Case Report

Can mechanical thrombectomy replace angioplasty for the treatment of patients with ST-segment elevation myocardial infarction (STEMI)? Report of a case

Mehmet Cansel*, Julide Yağmur, Ferhat Eyyupkoca, Hakan Tasolar, Nusret Acıkgoz and Necip Ermis

Faculty of Medicine, Inonu University, Malatya, Turkey.

We are reporting the case of a 64-year-old woman with acute inferior ST elevation myocardial infarction with right ventricular infarction. She underwent primary angiography which revealed total occlusion of distal right coronary artery (RCA) by thrombus. Three runs of aspiration were performed and the thrombus was aspirated from RCA without additional ballooning or stenting. Postaspiration angiography revealed normal TIMI-3 flow down with the resolution of the thrombus and a residual noncritical trombus was seen also. She was started on glycoprotein (GP) IIb-IIIa inhibitor tirofiban for 48 h. A new angiography performed on the 4th post-intervention day and TIMI-3 flow down was seen in RCA with complete disappearance of the residual thrombus.

Key words: Intracoronary thrombus, acute myocardial infarction, thrombus aspiration.

INTRODUCTION

ST-segment elevation myocardial infarction (STEMI) results from occlusive thrombus formation at the site of plaque rupture or erosion (DeWood et al., 1980; Falk, 1983). Rapid restoration of TIMI grade 3 flow is closely associated with improved survival (Cannon, 2001; Cannon and Braunwald, 1996). The current management of STEMI consists of primary angioplasty, including thrombus aspiration and stenting (Yang et al., 2005; Svilaas et al., 2008). Another adjunctive therapy is antiplatelet therapy with intravenous administration of the GPIIb/IIIa inhibitor which is recommended after primary angioplasty (EPILOG Investigators, 1997).

In the present report, we describe and discuss a case of acute inferior ST elevation myocardial infarction with right ventricular infarction in which there is successful initial use of an aspiration catheter without additional balooning or stenting and effectiveness of tirofiban (Aggrastat, Merck Sharp and Dohme, USA) treatment for

aspiration and tirofiban treatment without balooning and stenting in STEMI patients in primary anjiography. residual thrombus. We wanted, in our case, to emphasize

CASE REPORT

A 64-year-old woman was admitted with acute inferior acute myocardial infarction (AMI) with right ventricular infarction. She had half an hour chest pain and she did not have any coronary artery risk factors. Her blood pressure was 137/84 mmHg and pulse rate was 65/min on admission. No murmurs, rales or bruits were observed and the Killip class was grade I. An electrocrdiogram on admission showed ST segment elevations in leads D_{2-3} aVF and resiprocal depressions in leads V_{1-3} (Figures 1 and 2). The baseline creatine kinase value was 379 ml/dl. The pain-to-PCI (ptP) time was 70 min. She was pretreated with asetylsalicylic acid (ASA) 300 mg per-oral (PO), enoxaparine-sodium 60 mg subcutaneously, intravenous 5000 U unfractioned heparine (UFH) and 8 tablets clopidogrel 75 mg (PO) before angiogram.

On primary angiogram, the left anterior descending artery and circumflex artery was normal and RCA had a trombotic 95% lesion on the distal of the vessel (Figure 3) being performed 3 times with a Hunter Extraction Catheter, red thrombus was aspirated from the culprit lesion on distal RCA without additional balooning or stenting. After aspiration TIMI-3 flow was provided and a residual noncritical

