

PCI IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION EARLY POST-CABG: OUR EARLY EXPERIENCE AND POTENTIAL BENEFITS

Mohamed Makram and Aly Emad Eldin Hussien

ABSTRACT:

Department of cardiology,
National Heart Institute, Cairo,
Egypt.

Corresponding author

Mobile: +201001313260

E.mail:

makram_m@hotmail.com,

Mohamed Makram

Received: 6/3/2022

Accepted: 4/4/2022

Online ISSN: 2735-3540

Back ground: With the increasing number of patients undergoing coronary artery bypass surgery (CABG), many complications can occur. Post operative as stroke, arrhythmia and bleeding, Yet, the most important is myocardial infarction (MI) Post CABG.

Aim of the work: This study aimed to assess the feasibility and safety of PCI in patients with acute myocardial infarction early post CABG.

Patients and Methods: This study included 47 patients presented between May 2019 until June 2021 with acute myocardial infarction early post-CABG surgery and were sent for coronary angiography, all data were prospectively collected and retrospectively analyzed.

Results: out of the 47 patients included in this study, 37 (78%) patients underwent PCI, 6 (12.7%) had Redo surgery and 4 (8.5%) had conservative medical treatment

Conclusion: PCI can be safely done in post-CABG patients having acute myocardial infarction with good results regarding in-hospital stay and mortality.

Key Words: PCI, post CABG, myocardial infarction.

INTRODUCTION:

Over the past years CABG surgery was well established treatment option for many patients with advanced coronary artery disease with more patients having CABG and more patients being vulnerable for post-operative complications.

Many post-operative complications can occur post CABG including bleeding, stroke, arrhythmia and infection, but still post-CABG myocardial infarction remains one of the serious complications that is not uncommon^[1].

It is well known that acute STEMI is one of the common complications following CABG surgery with incidence that varies from 2% and 10%^[1].

Perioperative acute STEMI may be related to many factors like operative hypotension, sever bleeding, inadequate myocardial protection and early graft failure^[2].

However, it is not easy to diagnose early graft failure giving into consideration normally elevated cardiac biomarkers postoperatively as well as common ECG changes^[3].

It is currently recommended to have immediate coronary angiography when postoperative MI is suspected to accurately diagnose the cause and decrease the extent of myocardial damage^[3].

AIM OF THE WORK:

The aim of this study is to assess the safety and potential benefits of PCI done in patients with early post-operative MI.

PATIENTS AND METHODS:

This study is a retrospective randomized study, was conducted from the period May 2019 until June 2021, 47 patients diagnosed with post-operative myocardial infarction according to the 4th universal definition of myocardial infarction^[4].

CABG-related MI is arbitrarily defined as elevation of cTn values > 10 times the 99th percentile URL in patients with normal baseline cTn values. In patients with elevated pre-procedure cTn in whom cTn levels are stable (20 %). However, the absolute postprocedural value still must be > 10 times the 99th percentile URL, In addition, one of the following elements is required:

- Development of new pathological Q waves.
- Angiographic documented new graft occlusion or new native coronary artery occlusion.
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality in a pattern consistent with an ischemic etiology.

An Isolated development of new pathological Q waves meets the type 5 MI criteria if cTn values are elevated and rising but < 10 times the 99th percentile URL.^[4]

They were sent to the Cath-lab in National Heart Institute and had post-operative coronary angiography followed by PCI when needed, patients with combined cardiac surgery were excluded.

Operative details:

CABG was done either by median sternotomy, on-pump or off- pump

according to the surgeon preference, total revascularization was attempted in all patients, LIMA and SVG and radial artery were the preferred grafts, for extracorporeal circulation a standard heart-lung machine was connected after cannulation of ascending aorta and right atrium in a standard fashion.

After completing coronary anastomosis close doppler time flow and pulsatility index measurements were obtained at all grafted vessels to test for patency and effectiveness, heparin was administered aiming to achieve clotting time >300 msec., then reversal was done using protamine sulfate when indicated. Hemostasis in the usual manner then transferring the patients to post operative ICU.

Post-operative care:

All patients were immediately admitted to the post-operative ICU with continuous 3 leads ECG, pulse oximeter, invasive APB and central venous pressure monitoring.

Immediate post-operative 12 leads ECG was obtained for all patients and followed up every 6 hours in the first 24 hours for early detection of any new changes. immediate cardiac enzymes sample were withdrawn.

Echocardiography was done for all patients post-operatively for detection of any new regional wall motion abnormalities.

