Thrombolysis for ST Elevation Myocardial Infarction in RIPAS Hospital, Brunei Darussalam: 2005 vs 1999

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Abstract

Rapid reperfusion is critically important in the management of ST-elevation myocardial infarction (STEMI). Studies show worse outcomes with increasing delay in reperfusion therapy. UK guidelines for management of STEMI suggest administering thrombolytic treatment in eligible patients within 30 minutes of arrival at hospital, within 60 minutes of calling for professional help, and within 12 hours of the beginning of pain.

This study compares the values of several indicators of the process of thrombolysis therapy in patients with STEMI in RIPAS Hospital, Brunei Darussalam, in 2005 with corresponding values in 1999. Complete data for analysis were available for 37 patients in 2005 and 32 patients in 1999. Compared to 1999, in 2005 considerably more patients received thrombolysis within the first 4 hours of the onset of pain (50% vs. 70%) with 46% receiving it within 3 hours. The door to needle time was significantly shorter in 2005 compared to 1999. In 2005, 11% of all eligible patients received thrombolysis within 30 minutes of arrival in the hospital compared to 6.25% in 1999. Also, in 2005, 38% of the patients received thrombolysis within 60 minutes of arrival at the hospital compared to 12% in 1999. A significant reduction in the transfer time was an important factor in improving the door to needle time between 1999 and 2005.

At RIPAS Hospital, a favourable trend towards earlier thrombolysis was noted in 2005 compared to 1999. Yet, in 2005, only 46% of all eligible STEMI patients received thrombolysis within 3 hours of the onset of pain. Therefore, there is still room for improvement in our practice.

Introduction

Acute myocardial infarction with ST segment elevation (STEMI) is defined as necrosis of the myocardium due to rupture of a plaque and 100% occlusion of the infarct-related coronary artery [1]. Early resolution of the coronary thrombus is important for reducing the extent of myocardial necrosis [2-4]. For the management of STEMI, generally two myocardial reperfusion methods are used. The more widely available and easily administrable method is thrombolysis with fibrinolytic drugs like streptokinase or rtPA. The other method is percutaneous coronary intervention (PCI) or primary angioplasty requiring direct intervention on the coronary obstruction. Although considered the best treatment in acute myocardial infarction, PCI is unfortunately not available at all the hospitals [5-9]. In the 1984 GISSI study, conducted for 17 months in Italy on 11,712 patients to assess the impact of thrombolytic treatment on in-hospital mortality, the treatment significantly reduced mortality by 18% and the benefit was still significant after 10 years of follow-up [10,11]. The beneficial effect of thrombolytic therapy was again confirmed by the Fibrinolytic Therapy Trialists' (FTT) Collaborative Group study in 1994 [12].

Initially, a window period of 12 hours from the first signs of STEMI was suggested for thrombolysis. But the first 3 of these 12 hours were considered the most critical

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and called 'the golden hours' [9,13]. In 1996, Boersma, Simoons, and colleagues from Erasmus University, Rotterdam, Netherlands, published an analysis of data from 1983 to 1993, to define the relation between delay in fibrinolytic therapy and short-term mortality [13]. The benefit of fibrinolytic therapy in terms of lives saved per 1,000 patients was 65, if given within 1 hour; 37, if given between 1 and 2 hours; and 26, if given after 3 hours. The Prague-2 study in 2003 showed no difference between thrombolysis and PCI among patients with presentation time of < 3 hours from the onset of symptoms [14]. The 2005 CAPTIM study in France concluded that thrombolysis for STEMI, if performed within 2 hours of the onset of pain, was as effective as PCI in terms of life saving [6]. This was later confirmed in other studies conducted in France, Scandinavia, and Italy [8, 9, 15-19].

New European and American guidelines suggest thrombolysis within 30 minutes of arrival at the hospital, within 60 minutes from the call for professional help, and within 12 hours from the onset of pain, provided no contraindications are present [7,20,21].

