

Assessing the outcome of patients who underwent a primary percutaneous coronary intervention

Sarah Cuschieri, Mark Sammut

Abstract

Introduction: Patients presenting with acute ST-elevation myocardial infarction (STEMI) of less than 12 hours from onset of chest pain are candidates for primary percutaneous coronary intervention (PPCI).

Aim: To assess the patients' outcome after 12 months of their admission by a retrospective observational study.

Methodology: Data of patients admitted with STEMI and preceding to PPCI between 1st of January 2011 to 30th of June 2011 were analyzed. A total of 105 patients were recruited, identified and analyzed by using Cardiac Investigation and Patient Record (CIPR) software. Survival outcomes were determined by mortality data obtained from the Department of Information, Health and Research.

Results: Out of the 105 patients having PPCI, the majority were men (81%). 8.6% died within one year. 20% had scheduled repeat coronary angiography, 9.5% requiring further PCI. 0.95% had target vessel revascularization while another 0.95% was referred for coronary artery bypass grafting (CABG) due to triple vessel coronary disease.

Unplanned re-admissions rate due to another episode of chest pain was of 5.7%, out of which one presented with another STEMI requiring PPCI. The other patients underwent inpatient coronary angiogram, with 2 proceeding to PCI.

The remaining 63% did not experience any other cardiovascular related episodes.

Conclusion: This analysis showed that the re-admission rates over a year requiring further interventions were low as was the death rate. Only one target vessel revascularization was performed suggesting that the majority of the PPCI's performed were successful. This is important when assessing the quality of cardiovascular interventional service provided by our state health system.

Keywords

Cardiology, Percutaneous Coronary Intervention, Myocardial infarction, Thrombolytic Therapy, Chest pain

Introduction

Acute ST-segment elevation myocardial infarction (STEMI) is an emergency condition, which results from a thrombotic occlusion of a coronary artery. Impairment of vascular supply to the myocardium occurs, leading to an eventual infarction.¹

Primary percutaneous coronary intervention (PPCI) is the gold standard for STEMI management² provided that a PPCI center is within a reasonable geographical distance to ensure a rapid revascularization as possible. The other alternative to treat acute STEMI is thrombolysis. The earlier the patient presents to the Emergency department after onset of chest pain, the better results would be obtained by PPCI. When comparing PPCI to thrombolysis, it had been found that PCI is superior to thrombolysis when undertaken between 3 and 12 hours from the onset of chest pain, as it significantly leads to a more rapid and effective revascularization. It had been reported that in particular women³ and elderly patients⁴ benefit more from undergoing PPCI as compared to thrombolysis.

The PPCI procedure involves acquiring arterial access (originally through the femoral artery but nowadays the use of the radial or brachial arteries are also possible) under local anaesthesia, where a seldinger technique is used to guide a catheter up to the coronary artery. Visualization by means of intracoronary contrast medium injections and fluoroscopy would enable the catheter to be passed through the stenosis and into its distal branch⁵. The stenosis would then be dilated and stented, resulting in the return of blood flow through the vessel to the distal myocardium. The outcome depends

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on the presence of co-morbid factors such as pre-existing heart failure or renal failure, previous myocardial infarction, the degree of vessel collateralisation and the presence of multi-vessel disease⁵. These in addition to the duration of the door-to-balloon time, a prognostic factor in its own right.

This study was undertaken at Mater Dei Hospital, which is equipped with a PPCI facility and experienced team. Due to the relatively small size of the islands, patients experiencing acute chest pain have a greater chance of reaching the hospital within the first few hours of the onset and so the door-to-balloon time is generally short. The local protocol is that patients presenting to the Accident and Emergency department of Mater Dei Hospital with acute STEMI up to 12 hours duration are candidates for PPCI. Circulatory system diseases including ischemic heart disease⁶ constitute the major cause of death in Malta over recent years (38% of the death rate for 2010). This retrospective observational study was performed to assess the outcome of patients' cardiovascular interventional outcome at 12 months of having undergone PPCI.

Method

Over a 6 month period between the 1st of January 2011 to 30th June 2011, a total of 105 patients presented to the Accident and Emergency department of Mater Dei Hospital, Malta, with acute onset of chest pain, where an electrocardiogram in each case showed acute STEMI. These subjects were candidates to undergo PPCI. Permission for PPCI data covering this period was obtained from the cardiologist consultants, the Mater Dei hospital administration and the data protection office. The researchers kept no personal data of the subjects in this study.

A total of 105 patients were identified and analyzed by using the Cardiac Investigation and Patient Record (CIPR) software available at the time of presentation and during data collection. The CIPR software was Maltese designed software used at Mater Dei Hospital to log in and save all data from angiograms and angioplasties performed⁷, along with any other re-admissions requiring further interventions for each patient. Using this software, each patient under study was individually screened to assess for any additional interventions in the following 12 months. Nowadays, this software has been superseded by international software.

