



## Original Article

## Comparison of Coronary Artery Bypass Grafting Outcomes in patients with and without Prior Percutaneous Coronary Artery intervention

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## ABSTRACT

Percutaneous coronary intervention (PCI) is a crucial treatment for patients with coronary artery disease (CAD), especially high-risk patients like advanced age, diabetes, chronic kidney disease, left main lesions, and multi vessel CAD. **Objective:** To compare coronary artery bypass grafting outcomes in patients with and without prior percutaneous coronary artery intervention. **Methods:** This retrospective 5-year cross-sectional study was conducted on 2579 patients operated for CABG in between August 1<sup>st</sup>, 2017, and December 31<sup>st</sup> 2021 in a tertiary care hospital. All patients who underwent CABG were included in study, and comparison was done in patients with or without PCI. Data analysis were done by using SPSS version 23. p<0.05 was set statistically significant. **Results:** The results of perfusion and cross clamp time in operative room, use of IABP and reopening rates in both groups showed no statistically significant difference. The incidence of post-operative atrial fibrillation in group A is 4% Vs 1.5% in group B with significant p value of 0.028. Prolong ventilation, perioperative stroke and reintubation rates comparison in both groups were with non-significant p values. In hospital mortality was 4.5% in group A and 3.7% in group B with p-value of 0.370 which is non-significant. **Conclusions:** Patients with prior percutaneous coronary intervention can undergo CABG surgery with similar mortality rates as those with no prior PCI. The only significant difference in morbidity is post-operative risk of atrial fibrillation which is more in prior PCI patients' group.

## INTRODUCTION

Percutaneous coronary intervention (PCI) is a crucial treatment for patients with coronary artery disease (CAD), especially high-risk patients like advanced age, diabetes, chronic kidney disease, left main lesions, and multi vessel CAD [1]. The outcomes and risk/benefit ratio of the two generally accepted CAD treatment techniques, namely percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) surgery, have been studied in a number of randomised trials (RCTs) and a multitude of retrospective research [2]. Acute PCI has largely replaced

surgical-based revascularization of ACS as the main revascularization strategy, but coronary artery bypass grafting (CABG) still has a significant place in routine care for some indications [3]. Observational studies have shown that CABG has a better prognosis than PCI for patients with severe LV dysfunction, defined as an ejection fraction (EF) of 35% or less. The effectiveness of PCI versus CABG in patients with moderate LV dysfunction, that is, with an EF between 36% and 40%, has not been compared in any studies, though [4]. The development of

percutaneous coronary intervention (PCI) has increased CHD patient survival while simultaneously lowering the demand for CABG. PCI entails percutaneous access to the femoral, radial, or brachial arteries while under local anesthesia in order to perform wire-guided balloon inflation angioplasty, following stent deployment to preserve vascular patency, this compresses the plaque and opens the vessel [5]. However Interventional cardiologists have traditionally viewed in-stent restenosis (ISR) as their "enemy" which may lead to another intervention, either a second PCI or a coronary artery bypass [6]. Therefore, there is a corresponding rise in the number of patients getting coronary artery bypass grafting (CABG) who have previously undergone PCI operations [7]. The percentage of patients reportedly presenting for CABG who have previously undergone PCI is 13-40% [8]. In addition to preventing recurring angina and repeat interventions, CABG is a more successful treatment than PCI in terms of survival and preventing serious adverse cardiac events (MACEs) but the belief that patients can be safely directed to surgery if PCI fails is one of the factors contributing to the rapid growth in the use of PCI [9, 10]. As a result, there are now between 13 and 40% more patients presenting for CABG who had previously undergone PCI [11]. A study done in Pakistan showed that 1 in 4 people aged  $\geq 40$  years might develop ischemic heart disease. The risk factors involved are increasing age, smoking history and metabolic syndrome and female gender. The presence of comorbid like diabetes, hypertension and dyslipidemia further increases the risks associated with coronary artery disease [12]. Since the burden of CAD is high in our population and with the availability of tertiary care services in remote areas, incidence of PCI and CABG is increasing day by day. The objective of our study was to compare coronary artery bypass grafting outcomes in patients with and without prior percutaneous coronary artery intervention.

## METHODS

This was a descriptive study at a Tertiary Care Hospital starting from 1<sup>st</sup> August 2017 till 31<sup>st</sup> Dec 2021. The data were collected from database of cardiac surgery department. Inclusion criteria was all coronary artery bypass grafting patients which were performed at our institute between 1<sup>st</sup> august 2017 to 31<sup>st</sup> December 2021. Exclusion criteria was those patients with concomitant procedures like ASD/VSD closure or aortic/mitral valve repair/replacement along with CABG and they were excluded from the study. The total patients were 2579 amongst them 176 patients previously got PCI while 2403 had native CABG. The above group of patients were classified into 2 and results compared on the basis of their intraoperative and postoperative variables

collected from database record. The primary outcome was in-hospital mortality defined as any mortality occurring in the index hospital admission during the postoperative hospital stay before the discharge of patient. All the patients were prepared for surgery in routine manner with all necessary preoperative laboratory and radiological investigations done. The patients underwent usual on pump CABG with routine anesthetic approach. Left internal thoracic artery was used as arterial conduit and saphenous vein graft as venous conduit. We utilized the SPSS version-23 for data entry and analysis. For Statistical calculation, the chi-square test was applied. p-value lower than 0.05 was set statistically significant.

