Post-operative nursing bleeding management in mitral valve repair-re-exploration patient during early post-operative period: A case report

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Abstract

Background: One of the first targets of post-operative care for cardiac surgery is to control bleeding. Significant bleeding can affect cardiac function as it can lead to hemorrhagic shock, severe anemia, and cardiac tamponade. Valve surgery has a mortality rate of 3.4%. Mitral valve repair surgery has a mortality rate of 1.2% compared to a valve replacement mortality rate of 4.5%. A quick and appropriate decision in the management of bleeding is one of the factors determining the patient's outcome.
Case: 59-year-old female with a medical diagnosis of mitral valve prolapse with severe mitral regurgitation of non-significant coronary artery diseases performed mitral valve repair surgery. This case has a score of 1 on the Papworth scale, which means low risk of bleeding. During treatment in the ICU, there was an increase in blood production from the chest tube of 1,670 ml within six hours post-surgery. PT APTT value was within normal range. Bleeding management during early post-operative period was carried out, namely conducting supporting laboratory tests, monitoring hypotension, monitoring urine production, performing chest tube maintenance, giving blood transfusions, fluid management and collaboration for re-exploration. Re-exploration surgery was performed at the sixth hour of post-operative care.
Objective: This study aims to report on nursing bleeding management in mitral valve repair-re-exploration patient during early postoperative period.
Method: This research is qualitative research using the case study method.
Conclusion: The application of post-operative nursing bleeding management in mitral valve repair-re-exploration patient during the early post-operative period provides good clinical outcomes. Effective collaboration (multi-disciplinary teams) between cardiac surgeon, perfusionist, anesthetist, clinical pharmacist, and nurse is required to prevent and manage post-operative bleeding.

Keywords: early post-operative period; mitral valve annulus repair; nursing bleeding management post cardiac surgery

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Introduction

One of the surgeries with high mortality and morbidity is cardiac surgery. According to the Society for Thoracic Surgeons (STS) database, over 774,000 coronary artery bypass surgeries showed a 30-day mortality rate of 2.3% and for over 109,000 isolated valve surgeries it was 3.4% (Mazzeffi et al., 2014). Meanwhile, the mortality rate in mitral valve repair is 1.2% compared to mitral valve replacement of 4.5% (Bowdish et al., 2020).

To reduce the mortality rate in cardiac surgery, more efficient early post-operative management is needed. The initial management in the post-operative care after routine cardiac surgery has fundamentally shifted during the past two decades toward a more efficient use of limited post-operative care facilities, early extubation and rapid discharge. The use of fast-track protocols after cardiac surgery is feasible because it can improve

the effectiveness of perioperative anesthesia management, new surgical techniques, and better myocardial protection and better bleeding management by using point-of-care testing and new hemostatic drugs (Roekaerts & Heijmans, 2012).

One of the initial goals in early post-operative cardiac recovery is control of bleeding (Roekaerts & Heijmans, 2012). Significant post-operative bleeding can result in hemorrhagic shock, severe anemia and cardiac tamponade. All of these impair cardiac function (Zhou et al., 2020). Re-exploration of bleeding after cardiac surgery is associated with significant morbidity and mortality (Elassal et al., 2021). Reoperation for bleeding occurs in anywhere between 2.2% and 11.6% of the seven most commonly performed adult cardiac surgical procedures as reported by the Society of Thoracic Surgeons National Report (D'Agostino et al., 2018). Thus, the survival rate of patients who experience excessive bleeding after cardiac surgery can be improved by thorough assessment, early detection and prompt intervention.

The nursing team's work is essential since it performs continuous observation of the patient and needs to make quick decisions, required by the post-operative period of heart surgery. These professionals must identify and prevent complications, acting immediately and contributing to reducing hospital stay (Reisdorfer et al., 2021). This study aims to present nursing bleeding management in mitral valve repair-re-exploration patients during the early post-operative period.

