



**ORIGINAL RESEARCH PAPER**

**Cardiology**

**OUTCOMES OF THE OFF PUMP TO ON PUMP CONVERTED PATIENT DEPENDS ON TIMING OF CONVERSION**

**KEY WORDS:**

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**ABSTRACT**

Off-Pump CABG has less perioperative morbidity and mortality than ON-Pump CABG. Some patients need to convert OFF pump to ON pump. Emergency conversion ON pump increase the operative morbidity and mortality.

We are analyzing the determinant of conversion, Predicting factors, Impact of timing on the outcome of conversion.

**Methods:** In this study, we conducted retrospective study of 311 consecutive patients who were planned for OFF pump CABG from February 2013 to January 2018. This review included the preoperative characteristics operative and Post operative outcomes as well as the timing of conversion either before Hemodynamic collapse or after the Hemodynamic collapse.

**Results:** Out of 311 patients planned for OFF pump, 11 patients need conversion to ON pump (Incidence - 3.53%) out of those 11 patients 4 patients converted to ON pump before Hemodynamic collapse 7 patients after Hemodynamic collapse. Analysis of Preoperative characteristics showed that presence of moderate mitral regurgitation, COPD, LV EF < 35% are the risk factors for the conversion of OFF pump CABG to ON pump CABG, operative mortality was 27.27% in conversion group and 4% in non-conversion group. Mortality is High (100%) in delayed Conversion group than early conversion group (0%).

Respiratory failure, use of IABP, and ICU stay were significantly higher in conversion group than Non-conversion group. They were (27.27% Vs - 0.66%), (18.18% Vs- 0.66%) and (12.5 ± 3.8 Vs 10.4 ± 2.3) respectively.

**Conclusion:** Patients who are in need of OFF pump CABG require conversion to ON pump have lesser morbidity and mortality than ON pump. Time of conversion plays an important role in the outcome.

We concluded delayed conversion is associated in the very poor outcome. However early conversion, especially before hemodynamic collapse have better outcome.

Based on this, before planning for OFF pump, analysis all the risk factors for conversion to ON pump and the patient to be thoroughly monitored and conversion before Hemodynamic collapse.

**INTRODUCTION:**

Off-Pump Coronary Artery Bypass Grafting (OPCAB) has been shown to be similar or better outcomes in patients compared with On-Pump Coronary Artery Bypass [1]. So, many surgeons are doing Off-Pump techniques for CABG in an effort to eliminate the post operative complications associated with Cardio Pulmonary Bypass (CPB). However, rarely during beating heart operation the patient must be placed on CPB to safely complete the operation [2].

General reasons mandating conversion from an Off-Pump to an On-Pump procedure consists of;

- \* Hemodynamic instability.
- \* Failure to adequately expose the target vessel and
- \* Global ventricular ischemia [3].

Emergency conversion to cardiopulmonary bypass in Off-Pump CABG is considered in order to increase the operative mortality and morbidity [4].

The reported frequency of conversion to CPB varies from low of 1.1% to a high of 16.3%. Patients who require conversion may be associated a higher rate of morbidity or mortality [5].

**PATIENTS AND METHODS:**

Between February 2013 to January 2018, 311 patients planned for OP CAB at Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai, Tamil Nadu, India. 11 patients need conversion to ON pump CABG.

Depending on the retrospective analysis delayed conversion was defined as conversion to ON pump after Hemodynamic collapse. Elective conversion was defined as ON pump before Hemodynamic collapse. Preoperative and Post operative variables were compared in the conversion and Non-conversion group, also inter operative and post operative variables were compared between delayed conversion and elective conversion group.

**SURGICAL PROCEDURE:**

Off pump CABG done through median sternotomy deep pericardial retracting sutures were use to elevate and refuse the least to view the Larger vessels, cotopus tissue stabilizer was used to Stabilize the myocardium, Blood less field by obtained by putting Intracoronary Shunts and sucking the blood with fine tip suction cannula. Depends Critical lesion, Diagonal or LAD or RI or RCA anastomosis first, followed by OM, Partial Aortic clamping was used for proximal anastomosis.

