

Correlation of Prolonged Cardiopulmonary Bypass time with Postoperative Complications - A prospective review

AHSAN ARIF¹, ATTAULLAH KHAN NIAZI², MUHAMMAD MUNEEB³, KANZA SANA UMER⁴, AKHTAR ALI⁵, AHMED SHAHBAZ⁶

¹Senior Registrar Cardiac Surgery

^{2,3}Assistant Professor of Cardiovascular Surgery, Shalamar Medical & Dental College, Lahore.

⁴Clinical Psychologist, Kingdom of Saudi Arabia

⁵Assistant Professor Pulmonology, SMDC

⁶Professor of Cardiac Surgery, Punjab Institute of Cardiology, Lahore

Correspondence to Dr. Ahsan Arif, Email: ahsanarifisrar@gmail.com, Phone # 03326509882

ABSTRACT

Aim: To compare post-operative in-hospital outcome of on pump CABG in patients with shorter CPB duration vs. patients with longer CPB duration.

Methodology: In this cross sectional study conducted at Department of Cardiac Surgery, PIC, Jail Road, Lahore 182 subjects were selected using non probability Judgmental/ Purposive sampling Technique and randomly divided into two equal groups of 91 each. **Group A:** patients undergoing surgery for short duration of CPB < 90 minutes and half treated with **Group B:** patients undergoing surgery for long duration of CPB ≥ 90 minutes. Data was entered and analyzed using SPSS 25.

Results: There were 133(73.08%) males and 49(26.92%) females in this study. The mean age of cases was 50.68±9.26 years with minimum and maximum age being 35 and 70 years. Mean Baseline Creatinine recorded for Group A was 0.92±0.19 and for Group B was 0.91±0.21. Mean urine output level recorded for Group A after 6 hours of CABG was 1.05±0.25 and for Group B after 6 hours of CABG was 0.85±0.24. There was a significant association in the occurrence of acute renal injury in both groups whereas there was no significant association in the mortality of both groups.

Conclusion: There was a significant difference between post-operative in-hospital renal outcomes of on pump CABG in patients with shorter CPB duration vs. patients with longer CPB duration. The results of both groups are nearly same as far as in-hospital mortality is concerned.

Keywords: Cardiopulmonary Bypass, On Pump CABG, Off Pump CABG

INTRODUCTION

Cardiopulmonary bypass (CPB) is also known as on pump cardio artery bypass grafting. It helps the surgeon to treat the patient while the blood is artificially pumped. CPB time >90 minutes is somewhat related to splanchnic hypo-perfusion and hepatocellular integrity, pancreatic functions remained nearly unaltered. However, the significance of extracorporeal circulation variables such as CPB time and aortic XCT in deciding postoperative complications is still disputed¹. A study reported that CPB >150 minutes is a risk factor for GI complications². Another literature showed that in patients who underwent on-pump CABG, incidence of gastrointestinal complications was higher.³ On the other hand various studies reported no association between long CPB time and abdominal complications as well as GI complications. The reason is that the percentage of GI complications is only (0.7%) which is not significant large number of patients required to observe the role of long cardiopulmonary bypass^{4,5}.

There is an important relation between CPB time and the absolute increase in the plasma concentration of IL-6, but no significant association with aortic cross clamp timing⁶. Previously it's been observed that increase in serum creatinine was significantly high in patients with long duration of bypass as compared to short duration and ARF was also higher in long duration of surgery as compared to short duration. But the in-hospital mortality was almost equal in both groups⁷. Renal complications were also significantly associated with CPB >90 min^{8,9}.

SUBJECTS AND METHOD

In this cross sectional study conducted at Department of Cardiac Surgery, PIC, Jail Road, Lahore 182 subjects were selected using non probability Judgmental/ Purposive sampling Technique. Half of the participant were treated **Group A:** patients undergoing surgery for short duration of CPB < 90 minutes and half treated with **Group B:** patients undergoing surgery for long duration of CPB ≥ 90 minutes. The subjects aged between 35-70 years, of either gender