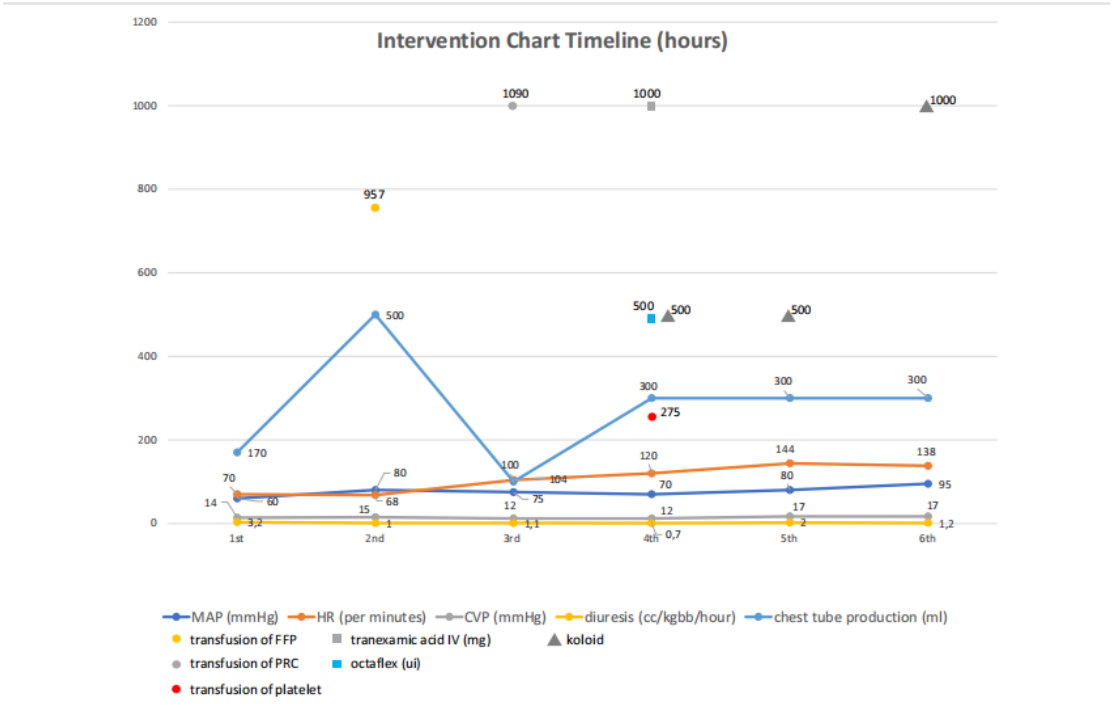
Case Presentation

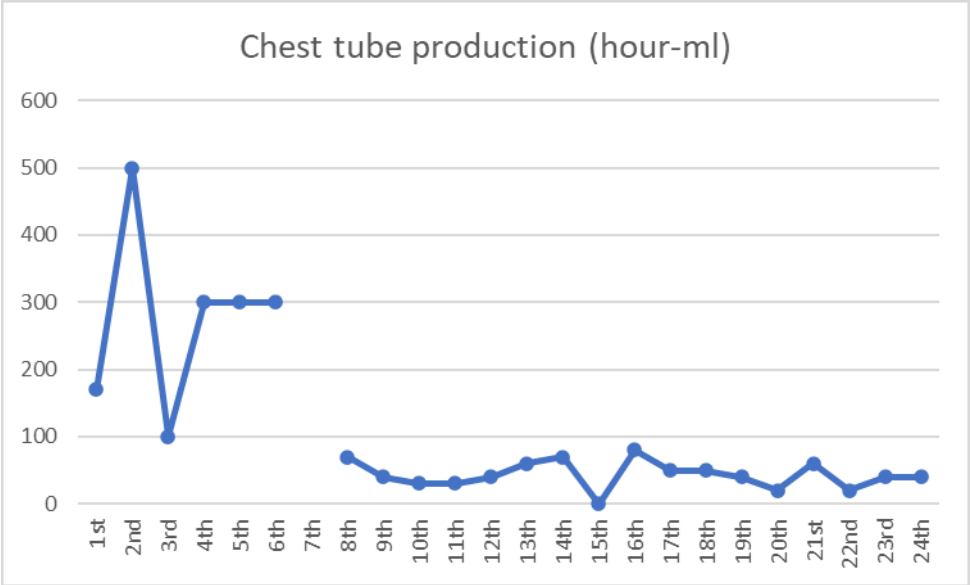
A 59 year old woman, with a preoperative diagnosis of Mitral Valve Prolapse with severe Mitral Regurgitation, non-significant Coronary Artery Diseases, underwent mitral valve repair surgery. Regarding preoperative medications, the patient stopped taking warfarin three to four days and clopidogrel five days before operation while aspirin continued till the time of surgery.

