Original Article

To Study the Role of The Effect of Peroperative Tranexamic Acid on Blood Loss in Major Surgeries Around Hip - A Prospective Study

Dr. Gagandeep Gupta[1], Dr. Divanshu Goel[2], Dr. Dhruv Gautam[3]*, Dr. Jashandeep Singh Chahal[4]

[1]*Professor, Department of Orthopaedics, Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana, Ambala (Haryana), India
[2,4]PostGraduate Student, Department of Orthopaedics, Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana, Ambala (Haryana), India
[3]*Senior Resident Department of Orthopaedics, Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana, Ambala (Haryana), India

***Corresponding Author:** Dr. Dhruv Gautam

*Senior Resident Department of Orthopaedics, Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana, Ambala (Haryana), India House No. 222, Sector – 2, HUDA Rohtak-124001, Haryana (India) Email: dhruvs377@gmail.com
DOI: 10.47750/pnr.2022.13.S08.436

Abstract

Introduction: Blood conservation plays a very important role in the care of a patient with lower extremity joint replacement and other surgeries. The procedure mandates consideration as major orthopaedic surgeries are associated with significant amount of blood loss both during and after surgery. Tranexamic acid (TA), a drug used to reduce perioperative blood loss, has been touted as a valuable adjunct to many perioperative blood conservation protocols.

Aim and Objective: To find out the significance of Tranexamic acid in minimizing the peroperative and postoperative blood loss in major surgeries around hip and to compare the blood loss calculated by conventional method with mean of preoperative and postoperative haemoglobin levels.

Material and Method: This study includes 40 patients all above 18 years of age operated for open reduction & internal fixation and fracture around hip and hip replacement surgeries such dynamic hip screw, proximal femoral nailing, total hip arthroplasty, hemiarthroplasty. Group A consist of 20 patients in which tranexamic acid was given and group B consist of 20 patients in which tranexamic acid was not given. Peroperative tranexamic acid was given and blood loss was measured by number of mops soaked, suction and drain collection and postoperatively haemoglobin levels were compared with preoperative haemoglobin levels and blood loss was measured in both the groups.

Result: In the present study of 40 cases, the role of tranexamic acid in group A had significantly less blood loss as compared to group B.

Keywords: Tranexamic acid, surgeries around hip, blood loss

INTRODUCTION

Majority of orthopaedic procedures result in significant blood loss which increase the morbidity and mortality, especially in patients with low haemoglobin level prior to surgery. As a result, of blood loss in the elective orthopaedic surgeries blood transfusion rates vary from 11% to 65% depending upon the type of surgery[1]. The risk of infection, immune suppression, allergic manifestations, anaphylaxis, volume overload, transfusion related lung injury etc. is not uncommon even with compatible transfusions[2]. The successful outcomes around hip surgeries require adequate intra operative haemostasis in order to avoid haematoma formation and minimize blood loss through suction drains. Achieving satisfactory post operative range of movements also depends on soft tissue haemostasis. Persistent bleeding after surgery can cause pain, haematoma formation, seroma formation and arthrofibrosis leading to sub optimal outcomes after surgeries. So, it is important to consider minimise blood loss during surgeries around the hip joint. Anaemia in patients with trochanteric fracture is associated with increased morbidity and mortality and it is an independent risk factor for functional mobility of patients. Several authors have reported the blood loss following operative treatment comparing different fixation systems but few authors have evaluated many associated variables that could influence the perioperative blood loss[3]. Total Hip Replacement (THR) Arthroplasty is a surgical procedure, which has relieved millions of people from incapacitating pain arising from the hip joint[5]**.** THR is associated with significant peri-operative bleeding that can cause hematomas and sometimes acute anaemia requiring blood transfusion with potential risks and costs[4]. Efforts have been made to develop biological methods of haemostasis during the procedure. Tranexamic acid is good haemostatic drug. Tranexamic acid (TXA) is a synthetic lysine analogue with antifibrinolytic activity-it inhibits the conversion of plasminogen to plasmin, an enzyme that breaks down fibrin-containing blood clots.