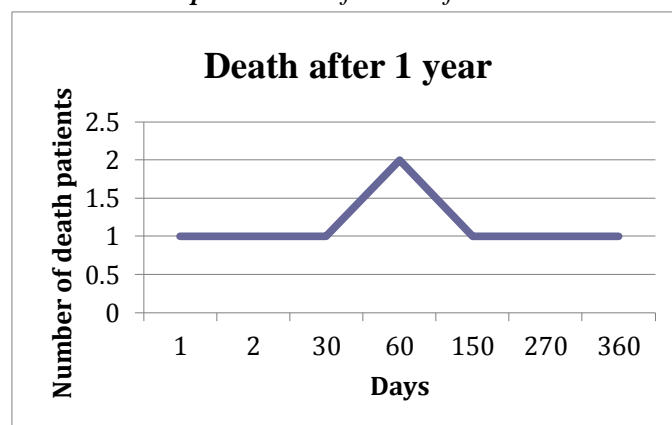
Special attention was given to those patients that were admitted again for additional target vessel revascularization after their STEMI admission. Survival outcomes of these patients were determined using mortality data obtained from the Department of Information, Health and Research, Ministry of Health, the Elderly and Community Care, Malta.

Results

Of the 105 patients having undergone PPCI in the studied period, 81% of the patients were men (n= 85).

The death rate in this cohort after a year was 8.6% (n=9), with 4.8% being men (n=5) and 3.8% female (n=4), with their age varying between 67 years and 95 years. Graph 1 shows the time of death after PPCI.

Graph 1: Time of death after PPCI



20% of the patients (n=21) had a scheduled repeat coronary angiogram 1 to 3 months after the PPCI. 9.5% (n=10) did not require any further intervention, while one -0.95% was found to have triple coronary artery disease and was referred to the cardiothoracic surgeons for coronary artery bypass grafting (CABG). Of the remaining 9.5% (n=10), one - 0.95% needed target vessel revascularization (i.e. PCI to the same vessel that had the initial PPCI) while the other 8.6% (n=9) had had PCI to other coronary vessels. One of these patients died 3 months following the scheduled PCI.

There was a re-admission rate of 5.7% (n=6) who presented to the Accident and Emergency department again with another episode of chest pain, out of which 0.95% (one) presented with another acute STEMI requiring PPCI due to an in-stent thrombosis. The other 4.75% (n=5) patients underwent an inpatient coronary angiogram, with 2 proceeding to PCI. 0.95% (n=1) out of the patients undergoing inpatient coronary angiogram had previously undergone scheduled repeated coronary angiography, which had taken place 15 days prior to the re-admission with chest pain.

The majority of the patients - 63% (n=66) did not experience any cardiovascular related episodes requiring interventions within one year of having had PPCI.

Discussion

In certain STEMI cases such as those with onset of chest pain exceeding 12 hours, thrombolysis is usually undertaken at Mater Dei hospital.

The majority of the subjects presenting with STEMI were men. This may be due to the fact that men are more at risk to develop cardiovascular disease throughout the

world especially when compared to premenopausal women.

In a recent meta-analysis, a significant death reduction was found in patients having undergone PCI as compared to thrombolysis though no significant reduction was found in cardiac deaths and myocardial infarction⁸. In the DANAMI-2 trial it was shown that a significant reduction in the primary endpoint of death, re-infarction and stroke after 30 days with PPCI was evident⁹.

Nowadays, as per latest guidelines, patients need to be on dual antiplatelet therapy (Aspirin and Clopidogrel) for a period of 1 year after a myocardial infarction in Malta. In 2010, the practice was slightly different, where patients were discharged on aspirin and ticlopidine. Ticlopidine is not as effective as an antiplatelet agent as clopidogrel, where at the time it was not yet available on the NHS drug formula.

Scheduled angiograms after PPCI are usually booked for patients having extensive coronary disease either to the culprit vessel or to other coronary vessels.

The re-admission rate after the initial PPCI was low due to cardiovascular-related conditions requiring further intervention. There was only one re-admission related to stent restenosis and required target-vessel re-vascularization. Stent thrombosis is a relatively rare complication.¹⁰

Two studies were found on re-admissions after PPCI, stating that re-admissions due to associated cardiovascular complications are more likely to occur within 30 days of the PCI.¹¹⁻¹² When implementing this to our study, only 1 subject was re-admitted with chest pain within the 30-day window post-PPCI. The remainder 5 patients were re-admitted beyond the 30-days of PPCI. The 30-day re-admission rate in some countries has now become a “quality indicator” for congestive heart failure as well as to acute myocardial infarction and being used as a means to assess health systems.¹³

Possible closer follow-up after PPCI might have identified some of these cardiovascular problems at an earlier stage and prevented the re-admission.¹⁴ Assessing compliance to medications might prevent re-infarction, bleeding and stent thrombosis.¹⁵

The majority of the subjects that had undergone a PPCI in this study did not present to hospital in need of further cardiovascular associated invasive procedures within the one-year follow-up. This could be interpreted, as suggesting that the majority of the PPCI's performed was successful.

