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EFFICACY OF TRANEXAMIC ACID IN TOTAL KNEE REPLACEMENTS IN INDIAN POPULATION

Ganesan. Ganesan Ram*, Thudukuchi Ramanathan Ashok, Perumal. Suresh, Vijayaraghavan Phagal Varthi

Sri Ramachandra Medical Collage, Porur, Chennai-600116, Tamilnadu, India.

ABSTRACT

To study the role of tranexamic acid in control of blood loss in total knee replacement surgeries. Prospective study of 180 patients who underwent total knee replacement in Sri Ramachandra Medical Centre from June 2010 to june2013. Patients were divided into two group's study and control groups. 1 gram of tranexamic acid in 200 ml of saline is given 20 minutes before release of tourniquet. Second dose and third dose were given at 3hrs and 6 hrs after the initial dose, irrespective of timing of surgery. Intra op blood loss was calculated by two methods, one was from haematocrit values and other was by observation of mops, drain and field loss. The average intra op blood loss in patients in study group was 627.71 ml and in control group was 726.98 ml. In bilateral total knee replacement cases the blood loss in study group was 792.50 ml and in control group was 610.20 ml. The study group patients needed 30 transfusions while patients in control group had 90 blood transfusions. Tranexamic acid given intravenously at the beginning of the operation was an efficient and cost-effective way to reduce blood loss in total knee replacement surgeries. Tranexamic acid also significantly reduces the need for allogeneic blood transfusions.

Key words: Total knee replacement, Tranexamic acid, Blood loss.

INTRODUCTION

An increase in postoperative bleeding on removal of the pneumatic tourniquet has been described in major surgeries and is attributed to an activation of the fibrinolytic system in the first hours after surgery (Jansen AJ *et al*., 1999; Fahmy NR, Patel DG, 1981; Risberg B, 1985). The effect is positive in so far as it reduces the risk of thromboembolism in orthopaedic surgery but it can also increase postoperative bleeding which in turn frequently causes the need for blood transfusions. Medication that reduces hyperfibrinolysis could be administered to reduce blood loss but the increased risk of thromboembolic complications must be taken into account. In this study we are analysing the effect of treatment with tranexamic acid, a fibrinolytic inhibitor on blood loss and blood transfusion requirements.

Corresponding Author

Dr. Ganesan. Ganesan Ram
Email: ganesangram@yahoo.com

MATERIALS AND METHODS

Prospective study of 180 patients who underwent total knee replacement in Sri Ramachandra Medical Centre from June 2010 to june2013. The inclusion criteria were patients undergoing total knee replacement with Hb more than 10 and coagulation profile within normal limits. The exclusion criteria were patients with bleeding disorders, thrombotic episodes and haematological disorders. We had 54 males and 122 female patients. Patients were divided into two group's study and control groups. 94 knees were in study group and 86 knees were in control group. We had 4 patients who underwent bilateral total knee replacement, whose one side knees were taken as control while other side knee were taken as study group. All the TKR were done under tourniquet.

If the weight of patient was more than 60 kgs tranexamic acid of one gram in 200ml of saline was given over 10 to 15 min .It was given 20 minutes before release of tourniquet . If weight of patient was less than 60 kgs half the above dose was given in same pattern. Second

dose and third dose were given at 3hrs and 6 hrs after the initial dose, irrespective of timing of surgery. Second and third dose were given predominantly to control post op bleeding. Intra op blood loss was calculated by two methods, one was from haematocrit values and other was by observation of mops, drain and field loss. Mean of those two was taken as intra op blood loss.

