


Original Research Article

# Incidence of reexploration in cardiac surgery under cardiopulmonary bypass at Government Mohan Kumaramangalam Medical College Hospital, Salem

Pon. A. Rajarajan\*

Associate Professor, Department of Cardio-Thoracic Surgery, Government Mohan Kumaramangalam Medical College Hospital, Salem, Tamil Nadu, India

\*Corresponding author email: [ponrajarajan@gmail.com](mailto:ponrajarajan@gmail.com)

	International Archives of Integrated Medicine, Vol. 6, Issue 4, April, 2019. Copy right © 2019, IAIM, All Rights Reserved. Available online at <a href="http://iaimjournal.com/">http://iaimjournal.com/</a> ISSN: 2394-0026 (P)                      ISSN: 2394-0034 (O)
	Received on: 04-03-2019                      Accepted on: 15-03-2019 Source of support: Nil                      Conflict of interest: None declared.
<b>How to cite this article:</b> Pon. A. Rajarajan. Incidence of reexploration in cardiac surgery under cardiopulmonary bypass at Government Mohan Kumaramangalam Medical College Hospital, Salem. IAIM, 2019; 6(4): 20-25.	

## Abstract

**Background:** Cardiac Surgery being the most modern and conceptualized surgery which involves cardiopulmonary bypass Clotting Mechanism, Temperature Control, Hemodilution, and Cardioplegic arrest, etc. The failure of any of these mechanisms ends up in a cascading effect of morbidity and mortality of the patients.

**The aim of the study:** The present study was primarily undertaken to study the incidence off Reexploration in Cardiac Surgery among patients subjected to cardiopulmonary bypass, thereby identifying the factors contributing to Reexploration and adopting suitable measures to reduce the incidence of Reexploration.

**Materials and methods:** Totally 25 patients who underwent cardiac surgery under cardiopulmonary bypass Department of Cardio-Thoracic Surgery, Government Mohan Kumaramangalam Medical College Hospital, Salem. Patients who had a problem of bleeding underwent Reexploration. Patients included in the study belonged to both sexes and age groups varying from 11 to 68 years. The patients were subjected to routine investigations.

**Results:** It was as high as 25% among the patient belonging to three different age groups (20-30), (40-50) and (50-60). The incidence of Reexploration was 58.3% (14/24) among patients who were CPB time exceeded 120 minutes. The overall incidence of Reexploration following open heart surgery was 1.38% (7/25). Among the patients to underwent Reexploration. Patients who underwent open Heart Surgery accounted for 29.16% (7/25) of patients. The incidence of Mortality in this group

was 28.57% (2/7) of patients. Among the 7 patients who had Reexploration 71.4% (5/7 of patients had an uneventful course after Reexploration). 7 Patients who had valve replacement surgery accounted for among the total of 25 patients who had an undergone Reexploration accounting for 29.1% of all cases of Reexploration. 71.4% (5/7) who had undergone Mitral Valve replacement patients accounted for 71.4% (5/7) of Reexploration. Aortic valve replacement patients accounted for 14.2% (1/7). Double Valve replacement patients accounted for 14.2% (1/7). Overall Mortality following Reexploration in this group was 71.42% (5/7). 7 Patients who had a Reexploration after Valve replacement Surgery 28.5% (2/7) of the patients were undergoing Mitral Valve Replacement for Restenosis. One patient who was Reexplored for Post-operative bleeding had a Left Ventricle Free Wall rupture following Mitral Valve Replacement.

**Conclusion:** Attention towards meticulous hemostasis prior to closure is Mandatory. A sound surgical technique will reduce the incidence of bleeding from sites of Cannulation and Anastomosis. Adoption OFF PUMP CABG has shown to reduce the incidence of postoperative bleeding and Morbidity when compare to ON PUMPCABG.

### Key words

---

Off-Pump CABG, Cardio Pulmonary Bypass, Reexploration, Mitral Valve Replacement.