During intraoperative annular dilatation, P2-P3 prolapse, P2 flail, rupture cordae P2, cleft at P1-P2 were found. At the intro operation, a mitral annuloplasty repair was performed with a 32 mm profile 3D band. The operation was carried out for five hours and 15 minutes with a CPB time of 116 minutes. Intraoperative bleeding for five hours and 15 minutes was 1800 ml, intraoperative urine output 2.96 cc/kg/hour, 1000 ml crystalloid incoming fluid, PRC 650 cc.

Based on the Papworth bleeding score, this case has a score of 1. The operation was an elective operation, single valve type of operation, no disease of the aortic valve, age less than 75 years. Only BMI is worth 23.5 kg/m2. With a score of 1, this case has a low risk factor for bleeding. This patient was also screened using Pursount scale used to assess the risk of surgery. The patient had a score of 5 (average result) which means the possibility of worsening the condition after surgery is very small.

On arrival at the ICU, vital signs BP 103/56 mmHg with dobutamine inotropic supported 5 mcg





per kilograms of body weight per minute, pulse 69 times per minute, respiratory rate 22 times per minute, with ventilator support mode PS 5 PEEP 5 FiO2 50% MV 8.16 VT 377-380 SaO2 100% CVP 14 mmHg PAP 23/14 (18). Post-operative laboratory results on Hb 5,3gr/dL; AGD pH 7.304 pCO2 41.3 pO2 223 HCO3 20.5 BE -6.0 SaO2 100%.

In the patient, two chest tubes were installed substernal No. 32 Fr and intra-pleural right No. 28 Fr with continuous suction at a pressure of 20 mmHg, no seepage in the area around the CTT insertion, not folded. Drain production one hour after installation of CTT was 120 cc. Furthermore, CTT production while in the ICU in the first hour was: 170 cc; second hour 500 cc; third hour 100 cc; fourth hour 300 cc; fifth hour 300 cc; sixth hour 300 cc.

Intervention or Clinical Examination

Based on the results of our study, we determined the risk of shock related with hypovolemia as the main focus of diagnosis in this case. The NOC (Nursing Outcome Classification) determined was the severity of blood loss with post-operative bleeding indicators.

Furthermore, we define nursing interventions with reference to the nursing intervention classification (NIC), namely (1) prevention of bleeding: closely monitor the risk of internal and external bleeding in patients (amount of drainage from surgical drains, dressings full of blood); record hemoglobin and hematocrit values before and after the patient loses blood; monitor signs and symptoms of persistent bleeding (hypotension, decreased urine output); give blood products; (2) chest tube care: do stripping and milking on the tube only if there is an indication according to the patient's condition or according to the doctor's order; observe the volume, turbidity, color, and consistency of lung drainage, and record it correctly; (3) administration of blood products: check again that the blood products have been prepared, matched; monitor for transfusion reactions; monitor for excess fluid; (4) fluid management.