**CONVERSION TO ON PUMP:**

This study, includes the patients who need emergency conversion to CPB because of Hypotension, Critical arrhythmias (eg. Ventricular tachycardia & fibrillation), Ischemia, Cardiac arrest.

**TIMING OF CONVERSION:**

**EARLY ELECTIVE CONVERSION:**

Defined as conversion before Hemodynamic collapse, It was planned and unhurried in situation where we were not able to maintain the systolic blood Pressure around 50 mm of Hg, Unexplained tachycardia, Acute ischemia as detected by ST-segments or well motion Changes, Electrical disturbance (eg. VT, VF, heart block) or Severe Bradycardia.

**DELAYED CONVERSION:**

Defined as conversion to CPB after Hemodynamic collapse where initial trials of inotropes was given for management of Hypotension, Surgery was continued after DC shock for arrhythmias or continued surgery after insertion of IABP support and requiring conversion.

**RESULTS:**

The mean age was 50.2 ± 9.845. Out of 311 patients who were planned to OFF pump CABG 11 patients were converted to ON pump CABG (3.53%) Table.1.

**TABLE 1: Preoperative characteristics of patients:**

S. No	Variables	Conversion Group	Non-conversion Group
1	No. of Patients	11	300
2	Age	46.82±12.1	53.59±7.59
3	Female	2 (18.18%)	36 (12%)
4	NYHA Class	2.9±0.8	2.3±0.4
5	Previous MI	5 (45.45%)	240 (80%)
6	Preoperative EF %	43.8±5.5	51.2±6.78
7	EF <35%	11 (100%)	41 (13.66%)
8	Presence of mild to moderate MR	7 (63.6%)	35 (11.66%)
9	No. of diseased vessels	2.8±0.7	2.9±0.6
10	Left main disease	3 (27.27%)	153 (51%)
Comorbidities			
11	Hypertension	9 (81.8%)	248 (82.66%)
12	Diabetes Mellitus	6 (54.5%)	215 (71.66%)
13	Dyslipidemia	8 (72.7%)	189 (63%)
14	COPD	3 (27.27%)	16 (5.33%)
15	Renal Insufficiency	2 (18.18%)	45 (15%)

**Operative and Post Operative data:**

As regards to the timing of conversion from OFF pump to ON pump, 8 patients out of 11 were converted to on Bypass early and elective before Hemodynamic collapse, 3 patients converted to on Bypass as delayed (Table - 2 & 3).

After analyzing the conversion group, Independent Predictors of conversion are LVEF - < 35% (100% Vs 13.66%, P <0.003), presence of moderate mitral Regurgitation (63.6% Vs 11.66%, P <0.02), COPD (27.27% Vs 5.33%, P <0.001).

**TABLE 2: Operative and Postoperative Outcome:**

S. No	Variables	Conversion Group	Non-conversion Group
1	Patient Number	11	300
2	No. of Grafts	3.1 ± 0.8	3.2 ± 0.6
3	Blood transfusion	8 (72.7%)	260 (86.66%)
4	Perioperative MI	5 (45.45%)	240 (80%)
5	Reoperation for bleeding	1 (9.09%)	2 (0.66%)
6	Respiratory failure	3 (27.27%)	2 (0.66%)
7	Need for postoperative dialysis	1 (9.09%)	3 (1%)
8	Stroke	0 (0%)	0 (0%)
9	Use of IABP	2 (18.18%)	2 (0.66%)
10	Length of ICU stay (days)	12.5 ± 3.8	10.4 ± 2.3
11	Early mortality (30 days)	3 (27.27%)	12 (4%)

**TABLE 3: Reasons of Conversion:**

S.No	No. of Patients	Reason of Conversion
1	7	Hypotension during distal anastomosis of circumflex artery
2	2	Ventricular fibrillation during distal anastomosis of LAD
3	2	Bradycardia and hypotension during distal anastomosis of PDA