## RESULTS

A total of 2579 patients were included in the study: group A includes 176 patients who had prior PCI before CABG, group B includes 2403 patients who had no PCI before CABG. The intraoperative parameters measured in our study were perfusion time and cross clamp time in both group of patients. The perfusion time on cardiopulmonary bypass machine during CABG surgery in prior PCI patients was 101.9 minutes and 99.25 minutes in no previous PCI group. The cross-clamp time was 57.08 minutes and 55.54 minutes respectively in both groups. Table 1 shows that the perfusion and cross clamp time were bit higher in group A patients as compared to group B. The postoperative parameters included in our study were use of intra-aortic balloon pump, reopening for bleeding or tamponade, in hospital complications which includes pleural effusions, wound infections, prolong stay etc), post operative atrial fibrillation, prolong mechanical ventilation that is defined as ventilator support more than 24 hours in ICU post CABG surgery, reintubation, post operative stroke incidence, and in hospital mortality.

**Table 1:** Intra-Operative Parameters

Variables	Group A (patients with previous PCI before CABG) N= 176	Group B (no PCI before CABG) N= 2403
Perfusion time (in mins)	101.90+/- 29.042	99.25+/- 29.669
Cross clamp time (in mins)	57.08+/- 20.735	55.54+/- 19.490

Table 2 compares these post operative parameters in both the group of patients. The use of IABP is 9% in group A and 8.4% in group B with p value 0.367 which is nonsignificant. Reopening rate is 8.5% in group A as compared to 7.5% in group B with p value 0.374. The incidence of in hospital morbidities in group A is 25% and 18.3% in group B. the incidence of post-operative atrial fibrillation in group A is 4% Vs 1.5% in group B with significant p value of 0.028. prolong ventilation and reintubation rate in group A was 1.7% and 0.6% as compared to 1.5% and 1.9% in group B with non-significant

p values. The incidence of post operative stroke in group A was 2.8% whereas 1% stroke rate in group B. In hospital mortality was 4.5% in group A and 3.7% in group B with p value of 0.370 which is non-significant. The results showed that the patients who previously had PCI were at a higher risk of getting post operative atrial fibrillation. Previous PCI in CABG patients has no effect on mortality and other intraoperative and post operative complications as p-value was insignificant for the calculated variables.

**Table 2:** Post-Operative Parameters

Variables	Group A (patients with previous PCI before CABG) N= 176	Group B (no PCI before CABG) N= 2403	p-value
IABP	16(9.0%)	203(8.4%)	0.367
Re Opened for Bleeding/ Tamponade	15(8.5%)	182(7.5%)	0.374
In Hospital Complications	44 (25%)	440(18.3%)	0.246
Post Operative Atrial Fibrillation	7(4.0%)	37(1.5%)	0.028
Prolong Ventilation (More Than 24 Hours)	3 (1.7%)	38(1.5%)	0.506
Re Intubated	1(0.6%)	47(1.9%)	0.147
Post Operative Stroke	5 (2.8%)	26(1.0%)	0.156
In Hospital Mortality	8 (4.5%)	90(3.7%)	0.370

## DISCUSSION

Patients frequently receive PCI as first line therapy due to referral patterns and the less invasive nature of this treatment, despite several randomized trials and large studies 3-6 clearly establishing CABG as the preferred modality over PCI for coronary revascularization in multi vessel disease [13]. Prior multiple PCI in CABG patients results in poor outcomes. The reasons behind this are inflammatory responses, post stenting endothelial dysfunction, per procedural myocardial damage, and late post stenting structural alterations are all brought on by PCI procedures. The coronary artery portion distal to the stented area, which would be the target area of a subsequent bypass graft anastomosis, may also be affected by the late structural alterations [14]. Additionally, coronary side-branch obstruction or occlusion brought on by numerous consecutive and overlapping stents (referred to as "stent jail") may disrupt collateral blood flow, impacting coronary runoff and the patency rate of the bypass grafts [15]. Moreover, the interval between a prior PCI and a CABG may also have an impact on the patients' clinical outcomes [16]. Multiple PCI procedures have become more common. As a result, there is a considerable increase in patients presenting for CABG who had already undergone PCI. According to the current meta-analysis, patients who have undergone PCI in the past and need another CABG for revascularization have a somewhat higher mortality rate soon after the procedure. A study was