### Introduction

Cardiac Surgery being the most modern and conceptualized surgery which involves cardiopulmonary bypass Clotting Mechanism, Temperature Control, Hemodilution, and Cardioplegic arrest, etc. The failure of any of these mechanisms ends up in a cascading effect of morbidity and mortality of the patients [1]. The complications associated in the postoperative period like cardiac failure renal dysfunction, pulmonary dysfunction and cerebrovascular accident play a major role in determining the outcome. Post-operative bleeding and Reexploration are inherent complications associated with cardiac surgery [2]. Cardio pulmonary bypass is an indispensable technique in undertaking cardiac surgery. Cardiac surgery can be performed under total and partial bypass. The total bypass is one where all the systemic venous return to the pump oxygenator instead of the heart [3]. In a partial bypass, a portion of the systemic venous blood returns to the heart and is ejected out into the aorta. The central component of the system is the oxygenator which allows the oxygenation of blood and elimination of carbon dioxide [4]. Initially, bubble oxygenators were used which allow gas exchange at a blood gas interface. Presently membrane oxygenators in which gas

exchange occurs through tiny pores in membranes. Silicone oxygenators are used particularly because of their stability for long periods for extracorporeal membrane oxygenation. The venous reservoir stores excess volume it is positioned to allow siphonage of blood by gravity and by slight negative pressure in the tubes by virtue of controlled vacuum pressure [5]. The arterial pump generates nonpulsatile blood flow. Roller pumps are used because they cause less damage to blood cells. Blood in the operating field is returned to the reservoir by way off cardiotomy suction lines. However, the blood contains air that is filtered out before the blood is returned to the system [6]. Following cannulation of the aorta and both superior and inferior vena cavae after systemic heparinization the bypass is gradually instituted [7]. A flow rate is maintained after calculating the patient's body surface area. Haematocrit of the patients and pump oxygenator blood volume is determined by the composition and amount of the blood and fluid infused before and after initiation of the bypass. Hypothermia increases viscosity thus at a low temperature the hematocrit is kept low. Virtually all procedures are done under some degree of hypothermia. Hypothermia reduces Oxygen consumption. Vant Hoffs reaction is directly related to

temperature [8]. Hypothermia in CPB allows low perfusion flow rates thereby reducing trauma to the cellular elements. Systemic hypothermia minimizes warming off the heart that may impair myocardial protection [9].

### Materials and methods

Totally 25 patients who underwent cardiac surgery under cardiopulmonary bypass Department of Cardio-Thoracic Surgery, Government Mohan Kumaramangalam Medical College Hospital, Salem. Patients who had a problem of bleeding underwent Reexploration. Patients included in the study belonged to both sexes and age groups varying from 11 to 68

years. The patients were subjected to routine investigation.

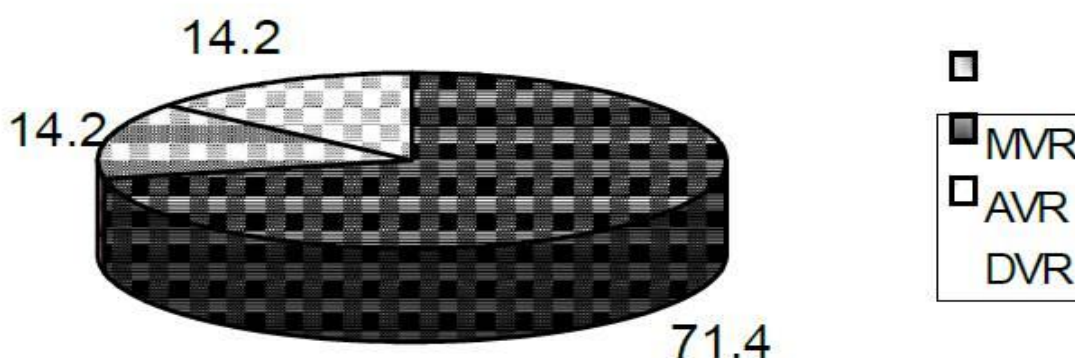
### Results

Incidence of Reexploration was 58.3% (14/24) among patients who were CPB time exceeded 120 minutes. The incidence of re-exploration in patients who had valve Replacement Surgery was as per **Table - 1**. The patients who underwent valve replacement Surgery accounted for 1.66% (7/420) in this group. 7 Patients who had valve replacement surgery accounted for among the total of 24 patients who had an undergone.