Nursing implementation carried out by nurses is in accordance with planned interventions during the early post-operative period, namely prevention of bleeding, chest tube care, administration of blood products and fluid management. Re-exploration interventions are carried out in collaboration.

Chest tube patency is a concern in the Guidelines for Perioperative Care in Cardiac Surgery Society Recommendations for Enhanced Recovery After Surgery (Engelman et al., 2019). During ICU care, chest tube patency is performed continuously and documented in the flowchart. During treatment in the ICU, the chest tube was not subjected to clothing, continued effective suction, and there was no seepage in the chest tube insertion area. Drain production is recorded hourly in a flow chart.

According to ERAS, patients should receive 1.5-1.7 liters of fluid per day to meet their fluid needs (Kołodziej et al., 2019). In this case, crystalloid fluids were given as much as 1500 cc/24 hours. In patients with bleeding, packed RBCs are given if Hb is less than 8 g/dL with mixed venous saturation > 60% and if Hb is < 10 g/dL with mixed venous saturation < 60%. platelet transfusion is recommended by NIH and ASA for active bleeding associated with thrombocytopenia (platelets <50,000 μ L-1) or in abnormal platelet function (Elassal et al., 2021). The patient was given a 957 cc FFP transfusion, 1090 cc PRC, 275 cc TC transfusion.

In accordance with the ERAS protocol, during post-operative care in the ICU, Prevention of Renal Stress and Acute Kidney Injury was performed. This included recording the details of urine output every hour, namely the 1st hour 160 cc, 2nd hour 50 cc, 3rd hour 55 cc, 4th hour 40 cc, 5th hour 100 cc, 6th hour 60 cc. Fluid balance: +640 cc/last 3 hours.

For collaborative medical action, administration of octaflex injection 500 iu, extra injection of vitamin K 20 mg IV and tranexamic acid 1000 mg IV was carried out. Lab tests were carried out with results within normal limits PT 15.5, INR 1.10, APTT 34.20. on to re-exploration at the sixth hour of treatment in the ICU. The re-exploration lasted one hour and 10 minutes. A source of bleeding was found from a branch of the innominate vein and oozing was found in the area of the sternum, other organs were intact. During the surgery, an additional drain was placed in the left intrapleura. Intra op bleeding re-exploration 1000 mL Urine output intraoperative re-exploration 150 cc.

Hemodynamically stable with minimal inotropic support. CTT production after re-exploration 20-50 cc/hour. post re-exploration CTT drain production decreased from before re-exploration. After re-exploration, transfusion was carried out with PRC 1049 cc FFP 967 cc and Hb post-transfusion 11.7gr/dl; hematokrit (36,0-45,0) 35,3%; platelets 86,000; coagulation factors normal ((PT 15,2; INR 1,07; APTT (21-41) 34; fibrinogen (238-498) 256 mg/dl; quantitative D-Dimer (<0,55) 0,28)). Eight hours after surgery, the doctor extubated the patient. Urine production decreased to 0.5 cc per kilogram of body weight per hour; it was decided to furosemide 10 mg/hour. With stable hemodynamics and POD 1, patient was moved to the HCCU room.

The nursing interventions during the early post-operative period are illustrated in the chart below.

The graph above illustrates the nurse's actions to closely monitor the patient's hemodynamics, diuresis, and chest tube production. In addition, the nurse also intervened immediately and appropriately according to clinical decisions, such as transfusion, medication, and fluid administration. During six hours of monitoring and intervention, with appropriate and immediate bleeding management interventions for the hemodynamic fluctuations of the mitral valve repaired patient during early post-operative period, the patient's outcome was stable.

Ethical consideration

The patient has given written informed consent. The Health and Research Committee of Dr. Hasan Sadikin Hospital approved this study (No. LB.02.01/X.6.5/298/2022).