---
*Corresponding author. E-mail: mcansel34@hotmail.com. Tel: +0090 422 3410660. Fax: +0090 422 3412708.
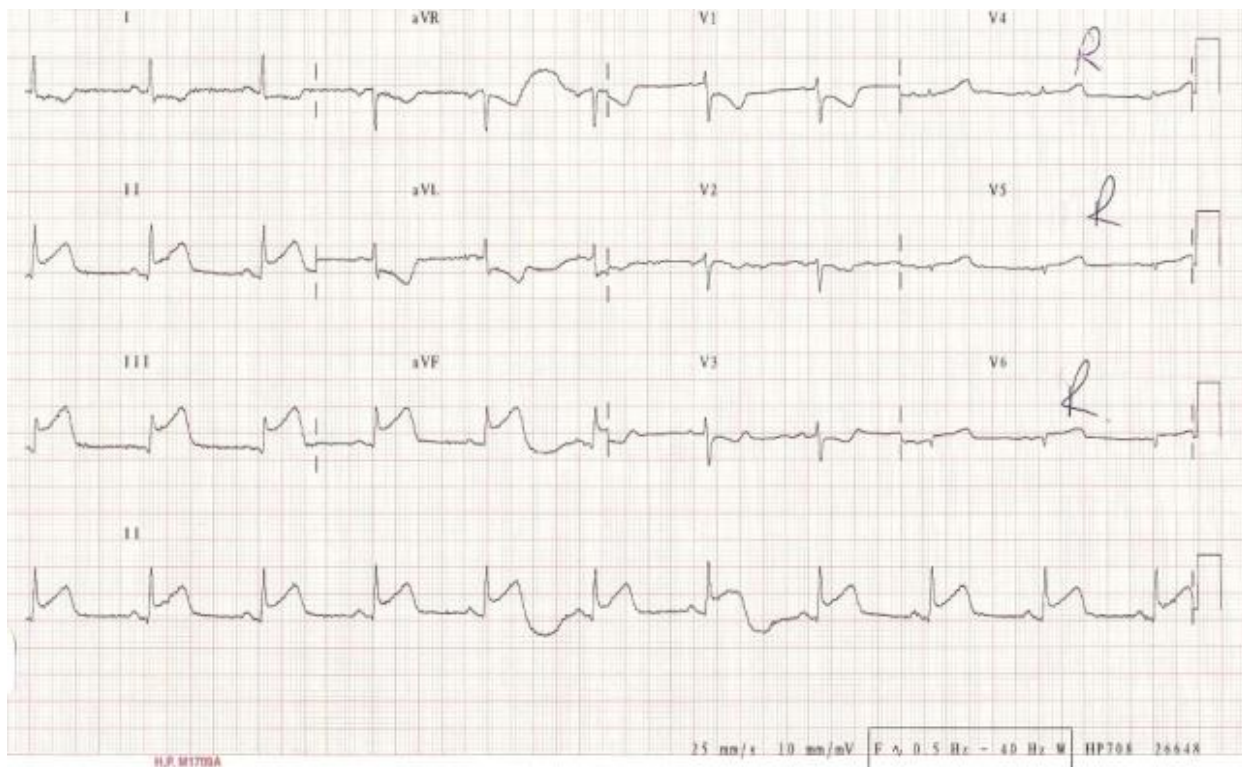
Figure 1. An electrocardiogram performed on admission showed ST segment elevation in leads D2-3-aVF and resiprocal ST depression in leads v1-3.
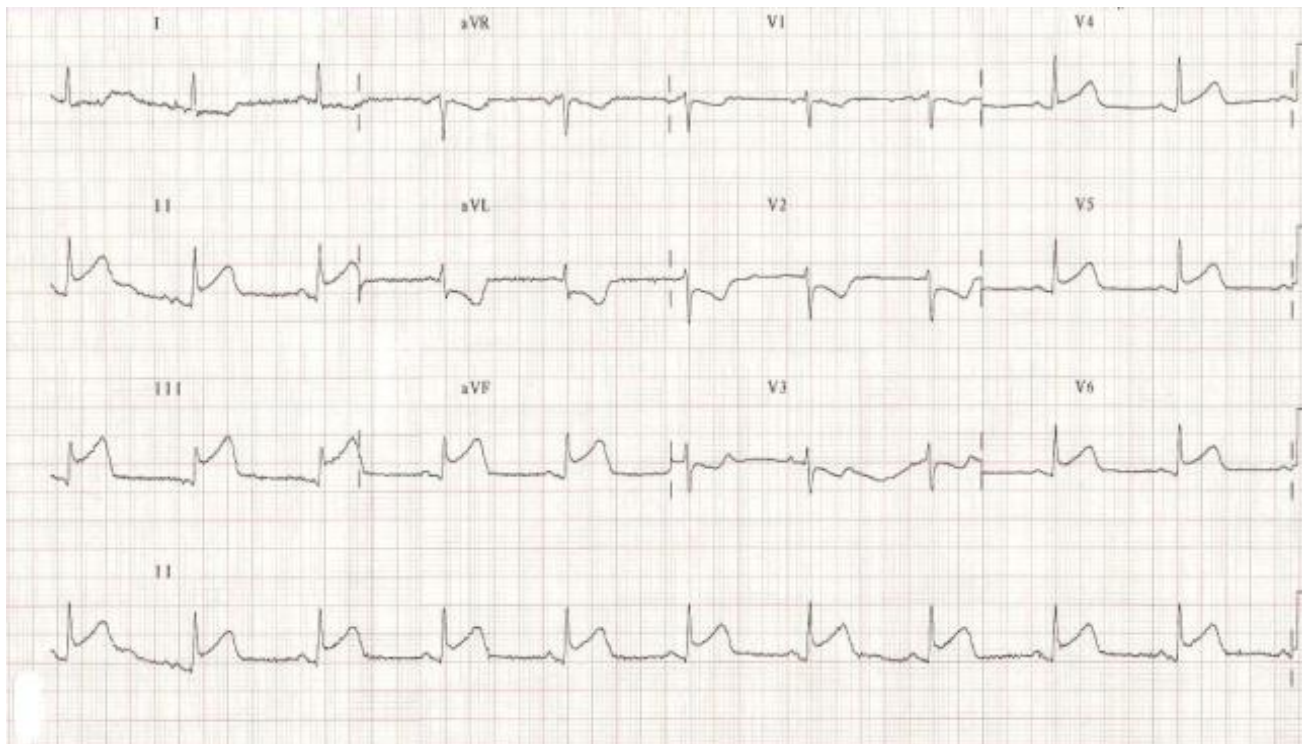