By stabilizing these clots, TXA reduces active bleeding. TXA is currently being used in orthopaedic surgery through the intravenous (IV) route during hip and knee arthroplasty procedures either for primary and revision. Its efficacy has been demonstrated in recent studies[6,7]; it reduces total peri-operative blood loss and the need for blood transfusion without increasing the risk of deep vein thrombosis or pulmonary embolism. Tranexamic acid is gaining wide attention from surgeons because of its low cast, easy access and use. There are several studies supporting the use of tranexamic acid in major surgeries around hip. This study will be aimed to ascertain the effectiveness of tranexamic acid in minimizing the intra operative and post operative blood loss in major surgeries around the hip joint.

MATERIAL AND METHODS

This study consisted of 40 patients operated for open reduction & internal fixation and fracture around hip and hip replacement surgeries at Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana, Ambala between September 2020 and September 2022 who were above 18 years of age in which the effect of tranexemic acid on blood loss around major hip surgeries like dynamic hip screw, total hip replacement and hemiarthroplasty in adult was observed. Patients weredivided into two groups 1 control group and 1 study group. 20 subjects in control group Tranexamic acid will not be given and 20 subjects in study group tranexamic acid will be given. In operative technique injection tranexamic acid was administered 40 TO 45 minutes prior to surgery in a dose of 15mg/kg as bolus injection given slowly intravenously over 5 minutes.The heart rate, respiratory rate and blood pressure was checked and charted intraoperatively and postoperatively.Intra operatively blood loss was calculated by weighing the sponges used and soiled by blood during surgery and measuring the amount of blood used in suction apparatus used during surgery. Blood loss from sponges was measured from size of a sponge and blood soaked in it. 10*10 cm sponge if 25% soaked contains 3ml blood, 50% soaked contains 6ml blood and 100% soaked 12ml blood[8]. Blood loss estimation from suction was calculated by amount of normal saline used via suction during surgery and subtracting it from total amount of blood plus saline in jar. Intraoperative blood loss was calculated by adding both blood loss from suction and blood loss from sponge. Post operative blood loss was evaluated with help of evacuation drainage which was turned onto active suction after 4 hours from the operative period and left on for 48 hours. Haemoglobin levels at postoperatively second day was evaluated. The haemoglobin level was assessed post operatively and was compared with preoperative haemoglobin level, mean was taken of both preoperative and postoperative haemoglobin. Mean haemoglobin was compared with intraoperative blood loss. 1gm% increase in haemoglobin by transfusing 1 unit of blood[9] and 1 unit of blood contains 350ml blood so 0.1gm% increase in haemoglobin is by 35ml of blood.

RESULTS

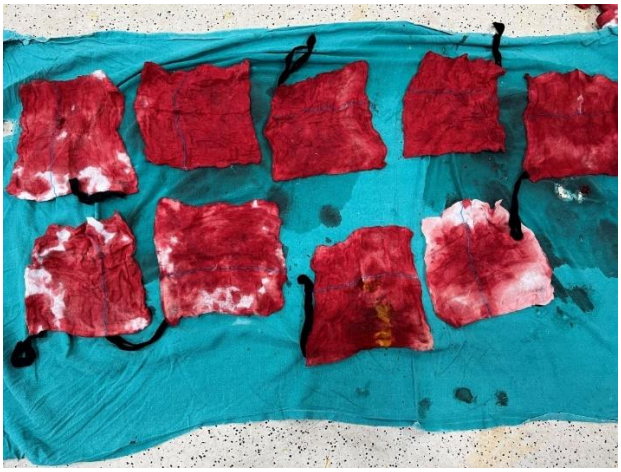
Intra operative blood loss was significantly less in group A as compared to group B. There could probably be attributed that the amount of soft tissue and bone dissection involved in surgeries such as proximal femoral nailing, cannulated cancellous screw fixation or dynamic hip screw is less as compared to total hip replacement or hemiarthroplasty is more and the increased duration of surgeries. As these surgeries did not involve much dissection, measurable blood loss was less and there was statistically insignificant difference between the control and case group.

It is concluded in this study that tranexamic acid is efficient in reducing blood loss during common surgeries around the hip joint.