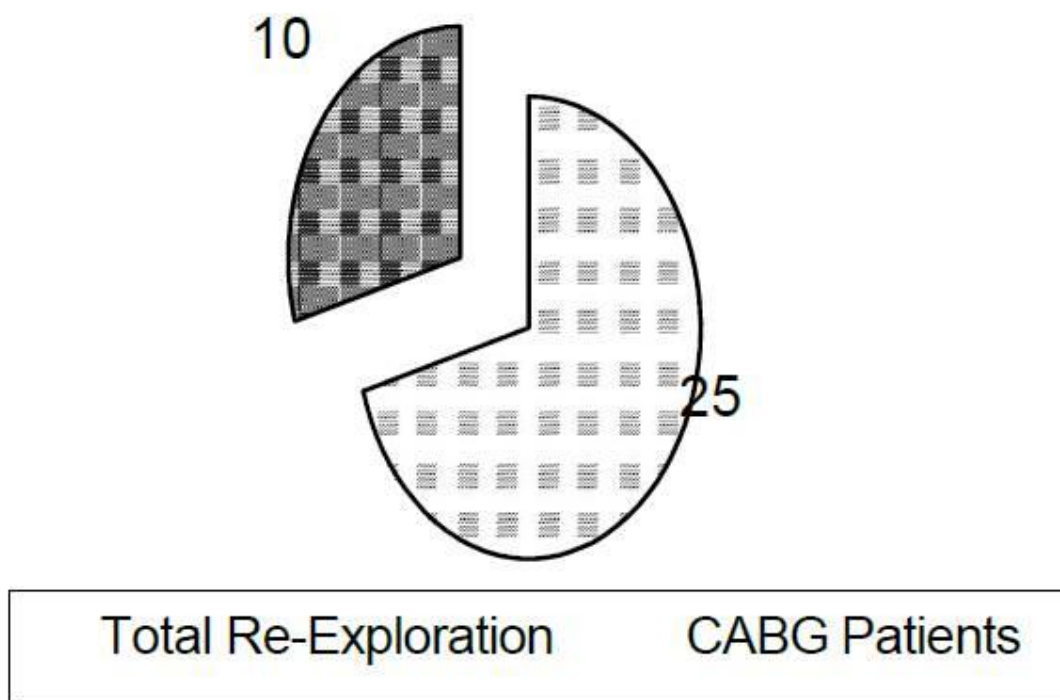
**Table – 1:** Relation to CPB time.

Total No. of Reexploration	Cardiopulmonary bypass time	No. of Reexploration in relation to CPB time	%
24	0 - 30	3	12.5
24	30 - 60	1	4.16
24	60 - 90	5	20.83
24	90 - 120	1	4.16
24	120 - 150	6	25
24	150 - 180	6	25
24	180 - 210	2	12.5

**Graph – 1:** The incidence of reexploration in patients who had valve replacement surgery.



**Graph – 2:** Incidence of reexploration in patients who underwent coronary artery bypass surgery.



The incidence of re-exploration in patients who had valve Replacement Surgery was as per **Graph - 1**. The patients who underwent valve replacement Surgery accounted for 1.66% (7/420) in this group. 7 Patients who had valve replacement surgery accounted for among the total of 24 patients who had an undergone Reexploration. Accounting for 29.1% of all cases of Reexploration. 71.4% (5/7) who had undergone Mitral Valve replacement patients accounted for 71.4% (5/7) of Reexploration. Aortic valve replacement patients accounted for 14.2% (1/7). Double Valve replacement patients accounted for 14.2% (1/7) Overall Mortality following Reexploration in this group was 71.42% (5/7). 7 Patients who had a Reexploration after Valve replacement Surgery 28.5% (2/7) of the patients were undergoing Mitral Valve Replacement for Restenosis. One patient who was Reexplored for Post-operative bleeding had a Left Ventricle Free Wall rupture following Mitral Valve Replacement.