To assess time trends in the performance of thrombolytic therapy at RIPAS Hospital, Brunei Darussalam, we compared the values of four indicators of the thrombolytic treatment process in 2005 with their corresponding values in 1999. These indicators were pain to needle time, door to needle time, transfer time, and coronary care unit (CCU) delay.

Methods

This study included all patients that arrived at the Accident and Emergency (A&E) Department, RIPAS Hospital, Bandar Seri Begawan, Brunei Darussalam, with STEMI and admitted to the CCU during January through December, 1999, and January through December, 2005. In RIPAS hospital, thrombolysis is initiated in the CCU rather than in the A&E Department. Relevant data were abstracted from patient files in the Cardiac Centre. Abstracted data were used to calculate the following four thrombolysis therapy process indicators:

1. Pain to needle time: time interval between the onset of pain and the beginning of thrombolysis therapy;

2. Door to needle time: time interval between arrival at the A&E Department and the beginning of thrombolysis therapy;

3. Transfer time: time interval between arrival at the A&E Department and transfer to the CCU;

4. CCU delay: time interval between arrival at the CCU and the beginning of thrombolysis therapy.

All data were computerized using Microsoft Excel and analyzed using Microsoft Excel and Stata (StataCorp LP, College Station, Texas, USA). We computed the mean, the median, and the 25th and 75th percentiles as descriptive statistics. As the study variables were not distributed normally, we used the nonparametric median test to evaluate statistical significance in the difference between two medians. We considered a p-value of <0.05 as significant.

Results

Between January and December, 2005, 50 patients (6 females, 44 males) presented with STEMI to the A&E Department, RIPAS Hospital. The average age of the patients was 54.4 years (range 28-84 years). Of these patients, 46 were thrombolysed, 2 had primary angioplasty, and 2 died before any treatment could be administered. For inclusion in the analysis for this study, complete data were available for 37 patients in 2005 and 32 patients in 1999.

Pain to needle time: In 2005, 46% of the patients received thrombolytic treatment within 3 hours of the onset of chest pain, 25% within 2 hours, and 2.7% within 1 hour. These values were not significantly different from their corresponding values in 1999. The median pain to needle time was 190 minutes in 2005 compared to 243 minutes in 1999 (P =0.469, Table 1). The mean pain to needle time was 335.9 minutes in 2005 and 285.2 minutes in 1999.

	2005 (n = 37)		1999 (n = 32)		2005 vs. 1999
Indicator	Median	IQR	Median	IQR	Median test P-value
Pain to needle time (minutes)	190	150, 270	243	125, 328	0.469
Door to needle time (minutes)	65	50, 95	98	75, 137	0.003
Transfer time (minutes)	40	25, 60	55	43, 92	0.007
Coronary Care Unit (CCU) delay (minutes)	25	10, 40	33	13, 50	0.333

Table 1. The medians, interquartile ranges (IQR, 25th and 75th percentiles), and statistical significant test results of 4 selected thrombolysis therapy process indicators, RIPAS Hospital, Brunei Darussalam, 1999 and 2005.

Door to needle time: In 2005, the overall door to needle time was shorter than in 1999. In 2005, almost 11% of the patients were treated within 30 minutes compared to 6.25% in 1999. The comparison of median door to needle times in 2005 vs. 1999 showed significant difference. In 2005, this was 65 minutes and in 1999 this was 98 min (P = 0.003, Table 1). The mean door to needle time was 77.2 minutes in 2005 and 118.7 minutes in 1999.

Transfer time (Figures 1). There was marked and significant improvement in the transfer time in 2005 compared to 1999. The median transfer time in 2005 was reduced to 40 minutes compared to 55 minutes in 1999 (P = 0.007, Table 1).The mean transfer time was 45.7 minutes in 2005 and 95.0 minutes in 1999.