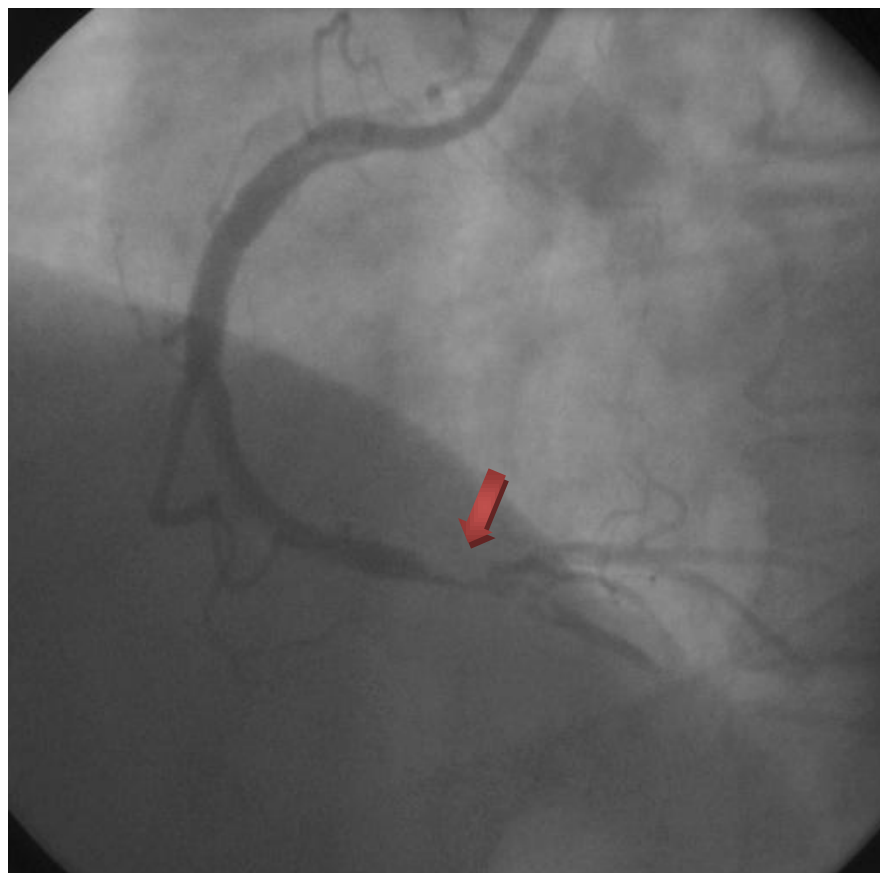**Figure 2.** ST segment elevation on right derivations.