planned to undergo CABG for coronary artery disease under general anesthesia and Euro Score between 0 – 5 were included in the study. Whereas Patients undergoing CABG along with other procedure including valvular diseases (on medical record), LVEF <30% on echocardiography, patients in which bypass time >240minutes due to intraoperative technical difficulties, Patients with renal impairment or creatinine >1.2mg/dl before surgery were excluded from them. Data was entered and analyzed using SPSS 25 Quantitative variables like age, BMI, increase in serum creatinine was presented as mean and standard deviation, median and interquartile intervals, and range. Qualitative variables like gender, ARF and in-hospital mortality was presented as frequency and percentage. Both groups were compared for qualitative variables like, (ARF and in-hospital mortality) by using chi-square test (if cell frequency < 5 then Fisher exact test) P-value ≤0.05 will be considered as significant.

RESULTS

There were 133(73.08%) males and 49(26.92%) females in this study. The mean age of cases was 50.68±9.26 years with minimum and maximum age being 35 and 70 years. The mean age of the patients in Group A (Short duration of CPB) was 49.21±8.89 whereas the mean age of the patients in Group B (Long duration of CPB) was 52.15±9.44. Mean BMI was 25.45±4.56 with minimum and maximum BMI being 17.07 and 42.82.

Table 1: Comparison of Perioperative measures

	Group A	Group B	P-value
Cardiopulmonary Bypass time	60.67 ± 17.83	125.02 ± 33.72	<0.001*
Baseline Creatinin	0.92 ± 0.19	0.91 ± 0.21	0.93
48hours Creatinin Levels	1.08 ± 0.38	1.40 ± 0.94	0.049*
Urine output (ml/kg/hr x 6h)	1.05 ± 0.25	0.85 ± 0.24	<0.001*

*p-value significant at 0.05

Table 1 shows that the difference between Cardiopulmonary Bypass time, Urine output and 48 hours Creatinin according to groups was statistically significant (p-value <0.001). Whereas the

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difference between Baseline Creatinin Levels according to groups was not statistically significant (p-value 0.093)

Table 2: Comparison of Post-operative outcome

	Group A	Group B	p-value
Acute Renal Injury	1(1.10%)	6 (6.59%)	0.050*
Mortality	0 (0%)	3 (3.30%)	0.080

*p-value significant at 0.05

Table 2 shows that, there was a significant association in the occurrence of acute renal Injury in both groups whereas there was no significant association in the mortality of both groups.

DISCUSSION

This current study was carried out to compare post-operative in-hospital outcome of on pump CABG in patients with shorter CPB duration vs. patients with longer CPB duration. Taniguchi, F.P et al (2007) reported similar findings regarding BMI & Anthropometric measures⁷

Acute kidney injury is a post-operative complication. There was a significant difference in the occurrence of acute kidney injury in both groups. The results of the previous study by Taniguchi, F.P et al (2007) showed ARI (%) 1.3% in shorter CPB group and 12.5% in longer CPB group with significant p-value 0.01.⁷ This observational study evaluated the influence of the CPB duration on postoperative renal function and in the development of ARI. It was observed that the CPB duration was correlated to postoperative renal dysfunction. Multiple prior studies have identified risk factors associated with postoperative ARI. In another study prolonged cardiopulmonary bypass (CPB) time was associated with renal dysfunction p-value 0.001 was significantly showing the difference in both groups¹⁰⁻¹³.

In our data 0% patients from Group A and 3(1.65%) patients from Group B died within 30 days of operation. The incidence of mortality was generally higher in Group B as compared to Group A, but Chi square test revealed that this difference is statistically insignificant i.e. (p-value=0.08) which shows there is no significant difference in the mortality of both groups. In another study by Kenji lino, MD et al 2017 the 30 days mortality (%) for two groups was 1.5% and 1.7% respectively with p value < 0.001 our findings are against to these results. The results of the previous study by Taniguchi, F.P et al (2007) showed hospital deaths 5.2% in shorter CPB group and 7.5% in longer CPB group with insignificant p-value 0.631. Study supported by our results.

CONCLUSION

There was a significant difference between post-operative in-hospital renal outcomes of on pump CABG in patients with shorter CPB duration vs. patients with longer CPB duration. The results of both groups are nearly same as far as in-hospital mortality is concerned.

Conflict of interest: Nil

Ethical consideration: Permission was granted by PIC Ethical Review Board.

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