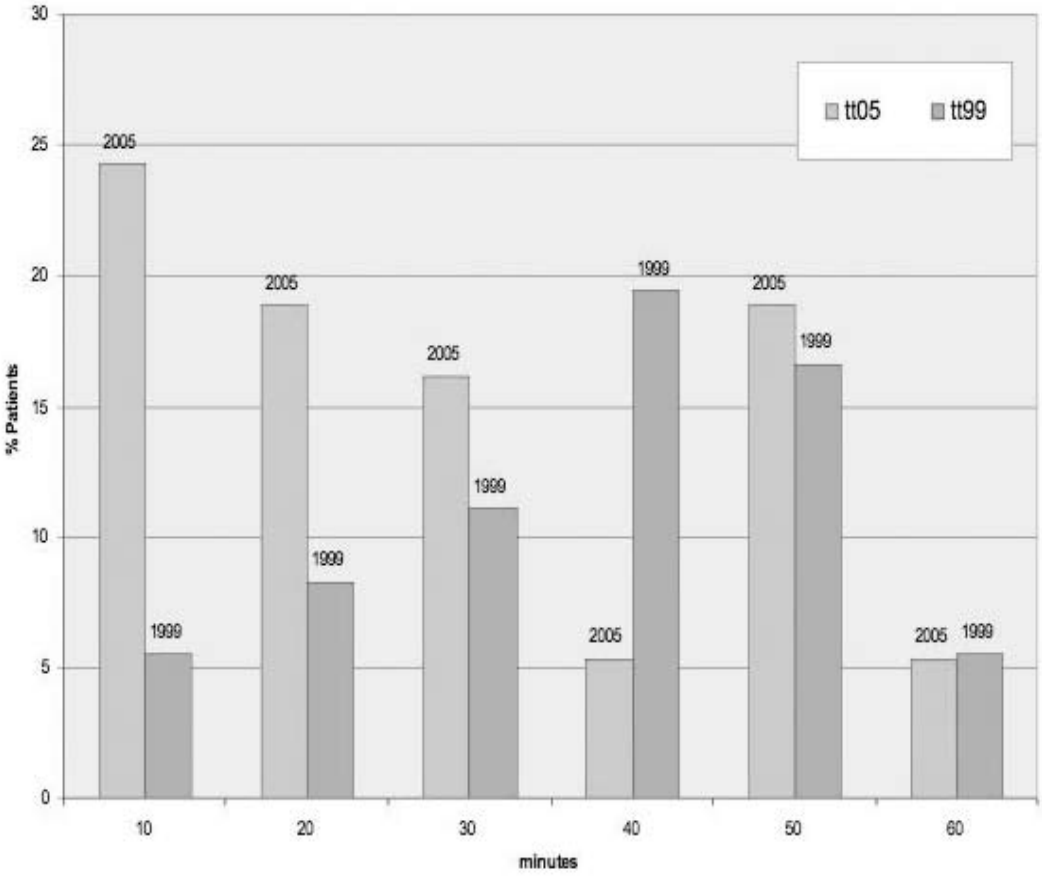

Figure 1. Percentage of STEMI patients with different transfer times in 1999 and in 2005, RIPAS Hospital, Brunei Darussalam.

CCU delay: Values of this indicator in 2005 and in 1999 did not differ significantly (Table 1, P = 0.333). The median CCU delay was 25 minutes in 2005 compared to 33 minutes in 1999. The mean CCU delay was 30.9 minutes in 2005 and 39.2 minutes in 1999.

Discussion

We conducted this study to asses the changes between 1999 and 2005 in the values of four important process indicators of thrombolysis therapy for STEMI in RIPAS Hospital, Brunei Darussalam. We also compared the 2005 values of the indicators at RIPAS Hospitals with international recommendations [7, 20, 21]. New European and American guidelines recommend thrombolysis for STEMI within 30 minutes of arrival at the hospital, within 60 minutes from the call for professional help, and within 12 hours from the onset of pain, provided no contraindications are present [7,20,21]. Two indicators of the thrombolysis therapy process are very important: pain to needle time and door to needle time. In 2005, 70% of all eligible patients were thrombolysed within 4 hours compared 50% in 1999. However, the median pain to needle times in these two years did not differ significantly (Table 1). In 2005, 46% of the patients were treated within 3 hours of the onset of pain. This percentage is close to that observed in the UK during a study conducted on 22,000 patients in 2005 [20]. In this study it was found that 56% of the patients were treated within 3 hours of the onset of pain. We did not compare the data on administration of fibrinolytic drugs within 60 minutes after the call for professional help as was done in the UK study, because the majority of patients seeking care for STEMI at RIPAS Hospital came directly on their own without calling for an ambulance [20].

