Section: Orthopedics

Original Research Article

THE EFFECT OF TRANEXAMIC ACID ON BLOOD LOSS DURING ARTHROPLASTY SURGERY AROUND THE HIP

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Received *: 20/11/2024*
Received in revised form *: 13/01/2025*
Accepted *: 29/01/2025*

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DOI: 10.70034/ijmedph.2025.1.58

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (1); 307-310

ABSTRACT

Background: The use of haemostatic agents such as tranexamic acid has long been followed in the field of obstetrics and gynaecology, dentistry, coronary by-pass surgeries etc since the past decade which has proven extremely beneficial in controlling the blood loss during the surgeries. The use of tranexamic acid in orthopaedic surgeries on a worldwide scale has increased significantly with positive results in the recent past. The purpose of this study is to assess the beneficial effects of tranexamic acid in improving the overall outcome of the patients undergoing major surgeries around the hip joint.

Materials and Methods: In this comparative study, 74 patients who had undergone either total hip arthroplasty or hip hemiarthroplasty between November 2019 to Novemebr 2020, were divided into two groups - those who are receiving a single dose of tranexamic acid (15mg/kg body weight) and control group who did not receive the injection at the time of surgery. Blood loss was monitored by amount of blood collected in the suction drain and change in the weight of the mops used during surgery. Blood loss during the surgery and in the post-operative period were recorded. Post-operative change in haemoglobin levels were analysed.

Results: In our study comprising of 74 patients 67.57 % in the study were females and 32.43% were males with the age ranginh from 15-70 years. There was a significant difference in the number of units of blood transfused with a p value 0.0179, the mean in the test group was 0.67 SD + 0.39, and the mean in the control group was 1.35SD + 0.63. The requirement of intra operative transfusion was statistically significant, more in the group that did not receive tranexamic acid, p less than 0.05 (p=0.044). There was a significant difference in the number of units of blood transfused in the post-operative period with a p value 0.000214. The requirement of transfusion in the post-operative period was statistically significantly more in the group that did not receive tranexamic acid, p less than 0.05 (p=0.00214).

Conclusions: Blood loss during the surgery and post-operative need for blood transfusion was significantly lower in the group who received tranexamic acid pre-operatively compared to the group who did not receive tranexamic acid. Post-operative rehabilitation was significantly better and faster in the group who received tranexamic acid.

Keywords: Total hip replacement, Hemiarthroplasty, Tranexamic acid.

INTRODUCTION

With the recent advances that have taken place in the field of orthopaedics, the replacement of joints has become popular and is being done routinely.[1] In the past few years with an increase in the lifespan of individuals there has been a rise in the elderly population. Among the bone diseases, the one which

is thought to be exclusively associated with advancing age is osteoarthritis.[2] The hip joint is one of the largest joints in the body and surgery on it is not without complications. The hip joint is the second most commonly involved joint with OA preceded by the knee joint. The best available treatment in the management of osteoarthritis is replacement of the joint.[3] One of the most commonly seen problems following the replacement of the hip or knee joint by arthroplasty is the unavoidable bleeding that takes place both intra operative and post operatively which will subsequently require transfusion of blood.[4] Even though transfusion of blood is considered as of procedure that is very safe, the translation of blood is not free from side effects. Following transfusion of blood an individual can also develop any of the adverse effects that are well documented and range from the benign asymptomatic variety to a severe life threatening allergic reaction because of other components that are transfused with the blood.[5]

In order to control the amount of bleeding that occurs during surgery thus reducing the requirement of blood transfusion a number of methods have been tried. Tranexamic acid is one of the drugs that has been in use since a long time and is used to reduce bleeding in a variety of situations.[6] This drug acts by this competitive inhibition of the activation of plasminogen under normal conditions and when given at high doses it can also inhibit the activity of plasmin noncompetitively. As it as an action on the plasmin it can prevent its activation and thus the degradation of the fibrin. [Figure 1]