Calculation of intra op blood loss using haematocrit

Actual Blood Loss(ABL)

- **ABL=BV{Hi-Hf}/Hm**
- Hi-PCV Initial
- Hf-PCV Final
- Hm-PCV Mean
- BV-Blood Volume-Body Wt x 70

Estimated Blood Loss(Ebl)

- Swab Weight&Gauze Weight
- Suction Bottle Volume
- Field Loss

Post op blood loss calculated from collection from suction drain during first and second post op day. Blood transfusion both intra op and post op was noted. Each transfusion was prescribed with regard to the patient's cardiovascular history, present status, and fall in Hb level, rate of blood loss and age. As a rule of thumb, we consider blood transfusion when Hb is below 8.5 g/l. We used no routine screening for thrombosis, but all clinically suspected thromboembolic complications in the first six weeks were investigated further.

RESULTS

The average intra op blood loss in study group was 627.71 ml and in control group was 726.98 ml. The average post op drain 1st post op day was 478 ml in control and 287 ml in study group. Similarly 2nd post op day drain was 87 ml in control and 34 ml in study group. There was nearly 15% less blood loss in TKR study group compared to their control. Similarly there was nearly 44% less post op drain on 1st pod in TKR study group respectively. In bilateral total knee replacement cases the blood loss in study group was 792.50 ml and in control group was 610.20 ml. The study group patients needed 30 transfusions while patients in control group had 90 blood transfusions.

Table 1. T-Test for Blood loss in TKR

Group	N	Mean	Std.Dev	Std.Error Mean
Control	86	726.981	248.235	37.855
Study	94	627.717	255.278	37.236

Table 2. Mann-Whitney Test for Blood loss in TKR

	Blood loss	POD 1
Mann-Whitney U	757.000	964.500
Wilcoxon W	1885.000	1910.500
Z	-2.048	-.372
Asy.Sig(2-Tailed)	.041	.710

DISCUSSION

Blood is a finite resource with a limited shelf life and is associated with considerable processing costs (McSwiney MM *et al*., 1993). Utilization of this resource needs critical review to identify areas of overuse and thus reduce risk to patient and hospital costs. Risks of homologous transfusion vary in type and severity. Morbidity and mortality may result from either an immunologically mediated reaction or a transmitted infection. Perioperative transfusion triggers for RBCs include physiologic signs of inadequate oxygenation of the entire or of a specific organ, haemoglobin concentration and logistic aspects such as experience of anaesthesiologists and surgeons, predictability of blood loss and time required for a haemoglobin determination and RBC delivery (Spahn DR, 2000).

Tranexamic acid (Ho K, Ismail H, 2003; Zohar E *et al*., 2004; Yamasaki S *et al*., 2005) given intravenously at the beginning of the operation, was an efficient and cost-effective way to reduce blood loss in total knee replacement surgeries. Tranexamic acid also significantly reduces the need for allogeneic blood transfusions. In total knee arthroplasties, total blood loss was 897 ml in the group that received antifibrinolytic agents and 989ml in the control group, which was comparable to study the conducted by Camarasa MA *et al*., (2006). They had a total blood loss was 1099 ml in the group that received antifibrinolytic agents and 1784 ml in the control group. In their study both intra and post op blood loss was added .From tables 1, 2 it was clear that the blood loss was statistically significant when tranexamic acid was used.

The total blood loss for both study and control patients, however, was less than in the previous study. This discrepancy may be due to differences in surgical and anaesthetic techniques in the previous studies, the administration of colloids, with their potential effect on blood loss, differed between study and control patients. This possible source of error was decreased in our prospective work. To measure accurate amount of blood loss, two methods of calculation of blood loss were

followed and mean of those two was taken as intra op blood loss. It was observed that blood loss calculations by haematocrit values were more accurate than the observation technique because of the wide variation between observers.

In 4 patients who underwent bilateral TKR, where one knee was used as study and the other was used as control there was a significant reduction of blood loss on the study. There was a major reduction in post op drain collection in the study group which reduces post op blood loss though statistically not significant it was clinically observed that post op drain in first 24 hrs in the study group was reduced nearly by 48% .