Figure 3. Angiography (left oblique projection) confirming thrombus within the RCA (arrowed).

thrombus was demonstrated (Figure 4). We put an end to the process without balooning and stenting since hemodinamically significant coronary stenosis or dissection could not been seen in the case after the thrombus aspiration. The procedure took totally 25 min in the catheter laboratory.

She was taken to the coronary care unit and received glycoprotein (GP) IIb-IIIa inhibitor tirofiban after coronary angiogram for 48 h. She was also given 25 mg/day metoprolol (PO), 75 mg/day clopidogrel (PO) and 40 mg/day atorvastatin (PO). ST segment resolution was observed by >50% in the Electrocardiography (ECG) which was taken after thrombus aspiration after 24 to 36 h (Figure 5). After four days, the control angiogram demonstrated TIMI-3 flow and resolution of the residual thrombus (Figure 6). The left ventricular ejection fraction was 60% by echocardiography.

DISCUSSION

The presence of intra-luminal thrombus on angiography occurs in nearly 90% of patients with an acute STEMI (DeWood et al., 1980). It is obvious that primary angioplasty when available is the optimal management of STEMI (Keeley et al., 2003). In this setting, direct stenting is recommended where possible to reduce distal embolization and liberal use of aggressive antiplatelet regimens including glycoprotein IIb/IIIa inhibitors recommended to reduce the thrombotic burden (Keeley et al., 2003). As in other cases, thrombus aspiration has been shown to improve outcomes in primary PCI for STEMI (De Luca et al., 2008; Vlaar et al., 2008). In EXPIRA and DEAR-MI trials, it has been shown that manual thrombus aspiration before stenting of the infarct-related artery in selected patients with STEMI improved myocardial reperfusion significantly (Gennaro et al., 2010; Pedro Silva-Orrego et al., 2006). When we investigate the updated guidelines, we realize that the existence of significant stenosis and coronary disection after the mechanical thrombus aspiration is one of the indication of coronary balooning and stenting (Focused Updates, 2004, 2005, 2007, 2009; Van de Werf et al., 2009). Also Chung-Pin-Liu et al. (2010) has shown that tirofiban may augment thrombus aspiration therapy on myocardial perfusion in primary PCI. The benefit of thrombus aspiration treatment without tirofiban might be less significant especially on ST-segment resolution (Chung-Pin-Liu et al., 2010).
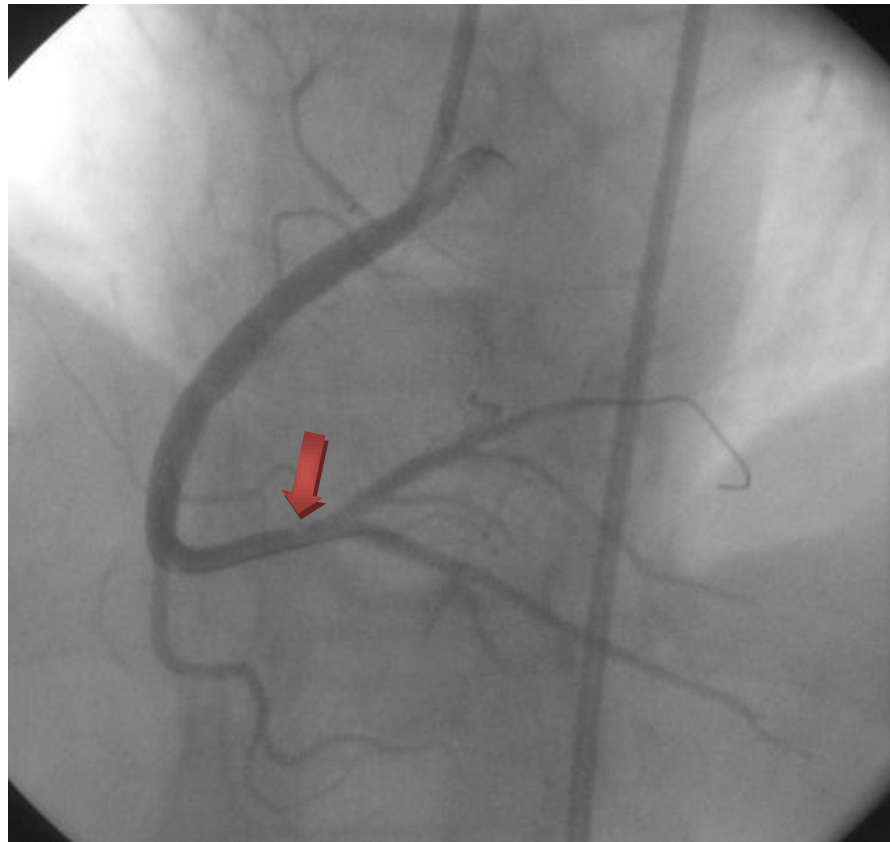
Figure 4. Angiography (left cranial projection) post-aspiration revealing the uncomplete disappearance of the thrombus with a residual trombus(arrowed).
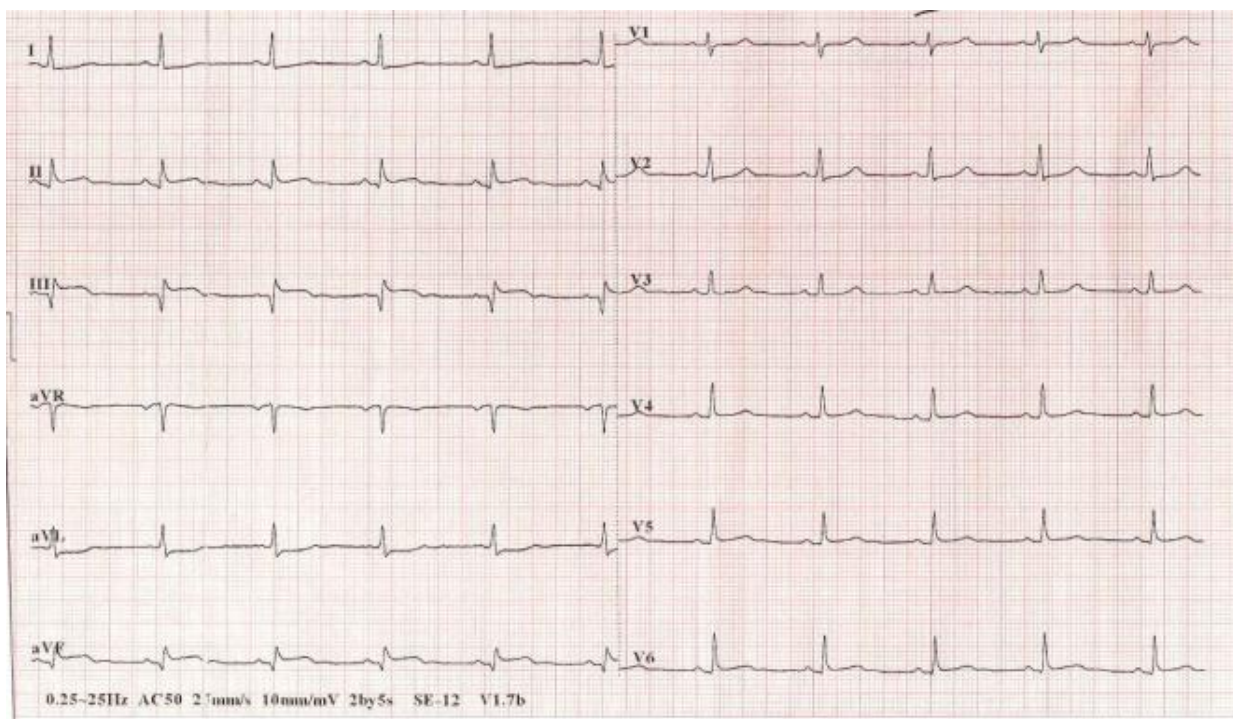

