure 2 (A) Thrombus seen in proximal RCA post lytic therapy (arrow). (B) Post mechanical aspiration mild residual stenosis is seen (arrow head).

TREATMENT

The ultimate treatment goal for acute STEMI is establishing vessel patency. PCI is the preferred method for achieving this objective, but where facilities are unavailable lytic therapy is utilised. As described above, in our patients lytic therapy followed by rescue PCI was employed with good results. Additional standard pharmacological agents used in the management of our patients included oxygen, aspirin, clopidogrel, heparin, nitrates, statins and β -blockers.

OUTCOME AND FOLLOW-UP

Both patients were discharged home on aspirin, clopidogrel, statin and β -blocker. They remained asymptomatic at 1 and 3 months follow-up office visits. Long-term follow-up is available for patient 1. He was hospitalised 2 years later for atypical chest pain. ECG and cardiac biomarkers were within the normal range. A repeat coronary angiography showed 30–40% stenosis at the site of previous plaque rupture (figure 3). Remainder of the coronary anatomy was unchanged.

DISCUSSION

Acute STEMI presentation is usually at a younger age than NSTEMI (non-ST segment elevation MI) with single vessel CAD frequently noted on angiography. Plaque erosion or rupture with consequent formation of a flow limiting thrombus at the site is likely a dominant aetiology. Owing to lack of wide availability of primary PCI facilities in our practice area, globally in emerging economies, and perhaps in rural settings of Western economies, acute reperfusion strategy is largely dependent on use of intravenous thrombolytics.^{12–14} Efficacy of thrombolytic therapy for acute STEMI is well established. There are notable limitations with failure to restore flow or incomplete restoration

Figure 3 Angiogram 2 years later showing mild stenosis.

of flow in a significant number of patients. Coronary angiography performed emergently as a rescue procedure post-thrombolytic therapy, for ongoing symptoms or persistent ST segment elevation, is associated with an improved outcome.³ However, clinical diagnosis of thrombolytic failure can be challenging. Persistent chest pain can be an unreliable marker of ongoing ischaemia. In the MERLIN trial³ 38% patients had TIMI grade 3 flow with persistent pain and conversely 53% patients who were symptom free had <TIMI grade 3 flow on invasive angiogram. Owing to above there is argument in favour of early coronary angiography post-thrombolytic administration performed either routinely¹² or that guided by myocardial ischaemia provocation on stress test.¹¹

During coronary angiography it is a common practice to stent high-grade vessel stenosis. Initial thrombectomy during PCI is associated with improved outcome.¹⁵ Angiographic assessment of lesion severity can be influenced by thrombectomy. This effect is perhaps more prominent in patients with a large thrombus burden, as may be the case in those presenting with acute STEMI and, in particular, younger patients who are less likely to have significant underlying coronary atherosclerosis. To terminate PCI procedure after only thrombectomy when only mild underlying coronary atherosclerosis is present is tempting and fiscally responsible, provided a good outcome can be established. An earlier report by Kramer⁶ of thrombectomy alone in the primary PCI population is encouraging. Our early experience in a small number of primary PCI patients is consonant with the findings of Kramer *et al.* Encouraged by our initial success in the primary PCI population we have now performed thrombectomy alone as a part of rescue PCI postintravenous thrombolysis in two patients. Procedural success and clinical outcome are good thus far. If good clinical outcome in selected patients can be further established, a wider adoption of this approach will impact the management of patients' post lytic therapy.

Learning points

- ▶ Manual thrombus aspiration as solo intervention post-thrombolytic therapy is feasible provided there is a mild residual lesion and thrombolysis in myocardial infarction grade 3 flow has been established.
- ▶ Mechanical thrombectomy alone is a viable option when long-term use of dual antiplatelet therapy is a medical or economic concern. The latter is of particular value to patients in our practice area where treatment compliance is influenced by prohibitive cost of pharmaceuticals.
- ▶ Emerging economies stand to benefit more from such an approach with significant cost reduction by minimising the use of intracoronary balloons and stents, and avoiding complications associated with them, albeit less.

Competing interests None.

Patient consent Obtained.

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