Analysis of Post operative data showed that increased morbidity and mortality in conversion group; respiratory failure (27.27% Vs 0.66%, P-value < 0.0002), use of IABP (18.18% Vs 0.66%, P-value < 0.02), length of ICU stay (12.5 ± 3.8 Vs 10.4 ± 2.3 days, P-value < 0.0001) and mortality was (27.27% Vs 4%, P-value < 0.01). On revision of operative and postoperative data of the converted group, we found 8 patients out of 11 were converted early and elective before hemodynamic collapse and 3 patients out of 11 were converted after trials to use of inotropes and/or IABP support and finally converted to On-Pump after hemodynamic collapse urgently or emergently.

**TABLE 4: Operative and post-operative data of converted patients:**

S. No	Variables	Early Conversion	Delayed Conversion
1	No. of Patients	8	3

2	Respiratory failure	1 (12.5%)	2 (66.66%)
3	Use of IABP	0 (0%)	2 (66.66%)
4	Length of ICU stay (days)	11.5±2.5	13.65±5.2
5	30 days mortality	0 (0%)	3 (100%)

Table 4 depicted that increase in morbidity and mortality of the converted group of patients is due to the delayed converted patients and there is no statistical significant differences between non converted patients and early converted patients.

**DISCUSSION:**

The Off-Pump CABG practice is described to have cost-effective and clinical benefits. A Study reported with the Society of Thoracic Surgeons (STS) data of 118140 CABG-only procedures that Off-Pump CABG was associated with decreased mortality and morbidity, including stroke or coma, ventilator use of 24 h or more, renal failure, deep sternal wound infection, re-operation for bleeding [6]. Few authors also demonstrated that a successful Off-Pump CABG decreases operative mortality and postoperative morbidity [7]. Conversion in OPCAB has been shown to increase mortality and morbidity, and operative mortality has been reported in the range of 7.8 - 22% [8].

Our study, the mortality was 27.27% % in the conversion group as compared to 4% in the non-conversion group. However in the conversion group the mortality in the delayed conversion was 100% as compared to 0% in the early conversion group, it was not statistically significant. Also in our converted OPCAB group, the incidence of respiratory failure, use of IABP, and ICU stay were significantly higher in conversion group than Non-conversion group. They were (27.27% Vs - 0.66%), (18.18% Vs - 0.66%) and (12.5 ± 3.8 Vs 10.4 ± 2.3) respectively.

Elective and early conversion of Off-Pump CABG to On-Pump CABG without hemodynamic compromise has been demonstrated not to raise mortality and morbidity [9].

Our study revealed that, morbidity and mortality were notably high in delayed conversion when compared with the early conversion, respiratory failure (66.66% vs 12.5%) use of IABP (66.6% vs 0.0%), length of ICU stay (11.5±2.5 vs 13.65±5.2) and operative mortality (66.7% vs 0.0%). However comparing the morbidity and mortality between nonconversion group and early conversion group were not statistically significant. We found that mild to moderate MR, COPD and LVEF <35% are risk factors for emergency conversion in Off-Pump CABG.

Omae et al., also revealed that occurrence of mild to moderate MR is a risk factor for emergency conversion, they also confirmed that MR deteriorated during circumflex artery territory anastomosis and that patients with MR had more hemodynamic compromise (decreased cardiac index and increased mean pulmonary artery pressure) than those without MR [10]. Related COPD, Pulmonary hypertension or poor oxygenation may associate to hemodynamic compromise. Mishra et al., also showed that low LV ejection fraction is a risk factor for conversion Off-Pump CABG [11].

**CONCLUSION:**

Patients required the OFF pump CABG may be converted to ON pump to have lesser morbidity and mortality than ON pump. Time of this conversion plays an important role in the outcome.

We could conclude that delayed conversion is related in the very poor outcome. However early conversion, especially before hemodynamic collapse have better outcome.

Based on our observation, analysis of all the risk factors may be beneficial before planning for OFF pump CABG and the patient should be thoroughly monitored and conversion before Hemodynamic collapse.

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