Coronary Artery By-Pass Surgery Patients accounted for 41.6% (10/24) of those who underwent Reexploration (**Graph – 2**). The

Incidence of mortality following Reexploration among patient who had undergone CABG was 60% (6/10). CABG patients who had Reexploration accounted for 46.15% (6/13) of the overall mortality among patients who had Reexploration while the overall mortality among the 24 patients who underwent Reexploration was 54.1% (13/24). The incidence of Reexploration in patients who underwent Triple vessel coronary artery by-pass Surgery was 60% (6/10). The incidence among patients who underwent Triple vessel coronary artery bypass surgery was Highest in this group. Overall mortality among the patients who had Triple vessel coronary artery bypass surgery who had undergone Reexploration was 83.3% (5/6). 20% (2/10) Incident of sternal instability after Reexploration 10% (1/10) Incidence of sternal infection after Reexploration among this group. One Patient underwent reexploration following CABG for DVD no bleeder site was identified.

Of the 24 patients who underwent a Reexploration 12.5% (3/24) had Sternal Infection. Patients were treated with Inj. vancomycin (Q.I.D.) for 7 days. The organism

implicated was M.R.S.A sensitive to the vancomycin.No incidence of Sternal Infection or Sternal Instability was recorded among patients with Congenital Heart Disease who had a Reexploration following Open Heart Surgery.

## **Discussion**

The overall incidence of Reexploration among patients following Cardiac Surgery under Cardio Pulmonary bypass was 2.12%.Outcome after reexploration in the present study among patients with TVD 83.3% (5/6) [10]. The overall incidence of mortality was found to be High among CABG patients following reexploration. The indications for re-exploration soon after cardiac surgeries are diverse and to decide on a time for the re-exploration is challenging. The incidence of reexploration as reported worldwide is about 2-5%. This is a significant decrease from the earlier reported incidence of 15% before improved surgical techniques were adopted [11]. The commonest causes of chest reexploration are macrovascular or microvascular bleeding which can be massive or associated with hemodynamic instability leading to hypotension or cardiogenic shock. In addition, it could be due to clots in the mediastinum as detected by the compressive effect leading to cardiac tamponade or detected by transthoracic or transoesophageal echocardiography, and in some case when the chest was left open at the end of surgery. Reactionary hemorrhage is the most frequent indication for reexploration and may occur because of surgical or systemic diseases. Studies have indicated that in 70 - 80 % of the cases bleeding is surgical [12]. The main finding from the study was that early intervention prevents morbidity and mortality in patients with an immediate complication after open heart surgery. The indications for the re-exploration are usually obvious and would not require complicated investigations and time is of immense essence [13]. The incidence of re-exploration 3.6% following open heart surgery from our study correlates well with other studies despite the fact that we adopted early surgical intervention. This study has shown that re-exploring the patients

early when indicated instead of watchful waiting did not unusually increase the re-exploration rate. The study, also, demonstrated the correlation between the indications for re-exploration and the intraoperative findings as 97.2% of patients had the same intraoperative findings as the indications for surgery [14]. The statistical relationship between the indications for re-exploration and the intraoperative findings using Pearson chi-square was significant (p value<0.001).

Matraca and coworkers observed that delayed re-exploration was associated with a higher infection rate, which was responsible for high mortality [15].

## **Conclusion**

Attention towards meticulous hemostasis prior to closure is Mandatory. The sound surgical technique will reduce the incidence of bleeding from sites of Cannulation and Anastomosis. Adoption OFF PUMP CABG has shown to reduce the incidence of postoperative bleeding and Morbidity when compare to ON PUMPCABG. Adoption of Hemostatic Technique for internal mammary artery anastomotic bleeding by which hemostasis can be achieved without the risk of anastomotic stenosis or aggravation of the bleeding, as it avoids placing sutures over the anastomotic suture line. Patients predicted to have increased risks of bleeding may benefit from prophylactic use of aprotinin, aminocaproic acid, or other agents shown to reduce hemorrhage.