done by Biancari et al., and Kahlon which reported that having previously undergone PCI did not impart any significant risk for postoperative morbidity or an increased risk of mortality following CABG which is analogous to our study [17, 18]. Another study done by Hassan et al., showed that prior PCI was independently associated determinant of postoperative in hospital mortality using multifactorial methods (odds ratio 1.93, p =.003). In hospital mortality was greater for patients with prior PCI (3.6% vs 1.7%, p =.01) when individuals with previous PCI were compared to patients without prior PCI using predicted values [19]. In our study the percentage of patients who underwent percutaneous intervention before was 6.8% as compared to 93.7% patients who had native CABG surgeries. According to the analysis done by National Heart Institute Egypt, the length of ICU stay was statistically significantly longer for the PCI group A vs non-PCI group B (50.45 hours in group A vs. 79.56 hours in group B), while the hospital stay was not different [20, 21]. In our study we looked at the prolong ventilation of patients which determines the length of stay in ICU, it was slightly greater in those patients who previously had PCI than those who didn't have any percutaneous intervention before, the percentages being 1.5% vs 1.7% with non-significant p value. Atrial fibrillation is defined as a type of supraventricular arrhythmias in which there is uncontrolled atrial activation along with disturbance in mechanical function. The overall incidence of AF in post CABG surgery is estimated to be 5 to 40%. Patients developing atrial fibrillation are at increased risk of developing heart failure, embolic phenomenon and prolonged ICU stay. Our study showed that patients with prior PCI are at increased risk of developing atrial fibrillation. The rate of AF incidence which was higher in PCI group A as compared to no PCI group B, 4% vs 1.5% with p-value of 0.028. The study results of our data showed that previous PCI in CABG patients has no significant difference in outcomes as p-value was non-significant. There is no statistically significant difference in mortality and morbidity of both groups except for atrial fibrillation.

## CONCLUSIONS

Patients with prior percutaneous coronary intervention can undergo CABG surgery with similar mortality rates as those with no prior PCI. The only significant difference in morbidity is post-operative risk of atrial fibrillation which is more in prior PCI patients undergoing CABG.

## Authors Contribution

Conceptualization: MSK

Methodology: RS, ADK, MUI, NAS

Formal analysis: AJ, BK

Writing-review and editing: HA, AJ, IA, ZA

All authors have read and agreed to the published version of

the manuscript.

### Conflicts of Interest

The authors declare no conflict of interest.