Study limitations

None of the patients were actually contacted nor was their medical file reviewed; therefore one cannot say whether their deaths were directly linked to cardiovascular consequences. Also, this does not allow

for further discussion on the effects of other therapies and co-morbidity. Any data missing from the software used would also have been left out from this study. Due to lack of electronic medical records for outpatient visits, any patients presenting to the cardiac medical outpatients within the follow-up period was not included in this study. Only patients having undergone invasive procedures at the hospital were taken into consideration. All subjects presenting to private hospitals were excluded.

The study lacked information on the medical history and presence of any co-morbidity that may have been present for each patient and which may have led to their differing prognosis.

Conclusion

This study documented that re-admission rates over a 1-year follow-up period requiring further interventions were low. The majority of the re-admissions were for scheduled angiograms. The possible strategy for the other unplanned re-admissions would be shorter duration to follow-ups at the medical outpatients to prevent development of complications as well as monitor treatment compliance. Interestingly to notice is that the majority of the studied cohort needed no further cardiovascular interventions over 1-year. Additionally the death rate was relatively low. This information is important when assessing the quality cardiovascular interventional service provided by our state health system.

Reference

1. NICE. Myocardial infarction with ST-segment-elevation (STEMI). National Institute for Health and Clinical Excellence, 2013.
2. Rathod KS, Jones DA, Gallagher SM, et al. *BMJ Open* 2013; 3:e003063.
3. Tamis-Holland JE, Palazzo A, Stebbins AL, et al. Benefits of direct angioplasty for women and men with acute myocardial infarction: results of the Global Use of Strategies to Open Occluded Arteries in Acute Coronary Syndrome Angioplasty (GUSTO II-B) Angioplasty Substudy. *Am Heart J.* 2004; 147: 133-139.
4. Goldenberg I, Matetzky S, Halkin A, Roth A, et al. Primary angioplasty with routine stenting compared with thrombolytic therapy in elderly patients with acute myocardial infarction. *AM Heart J* 2003; 145: 862 – 867.
5. Grech ED. ABC of interventional cardiology. Percutaneous coronary intervention. II: The procedure. *BMJ* 2003; 326: 1137 – 1140.
6. European Health Examination Survey 2010 – Pilot Study, Department of Health Information and Research, Ministry of Health, the Elderly and Community Care.
7. Cardiac Investigation & Patient Records (CIPR). [Accessed on 08/12/13] Available at: <http://www.stockholmchallenge.org/project/data/cardiac-investigation-patient-records-cipr>.
8. Keely EC, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomized trials. *Lancet.* 2003; 361: 13 - 20.

9. Andersen HR, Nielsen TT, Rasmussen K, et al. A comparison of coronary angioplasty with fibrinolytic therapy in acute myocardial infarction. *N. Engl J Med* 2003; 349: 733 – 742.
10. Stone GW, Rizvi A, Newman W, et al. for the SPIRIT IV Investigators. Everolimus-eluting versus paclitaxel-eluting stents in coronary artery disease. *N Engl J Med* 2010; 362: 1663-74.
11. Curtis JP, Schreiner G, Wang Y, et al. All-cause readmission and repeat revascularization after percutaneous coronary intervention in a cohort of Medicare patients. *J Am Coll Cardiol* 2009; 54: 903-907.
12. Hannan E, Zhong Y, Krumholz H, et al. 30-Day Readmission for Patients undergoing Percutaneous Coronary Interventions in New York State. *Jacc: Cardiovascular Interventions* 2011; 4: 1335 – 1342
13. Yost GW, Puher SL, Graham J, et al. Readmission in the 20 days after percutaneous coronary intervention. *JACC: Cardiovascular interventions* 2013; 6(3): 237-44.
14. Hernandez AF, Greiner MA, Fonarow, et al. Relationship between early physician follow-up and 30-day readmission among Medicare beneficiaries hospitalized for heart failure. *JAMA* 2010; 303: 1716-22
15. Levine GN, Bates ER, Blankenship JC, et al. 2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention: a report of the American College of Cardiology Foundation / American Heart Association Task Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. *J Am Coll Cardiol* 2011; 58: e44-122.