Postoperative MI was suspected after the detection of any of the following: elevation of cardiac enzymes > 10% of immediate postoperative levels, ECG changes indicative of new onset ischemic insults (ST elevation or depression, development of pathological Q waves or new onset LBBB), unexplained recurrent VT, VF or cardiac arrest.

Heart team discussion was made once postoperative MI is suspected and immediate coronary angiography was decided upon approval of the interventional

cardiologist, cardiac surgeon and anesthesiologist.

Coronary angiography details:

Coronary angiography was done through either femoral or radial approaches according to the cardiologist preference, with multiple left and right projections visualizing both native vessels and grafts, ad hoc PCI was done in same session when indicated, after administration of IV heparin achieving clotting time 250-350 msec.

All patients who underwent PCI was immediately loaded with 600 mg clopidogrel and continued on DAPT with clopidogrel 75 mg and ASA 100 mg once daily with other anti-ischemic medications.

Radial sheaths were immediately removed after finishing PCI while femoral sheaths were removed 4 hours later with

Table (1): Demographic data of patients

Male patients	30 (63 %)
>one risk factor for CAD	42 (89%)
Median sternotomy	47(100%)
>one graft	46 (97%)

Surgical patients: Out of our 47 patients diagnosed with post-operative MI and sent for immediate coronary angiography 37 (78%) of them had successful PCI to native coronary artery, 6 (12.7%) patients were sent for Re-do CABG and 4 (8.5%) patients had conservative medical treatment (2 of them had normal coronary and conduits angiography probably suffered from perioperative MI, the other two having normal flow to the grafts but with poor distal run-off). Among the six patients sent for redo-CABG, 2 patients were diagnosed as occlusion of the SVG one to RCA and the other to OM2. They were operated upon with redoing of the proximal anastomosis of both SVG which was founded to be kinked, the RCA vein was kinked shortly distal to the aorta by distension of the SVC, the other one to the OM2 was kinked beneath the left atrial auricle. In other two patients a spasm of the radial artery was diagnosed, which was treated by applying a saphenous vein

manual compression to ensure adequate hemostasis.

Follow-up:

All patients underwent PCI was transferred back to the ICU, except patients sent for redo-CABG, continuous hemodynamic monitoring, repeated ECG, echocardiography and laboratory workup were done and followed until being discharged. All patients were on high inotropic support with intra-aortic balloon pump.

Data analysis:

The mean age for our patients was 51 ± 14 years 30 (63 %) males, 42 (89%) patients had more than one CAD risk factors, median sternotomy was done in 47 (100%) patients and 46 (97%) patients had more than one graft.

distally to the grafted artery which was the OM in both cases. In the last two patients a hematoma was found in the LIMA compromising its flow, it was treated by applying a SVG distally to the LAD in both cases.

PCI patients: of the 37 patients treated by PCI, there was graft related problems in the form of: 27 (78.7%) patients anastomotic stenosis 3 of them have had an endarterectomy to the LAD by its whole length with a long on-lay patch by the IMA with poor run off so no PCI was done to them, 9 patients showed graft kinking (19.1%) and one patient whom had an intra-operative injury to right ventricle at time of dissection of an intra-mural LAD and repaired by two 4/0 proline stitches distal to the anastomosis which caused LAD post anastomosis stenosis. All patients amenable for PCI were treated by stents placement.

Table (2): percentages of patient in each line of treatment.

PCI patients	37 (78%)
Redo patients	6 (12.7%)
Conservative treatment	4 (8.5%)

Follow up of all patients showed improvement of hemodynamics, ECG and echocardiographic findings in 35 (94.5%) patients out of the 37 patients who had PCI while 2 (5.5%) patients died, 4 (66.7%) patients from the Re-do CABG group

improved and were successfully discharged while 2 (33.4%) patients died, in the conservative group 3 (75%) patients improved and successfully discharged while 1 (25%) patient died.

Table (3): Showing mortality among patients between the three groups.

PCI patients	35 (94.5%) improved	2 (5.5%) mortality
Redo patients	2 (66.7%) improved	2 (33.4%) mortality
Conservative treatment	3 (75%) improved	1 (25%) mortality



Figure (1): showing angiography with LIMA to LAD patent graft with stenosis of LAD distal to the anastomosis.

