ORIGINAL ARTICLE

Prior PCI is no more a bad Prognostic Factor for subsequent Coronary Artery Bypass Surgery

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ABSTRACT

Background: Significant population of coronary artery disease is being referred for coronary artery bypass surgery (CABG) who had prior history of percutaneous coronary intervention (PCI). Presence of prior coronary stent either blocked or patent is considered as a bad prognostic factor for CABG outcome.
Aim: To see prognostic impact of prior PCI on surgical outcome of CABG.
Methods: Retrospective analysis of electronic cardiac surgery database was performed for patient who underwent isolated CABG with history of prior PCI. Primary end point of study is operative mortality for CABG and MACCE while secondary end-points include duration of ventilation (hrs), ICU stay (hrs), hospital stay (days).
Results: Postoperative renal dysfunction, need for IABP insertion, Mediastinal re-exploration and sternal dehiscence. Results: Data analysis of 75 patients revealed that operative mortality was zero however the incidence of MACCE was 4%. Among the patients who experience MACCE, all experience non-fatal peri-operative myocardial infarction while there was no incidence of cerebral stroke. Conclusion:
Conclusion: Prior PCI do not impact the incidence of operative mortality and MACCE.
Keywords: CABG, Percutaneous coronary intervention (PCI), Operative mortality,

INTRODUCTION

In recent two decades, percutaneous coronary intervention (PCI) has made enormous expansion for newer venues of coronary artery segments and disease complexities.[1] Growing volume of data has shown promising results of PCI in left main stem coronary artery disease and challenging chronic total occlusion lesions (CTO).[2] Technology boom and wide spread availability of PCI expertise have won good number of patients who once were considered as having prohibitive risk for PCI. However, the other side of picture is that it is also generating relatively much more complex population of coronary artery disease who need CABG surgery as a consequence of in-stent restonsis (ISR) or progression of native CAD mandating surgical revascularization with patent in-situ stent. [3] This group of CABG population is considered at higher risk for procedural complication i.e. higher incidence of operative morbidity and mortality.4,5,6,7 Various scientific causes have been explained for suboptimal outcomes in CABG with history of prior PCI. These include more advanced CAD, compromised left ventricular function, loss of collateral circulation due to occlusion of side branches, distal micro-embolization due to stents, coronary artery endothelial dysfunction downstream to previously placed stent, local and systemic inflammatory reactions of stent, unstable clinical state, multiple PCIs, long stents (Full metal jackets) etc[7,8,9,10].

The objective of our publication is to determine the impact of previous coronary stenting on early outcome of subsequent CABG

Received on 26-12-2019
Accepted on 24-04-2020

MATERIAL AND METHODS

Ethical approval of research project was taken from Institutional review board / ethical committee of Rawalpindi Institute of Cardiology (RIC). The patient population who was referred for CABG and has history prior history of PCI are included in the study from January 2014 to December 2019. Clinical variable and operative information were retrieved from electronic cardiac surgery database of RIC (Cascade Lahore 2009). Collected information from data-based yielded a total of 75 number of patients (n=75) who had history of prior PCI and underwent for CABG. It included all the male and female patient of age ranging from 40-75 years of age who underwent conventional CABG. Patient who had ejection fraction (EF) of 35% or less, underwent combine surgical procedure or emergency surgical revascularization of myocardium were excluded from the study. Operative mortality was defined as death after the CABG due to any cause within 30 days of surgery. Major adverse cardiac & cerebral event (MACCE) includes in-hospital death due to all causes, acute myocardial infarction (AMI) or ischemic stroke. AMI for the study is defined as onset of new-Q wave in ECG, ST-elevation or CK-MB level more than 5-times of preoperative values. Ischemic stroke was defined as focal neurological deficit explained as ischemic event by CT-Scan of brain.