## **Acknowledgments**

Authors would like to thank the Cardiothoracic Surgery Department faculty, Govt. Mohan Kumaramangalam Medical College, Salem for their humble support to complete the research work.

## **References**

1. Sellman M, Intonti MA, Ivvert T. Reoperations for bleeding after coronary artery bypass procedures during 25

- years. *Eur J Cardiothorac Surg.*, 1997; 11: 521–527.
2. Unsworth-White MJ, Herriot A, Valencia O, Poloniecki J, Smith EE, Murray AJ, Parker DJ, Treasure T. Resternotomy for bleeding after cardiac operation: a marker for increased morbidity and mortality. *Ann Thorac Surg.*, 1995; 59: 664–667.
  3. Moulton MJ, Creswell LL, Mackey ME, Cox JL, Rosenbloom M. Reexploration for bleeding is a risk factor for adverse outcomes after cardiac operations. *J Thorac Cardiovasc Surg.*, 1996; 111: 1037–1046.
  4. Craddock DR, Logan A, Fadali A. Reoperation for hemorrhage following cardiopulmonary bypass. *Br J Surg.*, 1968; 55: 17–20.
  5. Susanna Price, Jeremy Prout, Siân I, John R. Tamponade' following cardiac surgery: terminology and echocardiography may both mislead. *Eur J Cardiothorac Surg.*, 2004; 26: 1156–1160.
  6. Charalambous CP, Zipitis CS, Keenan DJ. Chestreexploration in the intensive care unit after cardiac surgery: a safe alternative to returning to the operating theater. *Ann Thorac Surg.*, 2006; 81: 191–194
  7. Timothy SH, Jean CS, Alan JS. Hemorrhage-related reexploration following open heart surgery: the impact of pre-operative and post-operative coagulation testing. *Cardiovasc Surg.*, 2002; 10: 146–153
  8. Yavuz S, Eris C, Türk T. Re-exploration for excessive bleeding after coronary artery bypass surgery: how early is better? *Eur J Cardiothorac Surg.*, 2007; 31: 819–820.
  9. Dacey LJ, Munoz JJ, Baribeau YR, Johnson ER, Lahey SJ, Leavitt BJ, Quinn RD, Nugent WC, Birkmeyer JD, O'Connor GT. Reexploration for hemorrhage following coronary artery bypasses grafting: incidence and risk factors. *Arch Surg.*, 1998; 133: 442–447.
  10. Wolfe R, Bolsin S, Colson M, Stow P. Monitoring the rate of re-exploration for excessive bleeding after cardiac surgery in adults. *Qual. Saf. Health Care*, 2007; 16: 192–196.
  11. Iker Mataraci, Adil Polat, Mehmet Erdem, Orhan Tezcan, Alper Erkin, Kaan Kirali. Postoperative Revision Surgery for Bleeding in a Tertiary Heart Center. *Asian Cardiovasc Thorac Ann.*, 2010; 18: 266–271.
  12. Marco Ranucci, Giuseppe Bozzetti, Antonio Ditta, Mauro Cotza, Giovanni Carboni, Andrea Ballotta. Surgical Reexploration After Cardiac Operations: Why a Worse Outcome? *Ann Thorac Surg.*, 2008; 15: 1557–1562.
  13. Cliff K, Caroline Gerrard, Kimberley A, Helen Cunningham, Alain Vuylsteke. Delayed re-exploration for bleeding after coronary artery bypass surgery results in adverse outcomes. *Eur J Cardiothorac Surg.*, 2007; 31: 834–838.
  14. Karthik S, Grayson AD, McCarron EE, Pullan DM, Desmond MJ. Reexploration for bleeding after coronary artery bypass surgery: Risk factors, outcomes, and the effects of time delay. *Ann Thoracic Surg.*, 2004; 2: 527–534.
  15. Pelletier MP, Solymoss S, Lee A, Chiu RC. Negative reexploration for cardiac postoperative bleeding: can it be therapeutic? *Ann Thorac Surg.*, 1998; 65: 999–1002.