Section: Anaesthesia

Original Research Article

ASSESSMENT OF EFFECT OF TXA IN OFF-PUMP CARDIAC SURGERY PATIENTS

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Abstract

Background: To investigate the effect of TXA in off-pump cardiac surgery (OPCAB) patients. **Materials and Methods:** Sixty patients scheduled to undergo OPCAB of both genders were randomly assigned to 2 groups. Group I received TXA and group II received placebo. TXA was administered intravenously at a dose of 15 mg/kg before the start of surgery and a second dose of 15 mg/kg at the end of surgery. Placebo was also administered in the same manner. Parameters such as the amount of blood loss during surgery, the need for blood transfusions, length of hospital stay, the incidence of perioperative complications and mortality was recorded. **Result:** Group I comprised of 20 males and 10 females and group II 18 males and 12 females. The mean blood loss in group I was 625.0 ml and in group II was 694.4 ml. The difference was significant (P< 0.05). Fresh frozen plasma (FFP) was required in 2 patients in group I and 5 in group II. Packed cell (PC) was required in 2 patients on group I and 6 in group II. A significant difference was found (P< 0.05). The mean stay in hospital was 8.11 days in group I and 9.14 days in group II. The mean stay in ICU was 3.38 days in group I and 4.61 days in group II. A significant difference was found (P< 0.05). Complications observed were infection in 1 patient in group I and 3 patients in group II. Intra-operative bleeding was seen in 2 in group I and 5 in group II. Pericardial effusion was observed in 2 patients in group II. A significant difference was found (P< 0.05). 1 patient in group I died due to cardiac arrest on 8th post-operative day. 3 patients in group II died due to cardiac arrest on 6th post-operative day. A significant difference was found (P< 0.05). **Conclusion:** TXA found to be effective in reducing bleeding and the need for blood transfusions in OPCAB. It reduced complications as compared to placebo.

INTRODUCTION

Bleeding and blood infusions are common during coronary artery bypass graft (CABG) surgeries. Cardiopulmonary bypass (CPB) initiated during cardiac surgery was demonstrated to activate clotting, exhaust coagulation factors, and cause platelet dysfunction and excessive fibrinolysis.[1,2]

Off-pump cardiac surgery (OPCAB) has become a popular alternative to traditional on-pump cardiac surgery due to its perceived benefits of reduced morbidity and mortality, shorter hospital stays, and reduced costs. However, bleeding remains a major concern in OPCAB, and blood transfusions are often required, which can lead to complications such as infection, transfusion reactions, and increased hospital stays.[3,4]

Antifibrinolytic agents that have been used in patients who underwent cardiac surgery include aprotinin and the lysine analogs tranexamic acid (TXA). The TXA was revealed to have excellent hemostasis effects in cardiac surgeries without significant thromboembolic events. Many clinical trials have demonstrated the effectiveness of TXA to maintain hemostasis in on-pump CABG. Tranexamic acid (TXA) has been shown to reduce bleeding and the need for blood transfusions in various surgical procedures, including cardiac surgery. However, the optimal dose and timing of TXA in OPCAB remain unclear. Therefore, this prospective randomized controlled trial aimed to investigate the effect of TXA in off-pump cardiac surgery (OPCAB) patients.[5,6]

MATERIALS AND METHODS

In this prospective randomized controlled trial, we included sixty patients scheduled to undergo OPCAB of both genders after considering the utility of the study and obtaining approval from ethical

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review committee. Patients' consent in vernacular language was obtained before starting the study.

Demographic data, baseline characteristics such as name, age, gender etc. was recorded in case sheet proforma. Patients were randomly assigned to 2 groups. Group I received TXA and group II received placebo. TXA was administered intravenously at a dose of 15 mg/kg before the start of surgery and a second dose of 15 mg/kg at the end of surgery. Placebo was also administered in the same manner. The primary outcome measure was the amount of blood loss during surgery. Secondary outcome measures included the need for blood transfusions, the incidence of perioperative complications, length of hospital stay, and mortality. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Group I comprised of 20 males and 10 females and group II 18 males and 12 females [Table 1].

Table 1: Patients distribution

Groups	Group I	Group II
Agent	15 mg/kg TXA	Placebo
M:F	20:10	18:12

Table 2: Comparison of blood loss (ml)

Groups	Mean (ml)	P value
Group I	625.0	0.021
Group II	894.4	

The mean blood loss in group I was 625.0 ml and in group II was 894.4 ml. The difference was significant (P< 0.05) [Table 2].

Table 3: Type of blood products used

Blood products	Group I	Group II	P value
None	26	19	0.05
Fresh frozen plasma (FFP)	2	5	0.02
Packed cell (PC)	2	6	0.01

Fresh frozen plasma (FFP) was required in 2 patients in group I and 5 in group II. Packed cell (PC) was required in 2 patients on group I and 6 in group II. A significant difference was found (P< 0.05) [Table 3].