Demographic variables like age, gender, diabetes mellitus, hypertension, family history of CAD, smoking history were retrieved. Information related to PCI were recorded as number of stents in prior PCI, vessels involved in prior PCI, time since prior PCI, surgical indication of myocardial revascularization as one of the following or their combination include in-stent restenosis (ISR), De-novo native CAD distal to PCI/other vessels or combination of

both etc. However type of stent uses in prior PCI was not recorded as complete information was lacking in significant number of patients. All patient underwent conventional CABG i.e. Use of standard cardiopulmonary bypass (CPB) on systemic hypothermia (32C) with antegrade cold blood cardioplegic arrest with aortic cross clamp. Operative details like CPB time (min) and aortic cross clamp time (min), number of total coronary artery bypass graft performed, stentectomy performed, number of LIMA and SVG used were recorded in operative details of CABG. Incidence of intra-aortic balloon pump (IABP) used, duration of post-operative mechanical ventilation, ICU stay (Hrs), Hospital stay (days), operative mortality and pre-defined component of MACCE recorded for all patients who meet inclusion and exclusion criteria. Statistical analysis is performed with SPPSS version 2018 and Microsoft Excel 2016. Mean and stand deviation of mean was measure for numeric variable and frequency for categorical variable.

RESULTS

Information regarding demographic variable like age, gender, diabetes mellitus, hypertension, family history of CAD, smoking habit and average time between prior PCI and CABG (Days) etc. are summarized in table no. 1. The main indication for surgery were based on AHA/ACC guidelines for CABG with prior PCI with following CAD related characteristics (1) Combination of ISR + progression of native CAD in 50 patients (66.7%), (2) ISR only in 15 patients (20%), (3) Progression of native coronary artery disease in 10 patients (13.3%) as included in table no.1.Total no of vessels with prior stents were 125 in number. Single vessel stent was present in 30 patients (40 %), two vessels stents in 40 patients (53.3 %) and three vessel stents in 5 patients (6.7 %). Mean number of implanted stents per patient was 1.67 per patient. The data regarding the type of stent (DES, Bare metal or both) could not be entered as the exact information was not available in most of the cases.

Table 1: Demographic variable and information of prior PCI in patients who underwent CABG

Variable	Population Characteristic (Mean & St. Deviation of mean or frequency)
Age (years)	52.16 + 7.13
Gender Male (%) Female (%)	 73.3% (n=55) 26.7% (n=20)
Diabetes Mellitus (%)	46.7% (n=35)
Hypertension (%)	56% (n=42)
Family history of CAD (%)	41.33% (n=31)
Smoking (%)	65.33 (n=49)
Duration between PCI and CABG	671.41 + 517.35
Number of total prior PCI	125
Number of PCI stent per vessel Single vessel 2 vessel 3 vessel	 40% (n=30) 53.3% (n=40) 6.7% (n=5)
Indication for CABG ISR Denovo Native CAD with patent in-situ stent ISR + Native CAD	 20% (n=15) 13.3% (n=10) 66.7% (n=50)

Analysis of operative information showed that aortic cross clamp time was 90 ± 20 minutes and CPB time was 110 ± 30 minutes. IABP was inserted in 7 patients (9.3%) . Total 220 coronary artery bypass grafts were performed. Average no of grafts were 2.93 per patient. In few patients, stentectomy was inevitable. LAD stentectomy was performed in 5 patients (6.67%) while PDA/RCA stentectomy was performed in 2 patients (2.6%) as shown in table 2.

LIMA was used in 72 patients. Secondary end-points of study i.e. ventilation time (hrs), ICU stay (hrs), Hospital stay (days), incidence of renal dysfunction, incidence sternal dehisence, chest reopening etc are shown in table 3. We experience zero hospital mortality. Three patients (4%) had MACCE in the form of perioperative myocardial infarction (AMI) which was managed conservatively. All these patients recovered smoothly and were discharges home in satisfactory condition with overall zero operative mortality as summarized in table no.3.