DISCUSSION:

Vast majority of CABG patients are doing well after the operation and are sent home well after recovery. Yet there are very few patients suffering from ischemia after CABG⁽¹³⁾. Perioperative acute STEMI may be related to many factors like operative hypotension, sever bleeding, inadequate myocardial protection and early graft failure or spasm^[2]. In a study discussing the possibility or the role of PCI as a backup for CABG, conducted on more than half a million patients over a period of eleven years, they found the incidence of post CABG patients who needed coronary

angiography was 4.4% and about 2.6% of CABG patients needed coronary intervention PCI with 71.4% of cases done on the first 24 hours post operatively. It concluded that as CABG have an emergency important role post PCI, also PCI have an emergency role post CABG. They obtained stroke rate of 2.1%, acute renal injury of 16%, and sepsis of 3.4%. with extremely increased cost and hospital stay⁽¹³⁾.

Despite its diagnosis is still challenging, the identification of the patients suffering from post CABG peri-operative MI is crucial for their proper management⁽⁵⁾. Still this diagnosis is dependent on high cardiac

enzymes, specifically troponin I, with many studies relating high levels of this enzyme with high mortality.^[6]

Many causes are attributed for early perioperative MI like severe bleeding or inadequate cardiac protection during surgery, however graft related causes like graft spasm or occlusion remains the most common causes for perioperative MI⁽⁷⁾. In our study we experienced two cases with patent native coronary vessels as well as patent conduits experiencing perioperative MI with other two cases with poor target vessels not amenable for PCI and were treated medically. Although the indications for post-operative coronary angiography were presented in algorithm of the ESC Joint Working Groups on Cardiovascular Surgery and the Cellular Biology of the Heart position paper⁽⁸⁾, where it helps to assess the patency of the bypass grafts and the native coronaries, however, to date there is no randomized study to compare safety and efficacy of PCI in patients with early post-operative MI, although some studies tried to emphasize the importance of coronary angiography in suspected early post-operative MI^[9]. In a study done by Megally et al, they discussed the results of elective PCI after prior CABG, with a mortality rate 0.8%, coronary perforation 7.3%, cardiac tamponade 1% , and myocardial infarction 1.4%⁽¹⁴⁾. It is worth mentioning that there are some data that suggest that post-operative coronary angiography is associated with prolonged in-hospital stay and increased mortality and cost effectiveness⁽¹⁰⁾.

Other study found the incidence of post CABG angiography ranges from 0.4-30%. They obtained normal findings of coronary angio in 42-67% of cases sent post operatively with graft related causes in 33-58% of cases (15%). In other study they showed a rate of repeat angiography of 2.2% only with graft related causes in 73% (16%).

Benefits of PCI demonstrated in this study regarding in-hospital stay and mortality was previously demonstrated in other studies with subsequent increase in doing post-CABG PCI in infarcted patients⁽¹¹⁾.

In our study, 2 patients diagnosed as having acute myocardial infarction were found to have normal coronary angiography, which demonstrate the importance of coronary angiography for proper diagnosis of post-operative infarction⁽¹¹⁾.

Although very few number of patients had redo CABG patients (12.7%), results are associated with increased mortality, which has been noted in other studies⁽¹²⁾.

Study limitations:

The main limitation of this study is the relatively small number of patients included in the study, neither of the three groups (PCI group, Redo group or conservative group) can be compared to one another, that is why although we showed improved outcome with PCI, still we cannot judge that PCI is better than Redo CABG.

Conclusion:

Post-operative PCI for patients with early MI following CABG surgery can be performed safely with good results associated with decreased mortality and in-hospital stay, nevertheless redo CABG in these patients is associated with increased mortality and can be only attempted when PCI fails or cannot be done.

REFERENCES:

1. López Mora GE, Fiscal López O. Infartomiocárdicoperioperatorio. Arch Cardiol Méx. 2009;79(3):173–174
2. Davierwala PM , Verevkin A , Leontyev S , et al impact of expeditious management of perioperative myocardial ischemia in patients undergoing isolated coronary artery bypass surgery. Circulation 2013;128