Figure 5. After thrombus aspiration the ST elevation normalized in the inferior derivations.
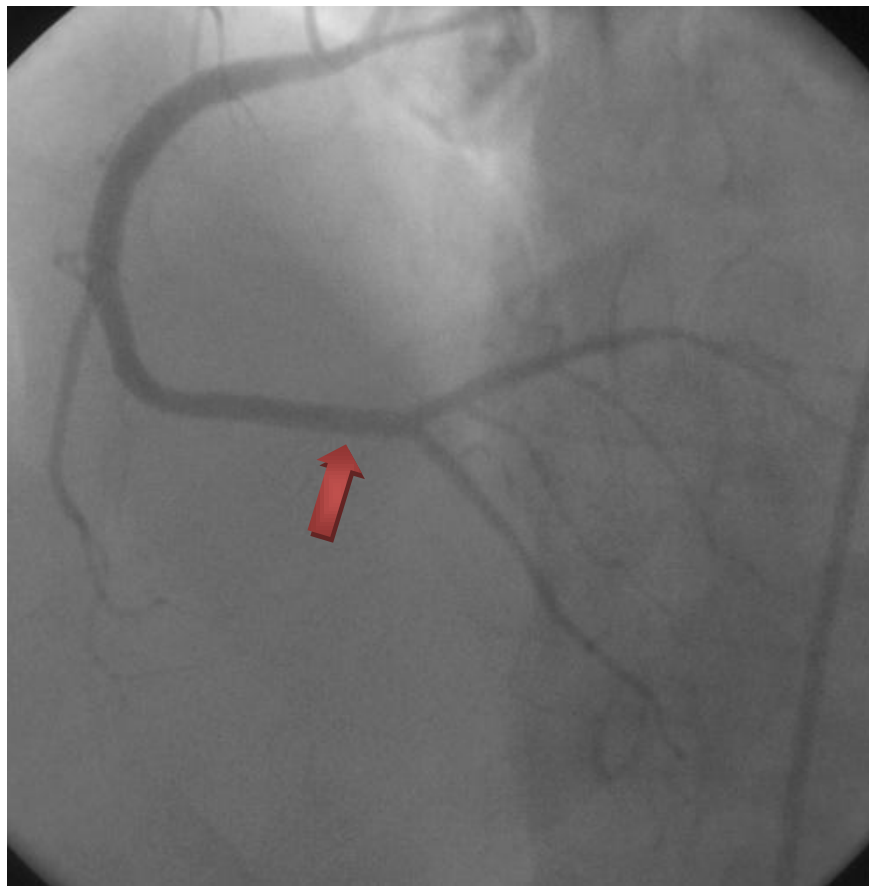
Figure 6. On fourth day angiography (left cranial projection) residual thrombus has resolved with tirofiban treatment (arrowed).

In the present case, we describe a STEMI patient treated by thrombus aspiration without additional ballooning or stenting. Generally, thrombectomy is used as a first step and is followed by stenting (with or without balloon predilatation). However, coronary plaques at the site of an acute obstruction causing acute myocardial infarction are often not critical (Little et al., 1988). As a consequence, theoretically, a subgroup of STEMI patients may not require further intervention on the infarct-related artery in cases of successful thrombus removal. We reported the successful management with aggressive antithrombotic therapy for a STEMI patient (referred for emergent intervention) by thrombus aspiration without additional ballooning or stenting.