Results

After repair-re-exploration, nurses continuously monitored the risk of shock related to hypovolemia associated with post-operative bleeding indicators. From the graph, it can be seen that post re-exploration there is a decrease in the amount of drain production. Re-exploration intervention at six hours and installation of an additional drain in the left intrapleura was able to overcome the bleeding in the patient.

Nursing evaluation is carried out based on the patient's response after nursing interventions, the results of the evaluation on the 24 hours treatment show no signs of risk of shock and the patient can be transferred to a semi-intensive room. Based on that, we conclude that patients improve with the interventions that have been given and the problem of nursing risk of shock is resolved.

Discussion

Perioperative nursing care demands an understanding of the risk factors for excessive bleeding after cardiac surgery to ensure vigilance in prioritizing and promptly addressing those that are modifiable (Lopes et al., 2015). In this case, the risk assessment of worsening is very low and the possibility of bleeding is very small. But, in this case, the patient experienced active bleeding and underwent re exploration. This is in accordance with a study that states reoperation for bleeding is generally due to technical failures, and less dependent on patients' preoperative risk factors (Zhou et al., 2020). An ICU nurse who plays a role in early post-operative period care should provide intensive care that is able to handle unexpected situations. The intensive care should be provided in early post-operative period and is related to the surgical success and adequate patient recovery (Reisdorfer et al., 2021).

Timing of re-exploration greatly affects outcome. The decision of re-exploration is a teamwork decision involving cardiac surgery and ICU physicians and finally approved by the operating surgeon (Elassal et al., 2021). With appropriate medical intervention and decisions, the patient in this case can be re-explored in the sixth hour post-operative. According to a prospective observational multicenter study in 2016, a six hour bleeding rate of 1.5 ml/kg/hour is an indicator of active bleeding in post-cardiac surgery patients (Colson et al., 2016).

A study states that delay in returning to the operating room may also lead to increased risk of morbidity and mortality (Zhou et al., 2020). Another study stated that the increased risk of in-hospital mortality is partly attributed to delays in operating room access for emergency surgeries (McIsaac et al., 2017). Quick and precise decisions for re-exploration improve patient outcomes. Poorer outcomes and increased mortality of up to 37.5% were closely associated with delayed re-exploration (>12 hours) (Colson et al., 2016).

In this case, the patient underwent cardiac surgery using a CPB (Cardio Pulmonary Bypass) machine. The use of CPB machines has several complications including System Inflammatory Response Syndrome, bleeding, pain, cardiovascular complications, pulmonary complications, neurological complications, renal complications, endocrine complications, infections, and gastrointestinal complications.

Another effect of using a CPB machine is bleeding. Heparin is applied to all parts of the

machine during CPB use to prevent massive extravascular coagulation. During using the CPB machine, the body temperature is lowered by 28-32 degrees Celsius to lower the body's metabolism. After completion of the use of the CPB machine, protamine is given as an antidote to heparin. When the patient enters the ICU room, the patient's condition is still hypothermic so it must be warmed up immediately. Hypothermic conditions make coagulation factor enzymes unable to work optimally. But when the body temperature has returned to normal, heparin is reactivated, increasing the risk of bleeding (Urden et al., 2014).

In these patients, CPB time was 116 minutes. To minimize the occurrence of unfavorable adverse outcomes, it is recommended that the CPB/graft time and cumulative CPB time be kept below 56 minutes and 180 minutes, respectively (Madhavan et al., 2018). CPB time in this case is within the normal range. In these patients, with a normal CPB time range, it is hoped that complications can be minimized. By looking at the CPT time still within the normal range and normal coagulation factors, the decision to re-explore is the right action in handling bleeding cases due to surgical factors.