The data from RIPAS Hospital showed that there was significant improvement in the door to needle time in 2005 (median: 65 minutes) compared to 1999 (median: 98 minutes). In 2005, almost 11% of the patients were treated within 30 minutes of arrival at the hospital, compared to 6.3% in 1999. In 2005, the mean door to needle time at RIPAS Hospital was 77.8 minutes, a value close to those reported in some studies from Europe [5,17]. We compared our results with those of other international studies including the Myocardial Infarction National Audit Project (MINAP) study [15, 20-23]. The MINAP study was conducted in UK from 2000 to 2005 to monitor hospital performance in the management of STEMI. This study showed that in 2004, more then 80% of the patients were thrombolysed within 30 minutes of arrival at the hospital, a percentage that doubled since 2000. Although, at RIPAS Hospital we have noted that the percentage of patients thrombolysed within 3 hours of the onset of chest pain almost doubled between 1999 and 2005, in absolute terms, these percentages were much smaller than those observed in Europe.

Of the four thrombolysis therapy process indicators we have studied, the pain to needle time is highly dependant on the patients' responses. The door to needle time in turn is affected by the transfer time and the CCU delay. In RIPAS Hospital, between 1999 and 2005, significant improvement was noted in the transfer time but no change was noted in the CCU delay.

Thus, better management in the A&E Department and increased public awareness has led to an improvement in the pattern of thrombolysis fro STEMI in Brunei Darussalam. These have led to significant reduction in the door to needle time and the pain to needle time.

Early thrombolysis is of critical importance in the management of STEMI. Through better organization, coordination, and optimization at every level of the therapy administration process, precious time can be saved. Public awareness and health care providers' education should play an important role in the overall strategy to improve the door to needle time and the pain to needle time. While favorable trends have been noted in the values of these indicators in RIPAS Hospital between 1999 and 2005,

there is room for further improvement to match the better performance records elsewhere.

References

1. Zipes D, Libby P, Bonow R, Braunwald E 2004. Braunwald's Heart Disease, a Texbook of Cardiovascular Medicine. 7th Edition. Elsevier Saunders

2. Bassand JP, Danchin N, Filippatos G, Gitt A, Hamm C, Silber S, Tubaro M, Weidinger F. 2005. Implementation of reperfusion therapy in acute myocardial infarction. A policy statement from the European Society of Cardiology. Eur Heart J: 26(24): 2733-41

3. Kristensen SD., Huber K., De Caterina R. 2004. ST-elevation myocardial infarction-should choice reperfusion therapy depend on the duration of symptoms? E-Journal of Cardiology Practice 3 [14].

4. Kristensen SD, Andersen HR, Thuesen L, Krusell LR, Botker HE, Lassen JF, Nielsen TT. 2004. Should patients with acute ST elevation MI be transferred for primary PCI? Heart 90: 1358-63

5. Bettencourt N, Mateus P, Dias C, Mateus C, Santos L, Adao L, Sampaio F, Salome N, Goncalves C, Simoes L, Ribeiro VG. 2005. Impact of pre-hospital emergency in the management and prognosis of acute myocardial infarction. Rev Port. Cardiol 863-72

6. Bonnefoy E, Gabriel P, Chabaud S, Dubien P, lapostolle F, Boudet F, Lacroute JM, Dissait F, Vanzetto G, Leizorowicz A, Touboul P. 2005. Is primary angioplasty more effective than prehospital fibrinolysis in diabetics with acute myocardial infarction? Data from the CAPTIM randomized clinical trial. Eur Heart J 26(17):1712-1718.