Table 4: Comparison of hospital and ICU stay

Parameters	Group I	Group II	P value
Hospital stay (days)	8.11	9.14	0.02
ICU stay (days)	3.38	4.61	0.01

The mean stay in hospital was 8.11 days in group I and 9.14 days in group II. The mean stay in ICU was 3.38 days in group I and 4.61 days in group II. A significant difference was found (P< 0.05) [Table 4].

Table 5: Comparison of complications

Complications	Group I	Group II	P value
Nil	27	20	0.04
Infection	1	3	0.05
Intra- operative bleeding	2	5	0.01
Re-explored - Pericardial effusion	0	2	0.04

Complications observed were infection in 1 patient in group I and 3 patients in group II. Intra- operative bleeding was seen in 2 in group I and 5 in group II. Pericardial effusion was observed in 2 patient sin group II. A significant difference was found (P< 0.05) [Table 5].

Table 6: Comparison of mortality

Groups	Number	P value
Group I	1	0.05
Group II	3	

1 patient in group I died due to cardiac arrest on 8th post- operative day. 3 patients in group II died due to cardiac arrest on 6th post- operative day. A significant difference was found (P< 0.05) [Table 6].

DISCUSSION

Although CPB avoidance during off-pump CABG (OPCAB) could reduce the blood exposure risk, hypothermia, acidosis, and tissue trauma still contributes to inadequate hemostasis during OPCAB. During OPCAB, serious trauma (sternotomy, internal mammary artery or saphenous

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vein graft harvesting, pericardiotomy, and heart manipulation) and heparin and protamine exposure activate coagulation by releasing tissue factors and activating extrinsic pathways. Therefore, blood transfusions are still needed for OPCAB, and complications after blood infusion have become one of the main concerns with OPCAB. A greater activation level of fibrinogen and other acute-phase proteins has been observed in OPCAB compared with on-pump CABG, which may lead to higher thromboembolic event risk in OPCAB. Therefore, the safety profiles of TXA in OPCAB should be further considered. The present study aimed to investigate the effect of TXA in off-pump cardiac surgery (OPCAB) patients.[7-9]

In our study, Group I comprised of 20 males and 10 females and group II 18 males and 12 females. Khadanga et al assessed the effectiveness of tranexamic acid (TxA) in reducing blood loss and related perioperative complications in 60 patients undergoing OPCABG. Patients were assigned in intervention group (I) who received TxA 10 mg/kg over 10 minutes at the time of induction and control group (C) who did not receive any TxA. Results of the study demonstrated that the mean volume of postoperative blood loss in the I group was 352.67 ml and 86.83 ml at 24 hours and 48 hours, respectively. The mean volume of postoperative blood loss was 602.00 ml and 166.3 ml at 24 hours and 48 hours, in group C respectively. A statistically significant difference in the postoperative chest drainage output between the groups was observed. There was no significant difference in blood transfusion requirements in both of the groups. The mean duration of postoperative complications, inotropic support, intermittent positive pressure ventilation, intensive care, and hospital stay were also comparable depicting no significant effect of TxA on reducing the perioperative morbidity.[10-13]

Our results showed that the mean blood loss in group I was 625.0 ml and in group II was 894.4 ml. Fresh frozen plasma (FFP) was required in 2 patients in group I and 5 in group II. Packed cell (PC) was required in 2 patients on group I and 6 in group II. In a study by Jerath et al, it was found that renal dysfunction could also influence the TXA concentration, which remained elevated above the therapeutic threshold for ~12 hours in high-risk cardiac surgeries.[14,15]

Our results showed that the mean stay in hospital was 8.11 days in group I and 9.14 days in group II. The mean stay in ICU was 3.38 days in group I and 4.61 days in group II. Wang et al studied hemostasis associated with TXA administration during OPCAB in 18,380 patients. Off which 10,969 were in the TXA group and 7,411 patients were in the no-TXA group. Tranexamic acid administration did not increase the risk of hospital death or thromboembolic events. TXA group had less blood loss at 24 hours (478.32 ± 276.41 vs. 641.28 ± 295.09) and 48 hours (730.59 ± 358.55 vs. 915.24 ± 390.13) and total blood loss (989.00 ± 680.43 vs. 1,220.01 ± 720.68) after OPCAB than the patients with non-TXA. In the study of Mehr-Aein and co-workers, 15% of patients were transfused in the TxA group while 36 % in the control groups which was highly significant.[16,17]

In our study, complications observed were infection in 1 patient in group I and 3 patients in group II. Intra- operative bleeding was seen in 2 in group I and 5 in group II. Pericardial effusion was observed in 2 patients in group II. In our study, 1 patient in group I died due to cardiac arrest on 8th post-operative day. 3 patients in group II died due to cardiac arrest on 6th post- operative day. Casati V et al in their study 1,250 patients underwent OPCAB and the results showed that TXA was not associated with post-operative death or thrombotic events. Although a greater activation level of fibrinogen and other acute-phase proteins was observed in OPCAB compared with on-pump CABG.[17]

CONCLUSION

TXA found to be effective in reducing bleeding and the need for blood transfusions in OPCAB. It reduced complications as compared to placebo.

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