

Prevalence and Causes of Mediastinal Reexploration for Excessive Bleeding After Cardiac Surgery Procedures

Hamid hoseinikhah¹, Omid Javdanfar², Mohamadreza Akbari³, Kayhan Mizani³, Mahsa Moallemi³, Aliasghar Moeinipour^{1*}

¹ Cardiac surgeon, Department of Cardiac Surgery, Faculty of Medical Science. Mashhad University of Medical Sciences, Iran

² Resident of cardiac surgery, Department of Cardiac Surgery, Faculty of Medical Science. Mashhad University of Medical Sciences, Iran

³ Student Research Committee, Faculty of medicine, Mashhad University of Medical Sciences, Mashhad, Iran

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ABSTRACT

Introduction: Postoperative bleeding in cardiac surgery is not an uncommon complication and can be evaluated with surgical and nonsurgical causes. Although any type of coagulopathy should be treated before, during, and after the surgical procedure, cardiac surgeons should have perfect surgical techniques for step by step hemostasis to minimize blood loss.

Materials and Method: This retrospective study was conducted on 85 patients out of 1075 (0.07%) ones required Reexploration of the Mediastinal to control the excessive bleeding after different cardiac procedures in Imam Reza Hospital in Mashhad of Iran from January 2018 to January 2019.

Results: Out of 85 patients who required Mediastinal Reexploration, 61 (71%) and 24(29%) patients underwent the off-pump procedure and cardiopulmonary bypass, respectively. The most common sites for surgical bleeding in the order were missed branches of left internal mammary artery / saphenous vein graft (65%), proximal or distal coronary anastomosis (18%), and aortic /atrial suture line (16%). The death in patients under study was 7 (8%), half of which were not related to Mediastinal Reexploration.

Conclusion: The possibility of postoperative bleeding can be minimized through correction of clotting factor deficiencies, improvement of surgical techniques in hemostasis.

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Introduction

Recent advances in cardiac surgeries resulted in a decreased rate of mortality and morbidity after this procedure. Despite this fact, uncontrollable bleeding after cardiac surgeries has not decreased yet leading to an increase in the rates of morbidity and mortality (1-4). Although surgical techniques play

remarkable roles in postoperative bleeding in some cases, these complications are inevitable and associated with preoperative antihemostatic drugs, side effects of cardiopulmonary bypass circuit, and comorbidities, such as chronic renal failure (5, 6). This study evaluated the 1-

*Corresponding author: Aliasghar Moeinipour, Cardiac surgeon, Department of Cardiac Surgery, Faculty of Medical Science. Mashhad University of Medical Sciences, Iran. Tel and Fax: +985131802321. Email: moeinipoora1@mums.ac.ir
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year experience of the authors in the center on the rate and causes of excessive mediastinal bleeding in patients who required to get back to the operating room for evaluation and controlling the bleeding after surgery.

Materials and Methods

This retrospective study was conducted on 85 patients out of 1075 (0.07%) ones who required reexploration of the mediastinum to control the excessive bleeding after different cardiac procedures in Imam Reza Hospital in Mashhad from January 2018 to January 2019. Coronary artery bypass grafting (CABG) was performed in 812 patients, 728 and 84 of who underwent off-and on-pump CABGs, respectively. Exclusion criterion was the age under 10 years.

Results

According to the results, 59 (69%) patients were male. Moreover, the mean age of the patients was 62.7±11.4 years. Out of 85 patients, 61 (71%) and 24 (29%) cases underwent procedures without cardiopulmonary bypass and with cardiopulmonary bypass circuit (Table 1).

Table 1: Demographic Data of Patients

Variable	Freq(percent)
On-pump coronary artery bypass grafting	8 (9%)
Off-pump coronary artery bypass grafting	48 (56%)
Coronary artery bypass grafting+ Mitral valve replacement / Aortic valve replacement	6 (7%)
Aortic valve replacement	3 (3%)
Mitral valve replacement	9 (10%)
Aortic valve replacement + Mitral valve replacement	4 (4%)
Total vascular regeneration	2 (3%)
Atrial septal defect/Ventricular septal defect	5 (5%)
Total	85

Patients, there was a certain surgical site for bleeding. The most common reasons included branches of the left internal mammary artery (LIMA)/saphenous vein graft (SVG) in 28