7. Guidelines. Percutaneus Coronary Intervention. 2006 ACC/AHA/SCAI. J Am Coll Cardiol 47:216-35

8. Mortensen OS, Bjorner JB, Oldenburg B, Newman B, Groenvold M, Madsen JK, Andersen HR 2005. Health-related quality of life one month after thrombolysis or primary PCI in patients with ST-elevation infarction. A DANAMI-2 sub-study. Scand Cardiovasc J 39(4):206-12

9. Goldstein P, Wiel E. 2005 Management of prehospital thrombolytic therapy in ST-segment elevation acute coronary syndrome (<12 hours). Minerva Anestesiol 71(6):297-302

10. Gruppo Italiano per lo Studio della Streptochinasi nell'Infarto Miocardico (GISSI) 1986. Effectiveness of intravenous thrombolytic treatment in acute myocardial infarction. Lancet 1: 397-402.

11. Gruppo Italiano per lo Studio della Streptochinasi nell'Infarto Miocardico (GISSI) 1987. Long-term effects of intravenous thrombolysis in acute myocardial infarction: Final report of the GISSI study. Lancet 2: 871-874.

12. Fibrinolytic Therapy Trialists' (FTT) Collaborative Group. 1994. Indications for fibrinolytic therapy in suspected acute myocardial infarction: collaborative overview of early mortality and major morbidity results from all randomised trials of more than 1000 patients. Lancet 343: 311-322.

13. Boersma E, Maas AC, Deckers JW, Simoons ML. 1996. Early thrombolytic treatment in acute myocardial infarction: reappraisal of the golden hour.Lancet 348:771-775

14. Widimsky P, Budedinsky T, Vorac D, Groch L, Zelizko M, Aschermann M, Branny M, Stasek J, Formanek P. 2003. Long distance transport for primary angioplasty vs immediate thrombolysis in acute myocardial infarction. Final results of the randomized national multicentre trial PRAGUE-2. Eur Heart J 24: 94-104

15. Iriart X, Delarche N, Auzon P, Denard M, Estrade G. 2005. Prehospital management of acute myocardial

infarction. Data from a consecutive cohort of 115 patients in a French region in 2002. Ann Cardiol Angeiol (Paris): 54(5)257-62

16. Maier R, Balzi D, Ainla T, Zeller M, Kallischnigg G, Barchielli A, Teesalu R, Cottin Y, Theres H, Buiatti E, Eha J, Beer JC. 2005. Hospital care of patients with ST-elevation myocardial infarction in four different European regions. Data from four regional myocardial infarction registries in Berlin, Dijon, Florence, and Tartu. Bundersgesundheitsblatt Gesundheitsforshung Gesundheitsschuts 48(10):1176-82

17. Oltrona L, Mafrici A, Marzegalli M, Fiorentini C, Pirola R, Vincenti A 2005. The early management of ST-elevation acute myocardial infarction in the Lombardy Region (GestIMA) Ital.Heart J supp : 6(8):489-97

18. Orso F, Maggioni AP 2006. What is the optimal reperfusion therapy strategy for elderly patients with Acute Myocardial Infarction? Am J Geriatr Cardiol: 15(1):14-28

19. The Task Force on the Management of Acute Myocardial Infarction of the European Society of Cardiology, 2003. Management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur Heart J 24: 28-66

20. Myocardial Infarction National Audit Project (MINAP), United Kingdom by John Birkhead, Raphael Balcon, Roger Boyle, David Cunningham, Michael Pearson et al,: How the NHS manages heart attacks. Fourth Public Report 2005

21. Guidelines. Acute myocardial infarction: pre-hospital and in-hospital management. 1996. The task force on the management of acute myocardial infarction of the European Society of Cardiology. Eur Heart J: 17: 43-63

22. Lane G, Cuddihy J, Wright P, Doherty D, McShane A 2005. Efficacy of fibrinolysis in the emergency department for acute myocardial infarction. Irish J Med Sci: 174(3) 9-12

23. Magid DJ, Wang Y, Herrin J, McNamara RL, Bradley EH, Curtis JP, Pollack CV Jr French WJ, Blaney ME, Krumholz HM 2005 Relationship between time of day, day of week timeliness of reperfusion, and in-hospital mortality for patients with acute ST-segment elevation myocardial infarction. JAMA 294(7); 803-12