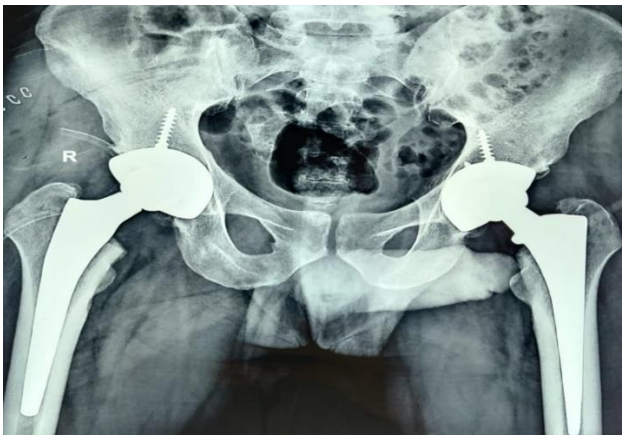
Tranexamic acid

48 hrs Post-Operative Drain Volume

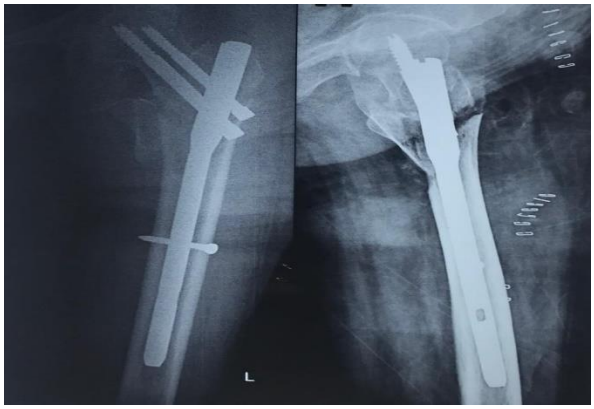
Peroperative blood loss through suction



Blood-soaked sponges

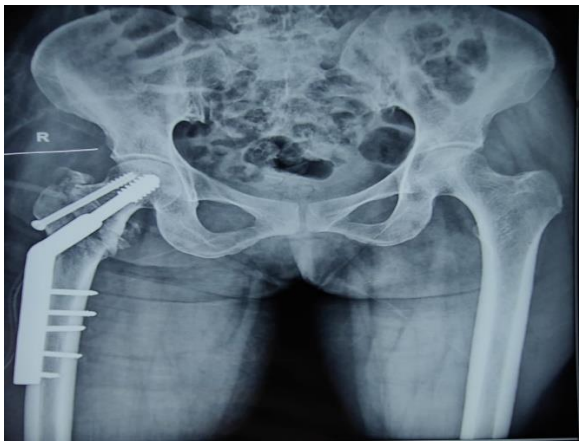


Post operative X-ray of THR



Post operative X-ray of PFN

Post operative X-ray of Bipolar Hemiarthroplasty



Post operative X-ray of DHS

DISCUSSION

One of the most common complications during major orthopaedic surgery is perioperative blood loss. Significant blood loss causes changes in hemodynamic of the patient perioperatively. In these situations, to maintain hemodynamic of the patient stable, blood transfusions become inevitable. But blood transfusion itself cause certain disadvantages like

1. Risk of transmission of infections
2. Increased chance of allergic reactions
3. Circulatory overload due to transfusion
4. Transfusion related acute inflammatory response and immunomodulation

Because of these disadvantages we have to avoid unnecessary blood transfusion. For that we have to reduce blood loss during surgical procedures. Increased fibrinolytic activity is one of the reasons for blood loss perioperatively. So, the use of an antifibrinolytic drug may cause reduction in perioperative blood loss. One of the most widely used antifibrinolytic is Tranexamic acid. Other antifibrinolytic agents are Epsilon Amino Caproic Acid and Aprotinin. So many studies are conducted to know the efficacy of tranexamic acid in reducing the blood loss.

In study about the efficacy and safety of prophylactic large doses of tranexamic acid in spine surgery. This study showed that prophylactic use of large doses of tranexamic acid provides an effective safe and cheap method for reducing blood loss during and after spine operation. It helps in reducing transfusion related complications.[10]

A similar study was conducted byto see the effect of tranexamic acid on hip fracture surgery. They concluded that tranexamic acid group has significantly lower perioperative blood loss.[11]

In study about whether tranexamic acid reduces postoperative blood loss in cementless total hip arthroplasty. Their study showed that the greatest reduction in blood loss was observed during the first four hours of surgery in the tranexamic acid group. So, they concluded that in patients undergoing total hip arthroplasty without cement, preoperative administration of tranexamic acid is associated with decreased postoperative blood loss during the first 24 hours, especially during the first four hours after surgery.[12]