The prophylactic administration of tranexamic acid significantly reduced the postoperative and total blood losses. In knee arthroplasties, tranexamic acid also reduced the number of blood transfusions. Likewise, in our study, we found a 150% reduction in the number of blood transfusions in patients receiving tranexamic acid. There was a considerable reduction of transfusions in post op period hence there was a reduced hospitalization cost and risk of transmitted infections and transfusion reactions.

We did not routinely conduct screening for thrombosis in our study. Previous research on tranexamic acid and thrombosis has failed to show any thrombogenic effect, even in patients who were treated for several days or even weeks Hedlund PO *et al*., (1969). This may be due to the fact that fibrinolytic activity in vein walls is not affected by tranexamic acid. Thrombosis prophylaxis using low-molecular-weight heparin delayed the onset of thromboses to the fourth or fifth postoperative day. For these reasons we consider it highly unlikely that we would have been able to show any thrombogenic effect of the administration of tranexamic acid.

Defining transfusion triggers for red blood cell transfusions is important to avoid unnecessary RBC transfusions and equally to avoid under transfusion in situations where RBC transfusions may be beneficial. The American College of Physicians recommended that RBC transfusions should be done unit by unit and the patient should be evaluated between each transfusion. In their study of patients undergoing curative surgery Tartter and Barron (1985) concluded that excessive intraoperative transfusion and the practice of administering blood without re-evaluating the haematocrit in between resulted in 90% of the unnecessary transfusions. They further recommended that the determination of the haematocrit immediately before administration of each unit would reduce blood consumption by 25% (Naveen, Manickam P, 2006). Similarly our study revealed blood loss calculated by haematocrit values are more accurate than by observational methods.

REFERENCES

Camarasa MA, Olle´1 GM. Efficacy of aminocaproic, tranexamic acids in the control of bleeding during total knee replacement: a randomized clinical trial. Serra-Prat2. *British Journal of Anaesthesia,* 96(5), 2006, 576–582.

Fahmy NR, Patel DG. Hemostatic changes and postoperative deep-vein thrombosis associated with use of a pneumatic tourniquet. *J Bone Joint Surg Am,* 63-A, 1981, 461–465.

Hedlung PO. Antifibrinolytic therapy with Cyklokapron in connection with prostatectomy: a double blind study. *Scand J Urol Nephrol,* 3, 1969, 177–82

Ho K, Ismail H. Use of intravenous tranexamic acid to reduce allogeneic blood transfusion in total hip and knee arthroplasties: a meta-analysis. *Anaesth Intensive Care,* 31, 2003, 529–37.

Jansen AJ, Andreica S, Claeys M, D'Haese J, Camu F, Jochmans K. Use of tranexamic acid for an effective blood conservation strategy after total knee arthroplasties. *Br J Anaesth,* 83, 1999, 596–601.

McSwiney MM, O'Farrell D, Joshi GP, Mc Carroll SM. Blood Transfusion in Total Hip Athroplasty: Guidelines to eliminate over transfusion. *Can J Anaesth,* 40(3), 1993, 222-226.

Naveen, Manickam P. Perioperative blood loss assessment- how accurate? *Indian J anesthesia*, 2006.

Risberg B. The response of the fibrinolytic system in trauma. *Acta Chir Scand,* 522, 1985, 245–71

Spahn DR. Perioperative Transfusion Triggers for Red Blood Cells. *VoxSanguinis,* 78(2), 2000, 163-166.

Tartter PI, Barron DM. Unnecessary blood transfusion in elective colorectal cancer surgery. *Transfusion,* 25, 1985, 113-115.

Yamasaki S, Masuhara K, Fuji T. Tranexamic acid reduces postoperative blood loss in cementless total hip arthroplasties. *J Bone Joint Surg Am*, 87, 2005, 766–770.

Zohar E, Ellis M, Infract N, Stern A, Sapir O, Freedman B. The postoperative blood-sparing efficacy of oral versus intravenous tranexamic acid after total knee replacement. *Anaesth Analg,* 99, 2004, 1679–183.