Similarly, Isaaz et al. (2006) showed that a remarkable subgroup of patients may not require aggressive ballooning and/or stenting and reported that urgent PCI during STEMI is stopped as soon as coronary flow is reestablished by aspiration and further intervention is performed only in the case of significant residual stenosis at early follow up (Isaaz et al., 2006). Also Giovanni et al. (2010) and Burzotta et al. (2007) reported the angiographic

and clinical outcome of a series of selected STEMI patients undergoing mechanical reperfusion by thrombus aspiration without additional ballooning or stenting.

In selected patients with STEMI undergoing mechanical reperfusion, thrombus aspiration without additional ballooning or stenting can be successfully performed (Giovanni et al., 2010). Indeed, when using thrombus aspiration devices, thrombus removal is greater when the thrombus burden is larger and complete removal of angiographically evident thrombus may sometimes occur (Burzotta et al., 2007). This situation may offer the possibility of avoiding further intervention in selected patients. Finally, a recent study also suggested that removal of thrombus burden by an aspiration catheter alone during primary PCI can improve myocardial reperfusion without occluding the distal coronary artery (Burzotta et al., 2005).

One study looking at patients undergoing primary angioplasty for acute STEMI has shown that the use of the export catheter prior to stent deployment significantly increases TIMI frame count, reduces the incidence of slow-flow or noflow and reduces the size of infarct (Noel

et al., 2005). The relative simplicity and cost-effectiveness of this approach make it attractive (Margheri and Guido Vittori, 2007). Also in RETAMI, trial Export-Medtronic manual aspiration device seems to remove more thrombotic burden compared with another device system, providing a greater postthrombectomy epicardial flow in patients with STEMI (Sardella et al., 2008). In the view of these knowledge, in the case of our patient who applied to the emergency department with acute STEMI, we followed the patient with tirofiban treatment after the thrombus aspiration with the Export catheter without ballooning and stenting since we have not found out any significant stenosis or coronary dissection on the post-aspiration angiogram.

Conclusion

Although the safety of avoiding ballooning and stenting after thrombectomy is yet to be evaluated, the present report suggests that this strategy can be considered. Furthermore, it needs studying on a wide scale.

REFERENCES

Burzotta F, Trani C, Romagnoli E (2007). Feasibility of sequential thrombus aspiration and filter distal protection in the management of very high thrombus burden lesions. J. Invasive Cardiol. 19:324-325.

Burzotta F, Trani C, Romagnoli E, Mazzari MA, Rebuzzi AG, De Vita M (2005). Manual thrombus-aspiration improves myocardial reperfusion: The randomized evaluation of the effect of mechanical reduction of distal embolization by thrombus-aspiration in primary and rescue angioplasty (REMEDIA) trial. J. Am. Coll. Cardiol. 46:371-376.

Cannon CP, Braunwald E (1996). Time to reperfusion: The critical modulator in thrombolysis and primary angioplasty. J. Thromb Thrombolysis 13:117-25.

Cannon CP (2001). Importance of TIMI 3 flow. Circulation 104:624-6.

Chung-Pin L, Mao-Shin L (2010). Additive benefit of glycoprotein IIb/IIIa inhibition and adjunctive thrombus aspiration during primary coronary intervention: Results of the Initial Thrombosuction and Tirofiban Infusion (ITTI) trial. Int. J. Cardiol. doi:10.1016/j.ijcard.2010.10.129.

De Luca G, Dudek D, Sardella G, Marino P, Chevalier B, Zijlstra F (2008). Adjunctive manual thrombectomy improves myocardial perfusion and mortality in patients undergoing primary percutaneous coronary intervention for ST-elevation myocardial infarction: A meta-analysis of randomized trials. Eur. Heart J. 24:3002-10.