Decision for reexploration of mediastinum after the procedure is made based on the amount of bleeding in a certain interval after surgery or hemodynamic status of the patients. Although there are no fixed indications for this procedure in textbooks, bleeding volumes greater than 400, 200-300, and 100cc in the first hour, 2 to 3 hours, and after 6 hours following the procedure, respectively, are common indications for reexploration of the mediastinum. Unsatisfactory hemodynamic status of the patient regarding postoperative hemorrhage can be regarded as the second indication to get him/her back to the operating room. Of total 85 patients who need to Reexplore of Mediastinal, in 42 of them (49%) there is not specific surgical site for Bleeding and reason for Hemorrhage was coagulopathy and chest wall and sternum. In the remaining 43

patients (65%), site of proximal/distal anastomosis in 8 patients (18%), and suture line of aorta, left atrium, and right atrium in 7 patients (16%). Mortality rate of this population was in

7 patients (8%) but mortality was not directly related to postoperative Hemorrhage. Cause of Death was Heart Failure in 3 cases and side effect prolonged intubation and multi organ failure in remaining of them.

Discussion

Excessive hemorrhage after cardiac surgery is one of the risk factors causing mortality and morbidity among patients. Postoperative bleeding as a problematic complication necessitates mediastinal re-exploration (7, 8). Complications in reexploration resulted from the side effects of blood product transfusion, and infections leading to prolonged stay in the intensive care unit and hospital (9-12). The amount of bleeding after the procedure is a determinant of surgical re-exploration to control the bleeding (8). Bleeding after cardiac surgery procedure is multifactorial and can be divided into surgical and non-surgical bleeding caused by coagulopathy.

The incidence rate of reexploration for postoperative bleeding varies in different studies between 1% and 11%. There are no universal criteria to decide whether to get the patients back to the operating room to control bleeding. Moreover, each cardiac surgeon decides to perform mediastinal re-exploration based on his/her own experience (10). Excessive bleeding after cardiac surgery can be associated with the surgical site, suture line, or defects in hemostasis (13-18). Coagulation factor deficiencies as a side effect of cardiopulmonary bypass circuit account for postoperative coagulopathy. Cardiopulmonary bypass can cause a reduction in the levels of coagulation factors, the release of fibrinolysis process, and result in a decrease in platelet count and function.

Clot and hemostasis are formed after reversing heparin following the termination of cardiopulmonary bypass

circuit. One of the mechanisms of postoperative bleeding is heparin rebound mechanism.

On the basis of many studies and references Cardiac Procedure without need for Cardiopulmonary Bypass Machine (like OFF- Pump CABG) have less potential for postoperative bleeding and Hemorrhage in compare to Cardiac Procedure who need Extracorporeal Circulation(Most of other remaining Cardiac Procedure like Valvular Surgery). (19, 21)

Cardiopulmonary bypass circulation leads to platelets dysfunction and can prevent coagulation factor activation which finally results in postoperative coagulopathy.

In addition, extracorporeal circulation reduces platelets count and leads to platelets dysfunction. Besides the side effects of cardiopulmonary bypass, nonsurgical coagulopathy includes the advanced patient age, low body mass index, chronic renal failure, and hepatic failure (22).

In addition to recent advances in CABG techniques without cardiopulmonary bypass (i.e., OFF-pump CABG), the rate of nonsurgical bleeding decrease in patients with coronary artery diseases due to eliminating the side effects of cardiopulmonary bypass circuit. Some preoperative

antiplatelet drugs, such as Plavix, Osvix, Warfarin, and Acetylsalicylic acid can cause hemostatic failure and increase postoperative bleeding.

Another type of postoperative bleeding is surgical bleeding. Cardiac surgery procedure needs to tight hemostatic insight in the whole time of procedure and step by step surgical technique to control of bleeding.

Postoperative bleeding at surgical site include various etiologies consist of

sternum, chest wall, pericardial and thymic tissues, branch of SVG and LIMA in CABG procedure, site of arterial and venous cannulation, suture line of distal and proximal anastomosis of conduit, suture line of aortic, and atrial wall in valvular surgery (23).

Some comorbid conditions in patients under cardiac surgery are associated with excessive bleeding after procedures. Chronic renal failure, especially when hemodialysis is needed, have more potential for bleeding after any type of cardiac surgery. This is because renal insufficiency influences the count and function of platelet and finally destroys the hemostatic pathway resulting in excessive hemorrhage after a cardiac surgery procedure. Moreover, chronic hepatic insufficiency, cirrhosis, and hepatitis can impair function of hemostatic agents (i.e., II, VII, IX, X) normally built in the liver that results postoperative bleeding (17, 18).

Conclusion

With correcting deficiency in Coagulation Factors and better surgical technique in Hemostasis, possibility of Postoperative Bleeding was minimized.

Conflicts of Interest:

The authors declare no conflict of interest regarding the publication of the study.

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