Table 2: Operative variable of population undergoing CABG with history of prior PCI

Variable	Population Characteristic (Mean & St.Deviation of mean or frequency)
Aortic cross clamp time (min)	90 + 20
Total CPB time (min)	110 = 20
total number of coronary grafts	220 (2.93 graft per patient)
Conduit used LIMA SVG	 96% (n=72) 100% (n=75)
Stentectomy performed	9.3% (n=7)
IABP inserted	9.3% (n=7)

Table 3: Postoperative outcome after CABG with prior PCI

Variable	Population Characteristic (Mean & St.Deviation of mean or frequency)
Operative mortality (%)	0%
MACCE In-hospital mortality (%) AMI (%) Ischemic cerebral stroke (%)	 0% 4% (n=3) 0%
Ventilation time (hrs)	10.09 + 13.29
ICU stay (hrs)	44.23 + 11.01
Hospital stay (Days)	8.53 + 2.52
Post-operative renal dysfunction Transient Renal dysfunction Hemodysis dependent Renal dysfunction	 17.33% (n=13) 0%
Mediastinal exploration for bleeding	4% (n=3)
Sternal dehiscence	2.6% (n=2)

DISCUSSION

Coronary stents technology made steady progress from bare metal stents to sophisticated drug eluting & bio-absorbale stents over last two decades.[11] Despite of advancement in technology and stent deployment technique, intense and long duration of anti-platelet therapy is a mandatory aspects of post-PCI care. Over the period of time, a population of CAD has been emerged who own complication related to PCI-stents (ISR) along with de-novo CAD in PCI & non-PCI vessels. Recent randomized trials indicate that 10% to 30% of the patient treated with PCI require repeat coronary revascularization[12,13]. A number of studies had shown that CABG after previous PCI with stent insertion is relatively high risk procedure with higher early post-operative mortality and MACCE.[14,15] Possible scientific explanation is that conventional CABG as procedure itself is

characterized by halting preoperative anti-platelet medication and use of heparinization for CPB and its reversal with protamine sulphate predispose to fluctuating coagulation profile during the course of surgery. Thus risk of thrombosis in patent stent or downstream to stent with ISR is always present. This predispose to grafted vessel occlusion, patent stent occlusion in non-grafted vessel or graft failure and hence myocardial perfusion jeopardy.

But in our study population, we have observed that the operative mortality and incidence of MACCE is remarkably low. There is a large volume of data that supports our results. Publications from Boening A. et al, van den Brule et al , Luthra s et al and Fuki et al etc demonstrated that there were no differences in mortality or morbidity between patients undergoing CABG with and without previous PCI[16,17,18,19]. There were no significant differences to the rate of MI, arrhythmia, re-interventions, neurologic complications, renal complications, pulmonary complications or in hospital mortality for patients undergoing CABG with and without previous PCI[16,17,18].

Above mentioned strong evidences in favor of or against for prognostic value of prior PCI in CABG created a dilemma to obtain an objective answer to the matter. From these diverse opinions regarding prognostic value of prior PCI in CABG surgery, we believe that higher mortality and morbidity in patients undergoing CABG with previous PCI reported in different series may be due to difference in baseline characteristics and clinical status before CABG or due to incomplete/less than optimal revascularization. Moreover most of these studies are retrospective like our. The quality, nature of the data and method of data analysis might have varied significantly. However this needs further evaluation by studies of better quality evaluating the impact of indication, timing, type of stents, number of treated vessels and number of previous PCIs and a longer follow-up is required to assess the impact of prior PCI on late outcome after CABG.

One thing worthy to mention about our CABG outcome experience with prior PCI is that we devised and implemented protocols for heparinization & its reversal and early introduction of anti-platelet therapy postoperatively. We used half dose of protamine sulphate to reverse the heparinization on conclusion of CPB and introduce early oral double anti-platelet therapy i.e. Asprin 75mg after 6 hours of surgery or on stabilization of chest drain output followed by clopidogrel 75mg on morning of first postoperative day[20]. We also have low threshold to insert IABP if indicated. In nutshell, we have found prior PCI in CABG patients is not a much significant factor that can impact the early operative outcomes.

CONCLUSION

At first hand experience with our CABG population with prior PCI, we concluded that prior PCI do not impact operative mortality and MACCE

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