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### REFERENCES

- [1] Zhang H, Zhao Z, Yao J, Zhao J, Hou T, Wang M, et al. Prior percutaneous coronary intervention and outcomes in patients after coronary artery bypass grafting: a meta-analysis of 308,284 patients. *Therapeutic Advances in Chronic Disease*. 2022 May; 13:20406223221078755. doi: 10.1177/20406223221078755.
- [2] Spadaccio C and Benedetto U. Coronary artery bypass grafting (CABG) vs. percutaneous coronary intervention (PCI) in the treatment of multivessel coronary disease: quo vadis? –a review of the evidences on coronary artery disease. *Annals of Cardiothoracic Surgery*. 2018 Jul; 7(4): 506. doi: 10.21037/acs.2018.05.17.
- [3] Thielmann M, Wendt D, Slottosch I, Welp H, Schiller W, Tsagakis K, et al. Coronary Artery Bypass Graft Surgery in Patients with Acute Coronary Syndromes After Primary Percutaneous Coronary Intervention: A Current Report from the North-Rhine Westphalia Surgical Myocardial Infarction Registry. *Journal of the American Heart Association*. 2021 Sep; 10(18): e021182. doi: 10.1161/JAHA.121.021182.
- [4] Augoustides JG. Advances in the management of carotid artery disease: focus on recent evidence and guidelines. *Journal of Cardiothoracic and Vascular Anesthesia*. 2012 Feb; 26(1): 166-71. doi: 10.1053/j.jvca.2011.10.004.
- [5] Rai P, Taylor R, Bittar MN. Long-term survival in patients who had CABG with or without prior coronary artery stenting. *Open Heart*. 2020 Nov; 7(2): e001160. doi: 10.1136/openhrt-2019-001160.
- [6] Buccheri D, Piraino D, Andolina G, Cortese B. Understanding and managing in-stent restenosis: a review of clinical data, from pathogenesis to treatment. *Journal of Thoracic Disease*. 2016 Oct; 8(10): E1150. doi: 10.21037/jtd.2016.10.93.
- [7] Fukui T, Tanaka S, Takanashi S. Previous coronary stents do not increase early and long-term adverse outcomes in patients undergoing off-pump coronary artery bypass grafting: a propensity-matched comparison. *The Journal of Thoracic and Cardiovascular Surgery*. 2014 Nov; 148(5): 1843-9. doi: 10.1016/j.jtcvs.2014.02.004.
- [8] Argueta-Morales IR, Meador LC, Nykanen DG, DeCampli WM. Infantile form of scimitar syndrome with contralateral pulmonary vein stenosis. *Pediatric Cardiology*. 2010 May; 31: 550-2. doi: 10.1007/s00246-009-9630-z.
- [9] Massoudy P, Thielmann M, Lehmann NMA, Kleikamp G, Maleszka A, Zittermann A, et al. Impact of prior percutaneous coronary intervention on the outcome of coronary artery bypass surgery: a multicenter analysis. *The Journal of Thoracic and Cardiovascular Surgery*. 2010 Sep; 137(4): 840-5. doi: 10.1016/j.jtcvs.2008.09.005
- [10] Yap CH, Yan BP, Akowuah E, Dinh DT, Smith JA, Shardey GC, et al. Does prior percutaneous coronary intervention adversely affect early and mid-term survival after coronary artery surgery?. *JACC: Cardiovascular Interventions*. 2009 Aug; 2(8): 758-64. doi: 10.1016/j.jcin.2009.04.018.
- [11] Miguel GS, Sousa AG, Silva GS, Colósimo FC, Stolf NA. Does prior percutaneous coronary intervention influence the outcomes of coronary artery bypass surgery?. *Brazilian Journal of Cardiovascular Surgery*. 2020 Mar; 35: 7-8. doi: 10.21470/1678-9741-2019-0234.
- [12] Jafar TH, Qadri Z, Chaturvedi N. Coronary artery disease epidemic in Pakistan: more electrocardiographic evidence of ischaemia in women than in men. *Heart*. 2008 Apr; 94(4): 408-13. doi: 10.1136/hrt.2007.120774.
- [13] Mehta GS, LaPar DJ, Bhamidipati CM, Kern JA, Kron IL, Upchurch Jr GR, Ailawadi G. Previous percutaneous coronary intervention increases morbidity after coronary artery bypass grafting. *Surgery*. 2012 Jul; 152(1): 5-11. doi: 10.1016/j.surg.2012.02.013.
- [14] Massoudy P, Thielmann M, Lehmann N, Marr A, Kleikamp G, Maleszka A, et al. Impact of prior percutaneous coronary intervention on the outcome of coronary artery bypass surgery: a multicenter analysis. *The Journal of Thoracic and Cardiovascular Surgery*. 2009 Apr; 137(4): 840-5. doi: 10.1016/j.jtcvs.2008.09.005.
- [15] Thielmann M, Leyh R, Massoudy P, Neuhäuser M, Aleksic I, Kamler M, et al. Prognostic significance of multiple previous percutaneous coronary interventions in patients undergoing elective coronary artery bypass surgery. *Circulation*. 2006 Jul; 114(1\_supplement): 1-441. doi: 10.1161/CIRCULATIONAHA.105.001024.
- [16] Ueki C, Sakaguchi G, Akimoto T, Shintani T, Ohashi Y, Sato H. Influence of previous percutaneous coronary intervention on clinical outcome of coronary artery bypass grafting: a meta-analysis of comparative

- studies. *Interactive CardioVascular and Thoracic Surgery*. 2015 Apr; 20(4): 531-7. doi: 10.1093/icvts/ivu449.
- [17] Biancari F, Mariscalco G, Rubino AS, Vinco G, Onorati F, Faggian G, et al. The effect of prior percutaneous coronary intervention on the immediate and late outcome after coronary artery bypass grafting: systematic review and meta-analysis. *Heart, Lung and Vessels*. 2014; 6(4): 244.
- [18] Kahlon RS and Armstrong EJ. Coronary artery bypass grafting among patients with prior percutaneous coronary interventions. *Journal of the American Heart Association*. 2018 Oct; 7(20): e010609. doi: 10.1161/JAHA.118.010609.
- [19] Hassan A, Buth KJ, Baskett RJ, Ali IS, Maitland A, Sullivan JA, et al. The association between prior percutaneous coronary intervention and short-term outcomes after coronary artery bypass grafting. *American Heart Journal*. 2005 Nov; 150(5): 1026-31. doi: 10.1016/j.ahj.2005.03.035.
- [20] Bakr HG, Helmi IM, Kamel WA. Does the previous stenting affect the outcome of coronary artery bypass grafting in patients with multivessel disease. *Journal of Medicine in Scientific Research*. 2022 Jan; 5(1): 7. doi: 10.4103/jmisr.jmisr\_28\_21.
- [21] Omran AM. Effect of the type of stent on results of coronary artery bypass grafting in multivessel disease patients. *Journal of the Egyptian Society of Cardio-Thoracic Surgery*. 2016 Dec; 24(4): 286-92. doi: 10.1016/j.jescts.2016.12.005.