DeWood MA, Spores J, Notske R (1980). Prevalence of total coronary occlusion during the early hours of transmural myocardial infarction. N Engl. J. Med. 303(16):897-902.

EPILOG Investigators (1997). Platelet glycoprotein IIb/IIIc receptor blockade and low-dose heparin during percutaneous coronary revascularization. N. Engl. J. Med. 336:1689-1696.

Falk E (1983). Plaque rupture with severe pre-existing stenosis precipitating coronary thrombosis: characteristics of coronary atherosclerotic plaques underlying fatal occlusive thrombi. Br. Heart J. 50:127-134.

Focused Updates (2004, 2005, 2007, 2009). ACC/AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction (updating the 2004 Guideline and 2007 Focused Update) and ACC/AHA/SCAI Guidelines on Percutaneous Coronary Intervention (updating the 2005 Guideline and 2007 Focused Update): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines.

Gennaro S, Massimo M, Emanuele C (2010). Impact of Thrombectomy With Export Catheter in ınfarct-related artery during primary percutaneous coronary ıntervention (EXPIRA Trial) on Cardiac Death Am. J. Cardiol. 106:624-629.

Giovanni PT, Francesco B, Carlo T (2010). Thrombus Aspiration Without Additional Ballooning or Stenting to Treat Selected Patients with ST-Elevation Myocardial Infarction. J. Invasıve Cardiol. 22:489-492

Isaaz K, Robin C, Cerisier A (2006). A new approach of primary angioplasty for ST-elevation acute myocardial infarction based on minimalist immediate mechanical intervention. Coron. Artery Dis. 17:261-269.

Keeley EC, Boura JA, Grines CL (2003). Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: A quantitative review of 23 randomised trials. Lancet 361:13-20.

Little WC, Constantinescu M, Applegate RJ (1988). Can coronary angiography predict the site of a subsequent myocardial infarction in patients with mild-to-moderate coronary artery disease? Circulation 78:1157-1166.

Margheri M, Guido V (2007). Thrombus Aspiration with export Catheter in ST Elevation Myocardial Infarction. J. Interven. Cardiol. 20:38-43.

Noel B, Morice MC, Lefevre T (2005). Thromboaspiration in acute STelevation MI improves myocardial reperfusion. Circulation 112(suppl II):519.

Pedro Silva-Orrego, Paola C, Riccardo B (2006). Thrombus Aspiration Before Primary Angioplasty Improves Myocardial Reperfusion in Acute Myocardial Infarction. J. Am. Coll. Cardiol. 48:1552-9.

Sardella G, Mancone M, Nguyen BL (2008). The effect of thrombectomy on myocardial blush in primary angioplasty: the Randomized Evaluation of Thrombus Aspiration by two thrombectomy devices in acute Myocardial Infarction (RETAMI) trial. Catheter Cardiovasc. Interv. 71(1):84-91.

Svilaas T, Vlaar PJ, van der Horst IC (2008). Thrombus aspiration during primary percutaneous coronary intervention. N. Engl. J. Med. 358:557-67.

Van de Werf F, Bax J, Betriu A, Blomstrom-Lundqvist C, Crea F, Falk V, Filippatos G, Fox K, Huber K, Kastrati A, Rosengren A, Steg PG, Tubaro M, Verheugt F, Weidinger F, Weis M (2009). ESC guidelines on management of acute myocardial infarction in patients presenting with persistent ST-segment elevation. Task Force on the management of ST-segment elevation acute myocardial infarction. Rev. Esp. Cardiol. 62(3):293, e1-47.

Vlaar PJ, Svilaas T, Van der Horst IC (2008). Cardiac death and reinfarction after 1 year in the Thrombus Aspiration during Percutaneous coronary intervention in Acute myocardial infarction Study (TAPAS): A 1-year follow-up study. Lancet 371:1915-1920.

Yang CT, Hwang JJ, Lin LC (2005). Initial thrombosuction with subsequent angioplasty in primary coronary intervention-comparison with conventional strategy. Int. J. Cardiol. 102:121-6.