Monitoring of nursing interventions in this case uses invasive and non-invasive hemodynamic parameters. Invasive monitoring used is Invasive Blood Pressure, central venous pressure, and pulmonary artery pressure. Non-invasive monitoring includes Mean Blood Pressure, heart rate, and urine output. In the first two hours in the ICU, there was no change in vital signs. In the third hour, heart rate started to rise, CVP rose either due to the effect of loading or there was intrathoracic pressure due to the production of a lot of drain that had not been released. In the third hour, when the MAP dropped, the patient was given resuscitation fluid, namely colloidal fluid as much as 2000 cc. After resuscitation, the patient's hemodynamic monitoring parameters were still within the normal range.

Fluid administration is a powerful tool for hemodynamic stabilization as it increases preload and improves cardiac function in fluid-responsive patients (Bignami et al., 2017). Cardiac surgery and CPB elicit a systemic inflammatory response which produces a capillary leak. Therefore, fluid resuscitation with crystalloids and/or colloids is necessary to offset the hemodynamic consequences of the capillary leak and the vasodilation that occurs from rewarming and vasodilating drugs. However, the maintenance of intravascular volume in the leakage phase occurs at the expense of expansion of the interstitial space (Roekaerts & Heijmans, 2012).

Managing bleeding in cardiac surgery poses a considerable challenge (Pearse et al., 2019). In the management of bleeding after cardiac surgery, PRC transfusion must be managed according to protocol and determined by the clinical status of the patient. In this case, the patient was given PRC transfusion with a laboratory result of 5.4 g/dl. A study mentioned Packed RBC is given if Hb is less than 8 g/dl with mixed venous saturation >60% and if Hb <10 g/dl with mixed venous saturation <60% (Elassal et al., 2021). Allogeneic RBC transfusion is unlikely to improve oxygen transport when the hemoglobin concentration is greater than 10 g/dL and is not recommended (class III: no benefit; level B-R) (Huang et al., 2021).

However, the indiscriminate use of blood products in cardiac surgery has been associated with increased risk of infection, increased need for mechanical ventilation, increased organ failure, longer length of hospital stay, and higher mortality rates. Although blood transfusion may become imperative for the management of postoperative cardiac surgery patients, several efforts have been made to restrict and standardize transfusion practice and improve outcomes for patients (Moraes et al., 2021). Therefore, transfusion monitoring is very important in the post-operative management of cardiac surgery patients. In the intervention that has been carried out, the administration of transfusion is in accordance with medical indications and during the monitoring of transfusion administration no transfusion reaction was found.

Medication administration in bleeding management is done collaboratively. Nurses must understand how to administer drugs and the side effects that may occur after injection. Hemostatic medications play a vital role in the management of perioperative bleeding (Elassal et al., 2021). In this case, the patient was given medications, namely octaflex injection 500 iu, extra injection of vitamin K 20 mg IV and tranexamic acid 1000 mg IV. A decrease in the incidence of allogeneic blood transfusion and re-exploration rate is associated with the use of tranexamic acid (Miles et al., 2022; Myles et al., 2017).

Morbidity and mortality are significantly associated with the incidence of rebleeding after cardiac surgery (Elassal et al., 2021). Therefore, post-re-exploration monitoring for signs of bleeding should be improved. A study mentioned that re-exploration for bleeding was significantly associated with longer ICU stay, hospital stay, and increased incidence of SWI. A higher mortality rate was found in patients who underwent re-exploration (15.4%) (Elassal et al., 2021). However, in this case, the patient's prognosis improved after undergoing re-exploration.

Conclusions

The implementation of post-operative nursing bleeding management in patients with mitral valve repair-re-exploration during the early post-operative period includes performing supporting laboratory examinations; monitoring hypotension; monitoring urine production; performing chest tube care; providing blood transfusions; fluid management and collaboration for re-exploration provides good clinical outcomes. Effective collaboration (multi-

disciplinary teams) between cardiac surgeon, perfusionist, anesthetist, clinical pharmacist, and nurse is required to prevent and manage post-operative bleeding.

Declaration of Interest

The authors have no conflict of interests.

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Data Availability

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