In their study concluded that tranexamic acid may promote hypercoagulable state but contrary to this in our study, we did not notice any incidence of deep vein thrombosis. This result of ours could be explained based on the research on tranexamic acid by Hippala et al which states that fibrinolytic activity in vein was not affected by tranexamic acid. It should be noted here that tranexamic acid does not promote clot formation but simply stabilizes the clot that has formed.[13]
Drain was not used in the case of proximal femoral nail fixation and dynamic hip screw fixation. So, we could not quantify the amount of post operative blood loss in these cases. In total hip replacement and hemiarthroplasty series we found a significant decrease in the post operative blood loss as well.

The need for blood transfusion was not compared, since no clear parameters had been defined in either group for the indications for transfusion and, therefore, was susceptible to bias. But we found that transfusion requirement was less in cases when tranexamic acid was used.

CONCLUSION

We conclude that, as tranexamic acid reduced the intra and post-operative bleeding in our patients who underwent various hip surgeries, its use can be extended to other major orthopaedic surgeries. Prophylactic use of tranexamic acid also provides effective, safe and economical method for reducing blood loss and also in reducing the financial burden in terms of expenses incurred on blood transfusion. Tranexamic acid helps in reducing blood transfusion complications.

BIBLIOGRAPHY

1. Fegan BG, Wong CJ, Johnston WC, Rellano R, Colterjohn N. Transfusion Practices for elective Orthopaedic surgery. CMAJ 2002:2002;166.
2. Ecker ML, Lotke PA. In: Rand JA, ed. Total hip arthroplasty. Reven, New York.
3. Ronga M, Bonzini D, Valoroso M. Blood loss in trochanteric fractures: multivariate analysis comparing dynamic hip screw and gamma nail. Available at: Doi:10.1016/S0020 1383(17)3067-5.
4. Lloyd TD, Neal-Smith G, Fennelly J, Claireaux H, Bretherton C, Carr AJ, et al. Palmer – perioperative administration of tranexamic acid in lower limb arthroplasty. Anaesthesia 2020;75(8):1050-1058.
5. Hogan CA, Golightly LK, Phong S, Dayton MR, Lyda C, Barber GR. Perioperative blood loss in total hip and knee arthroplasty: outcomes associated with intravenous tranexamic acid use in academic medical center. Available at: https://journals.sagepub.com/doi/full/10.1177/2050312116637024
6. Wei Z, Liu M. The effectiveness and safety of tranexamic acid in total hip or knee arthroplasty: a meta-analysis of 2720 cases. Transfus Med 2015;25:151-62.
7. Lin ZX, Woolf SK. Safety, efficacy and cost-effectiveness of tranexamic acid in orthopaedic surgery. Orthopaedics 2016; 39:119-30.
8. Algadiem EA, Ali A, Alsubaie HI. Blood loss estimation using Gauze visual analogue. Trauma Mon 2016;21(2):e34131.
9. Kashefi P, Rahmani A, Khalifesoltani M. Changes in the hemoglobin level after one unit of packed red blood cell transfusion in Intensive Care Unit patients. J Res Med 2018;23:85.
10. Elwatidy S, Jamjoom Z, Elgamal E, Zakaria A, Turkistani A, ElDawlatly A. Efficacy and safety of prophylactic large dose of tranexamic acid in spine surgery: A prospective, randomized, double blind, placebo-controlled study. Spine (Phila Pa 1976) 2008; 33:2577-80.
11. Sadeghi M, Mehr-Aein A. Does a single bolus dose of tranexamic acid reduce blood loss and transfusion requirements during hip fracture surgery? A prospective randomized double-blind study in 67 patients. Acta Medica Iranica 2006; 45:431
12. Yamasaki S, Masuhara K, Fuji T. Tranexamic acid reduces postoperative blood loss in cementless total hip arthroplasty. J Bone Joint Surg Am 2005; 87:766-70.
13. Zufferey PJ, Miquet M, Quenet S, Martin P, Adam P, Albaladejo P, et.al. Tranexamic acid in hip-fracture surgery. Br J Anaesth 2010;104(1):23-30.