3. Windecker S , Kolh P , Alfonso F , et al., 2014 ESC/EACTS Guidelines on myocardial revascularization: The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) Developed with the special contribution of the European Association of Percutaneous Cardiovascular Interventions (EAPCI). *Eur Heart J* 2014; 35: 2541–619
4. Kristian Thygesen thygesen@oncable.dk, Kristian Thygesen dkkristhyg@rm.dk, Joseph S. Alpert jalpert@email.arizona.edu, Allan S. Jaffe, Bernard R. Chaitman, Jeroen J. Bax, David A. Morrow and Harvey D. White harveyw@adhb.govt.nz The Executive Group on behalf of the Joint European Society of Cardiology (ESC)/American College of Cardiology (ACC)/American Heart Association (AHA)/World Heart Federation (WHF) Task Force for the Universal Definition of Myocardial Infarction *J Am Coll Cardiol*. 2018 Oct, 72 (18) 2231–2264.
5. Alter P , Vogt S , Herzum M , et al Indications for angiography subsequent to coronary artery bypass grafting. *Am Heart J* 2005;149:1082–90. doi: 10.1016/j.ahj. 2004.08.016
6. Farooq V, Serruys PW, Vranckx P, Bourantas CV, Girasis C, Holmes DR, et al. Incidence, correlates, and significance of abnormal cardiac enzyme rises in patients treated with surgical or percutaneous based revascularisation: a substudy from the synergy between percutaneous coronary interventions with Taxus and cardiac surgery (SYNTAX) trial. *Int J Cardiol*. 2013; 68(6):5287–92.
7. Bassiri H ,Nematollahi A , Noohi F , et al., Coronary graft patency after perioperative myocardial infarction: a study with multislice computed tomography. *Interact Cardiovasc Thorac Surg* 2011; 12:596–9. doi: 10.1510/icvts. 2010.261834
8. Thielmann M, Sharma V, Al-Attar N, et al. ESC Joint Working groups on cardiovascular surgery and the cellular biology of the heart position paper: Perioperative myocardial injury and infarction in patients undergoing coronary artery bypass graft surgery. *Eur Heart J*. 2017; 38(31):2392–2407.
9. Preußner MJ, Landwehr J, Mastrobuoni S , et al Survival results of postoperative coronary angiogram for treatment of perioperative myocardial ischaemia following coronary artery bypass grafting: a single-centre experience. *Interact Cardiovasc Thorac Surg* 2018;26:237–42. doi:10.1093/icvts/ivx317.
10. Incidence, Predictors, and Outcomes of In-Hospital Percutaneous Coronary Intervention Following Coronary Artery Bypass Grafting. *J Am Coll Cardiol* 2019;73:415-423.
11. Sef D, Szavits-Nossan J, Predrijevac M, et al., Management of perioperative myocardial ischaemia after isolated coronary artery bypass graft surgery
12. Thielmann M, Massoudy P, Jaeger BR, Neuhauser M, Marggraf G, Sack S, et al. Emergency re-revascularization with percutaneous coronary intervention, reoperation, or conservative treatment in patients with acute perioperative graft failure following coronary artery bypass surgery. *Eur J Cardiothorac Surg*. 2006;30(1):117–25.
13. Mohamad Alkhouli, MD, Khaled M. Ziada, Vinay Badhwar et al: When PCI Becomes the Backup for Coronary Bypass Surgery : *J Am Coll Cardiol*. 2019;73:415-423, 424-426.
14. Megaly M, Abraham B, Pershad A, et al. Outcomes of chronic total occlusion percutaneous coronary intervention in patients with prior bypass surgery. *J Am Coll Cardiol Interv*. 2020;Epub ahead of print.
15. Fleissner F, Issam I, Martens A, Cebotari S, Haverich A, Shrestha ML. The unplanned postoperative coronary angiogram after CABG: identifying the patients at risk. *Thorac Cardiovasc Surg*. 2017;65(4):292–5.
16. Leopold Rupperecht, Kurt Debl, Andreas Keyser et al: Impact of coronary angiography early after CABG for

suspected postoperative myocardial
ischemia: Journal of Cardiothoracic

Surgery volume 14, Article number: 54
(2019).

توسيع الشرايين مع تركيب الدعامات في حالات الجلطات القلبية الحادة ما بعد عمليات ترقيع الشرايين التاجية للقلب.

محمد مكرم وعلي عماد الدين حسين

معهد القلب القومي

مقدمه: حالات الجلطات القلبية الحادة ما بعد عمليات ترقيع الشرايين التاجية للقلب لها نسبة خطورة مرتفعة و تحتاج للتشخيص و التدخل السريع.

الهدف من البحث: دراسه نتائج تركيب دعامات للقلب في حالات الجلطات القلبية الحادة ما بعد عمليات ترقيع الشرايين التاجية للقلب.

المرضي و الطرق: اجريت هذه الدراسه علي سبعة و اربعون مريضا ممن اجريت لهم جراحة ترقيع الشرايين التاجية للقلب في معهد القلب القومي.

النتائج: اظهرت هذه الدراسه ان تركيب دعامات للقلب في حالات الجلطات القلبية الحادة ما بعد عمليات ترقيع الشرايين التاجية للقلب لهل نتلجج جيده.

التوصيات: تركيب دعامات للقلب في حالات الجلطات القلبية الحادة ما بعد عمليات ترقيع الشرايين التاجية للقلب هو علاج فعال في هذه الحالات.