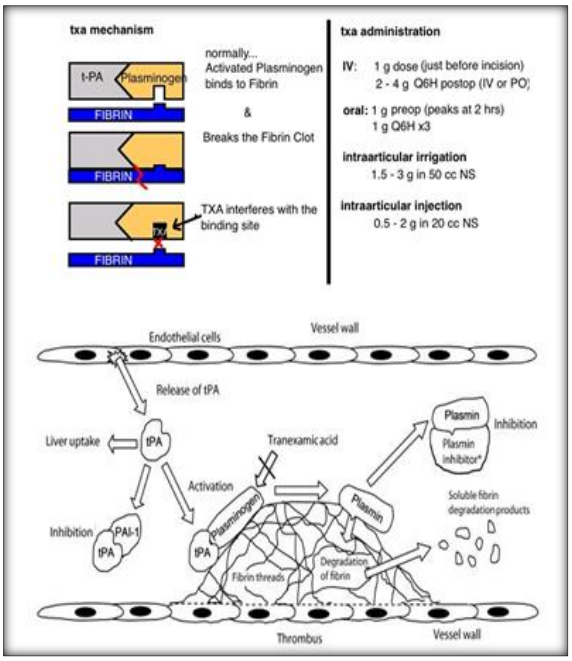

Figure 1

Recently, orthopedicians worldwide have tried tranexamic acid in a variety of surgeries including the knee and hip arthroplasties and found promising results.[7,8] Even though there is enough data on the role of tranexamic acid in knee surgeries, there is no data on its role in hip arthroplasies especially from our region. In view of this we decided to study the effect of tranexamic acid on blood loss and the rate of transfusions in hip replacements surgeries.

MATERIALS AND METHODS

This is a comparative study. The study was approved by Father Muller Medical College Institutional Ethics Committee, Mangalore (Lettter No FMMCIEC/CCM/379/2019, dated 26/10/2019). We selected 74 patients who had undergone total hip arthroplasty or hip hemiarthroplasty for a period of 2 years at the department of orthopaedics at Father Muller Medical College, Mangalore between November 2019 to Novemeber 2020 and who gave written informed consent to be enrolled in the study. Patients between the age group 18-80 years of age were selected and individuals who were allergic to tranexamic acid, who had pre-operative hepatic or renal dysfunction, bleeding disorders who were on anti-coagulants/anti platelet drugs were excluded from the study. Patients were divided into two groups - those who are receiving a single dose of tranexamic acid (15mg/kg body weight) and control group who did not receive the injection at the time of surgery. We had two equal groups of 37 cases each. Blood loss was monitored by amount of blood collected in the suction drain and change in the weight of the mops used during surgery determined by gravimetric method 100. Patients were followed up and analysed for the change in haemoglobin levels post operatively with a record of blood loss during the surgery and in the post-operative period. Collected data was analysed by frequency, percentage, mean, standard deviation and Chi-square test.

RESULTS

The mean age in the control group was 58.91 SD + 8.22 years and in the test group was 56.81 years. The age group difference between the two groups was not statistically significant with a p value less than 0.05 (0.22) . 43.24 cases were above the age of 60 years in the present study. In our study, 67.57 % were females and 32.43% were males. The gender difference between the two groups was not statistically significant with a p value less than 0.05 (p=0.18). Right side was commonly affected by pathology that needed surgery (56.76%) . The side difference between the two groups was not statistically significant with a p value less than 0.05 (p=0.18). In 50.00%, the indication for joint replacement was femoral neck fracture, avascular necrosis of femur head in 27.03% and 22.97% the indication for joint replacement osteoarthritis (Fig 2). The difference between the two groups was not statistically significant with a p value less than 0.05 (p=0.67). Hip hemi arthroplasty was done in 50%

and total hip arthroplasty was done in 50%. The difference between the two groups was not statistically significant with a p value less than 0.05 (p=0.089).

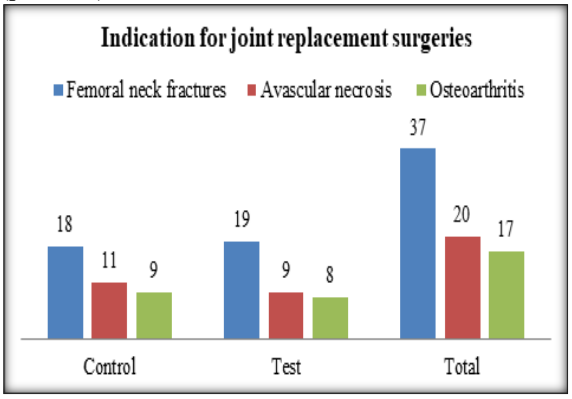

Figure 2: Indication for joint replacement surgeries

There was a significant difference in the number of blood transfusions with a p value of 0.0179, the mean in the test group was 0.67 SD + 0.39 and the mean in the control group was 1.35SD + 0.63. The requirement of intra operative transfusion was statistically significantly, more in the group that did not receive tranexamic acid with a p value less than 0.05 (p=0.044) (Fig. 3). There was a significant difference in the number of blood transfusion in post-operative period with a p value 0.000214, the mean in the control group was 0.1 and the mean in the test group was 1 (Fig. 4). 89.19% in those who received tranexamic acid requited blood transfusion as compared to 62.16%. The requirement of transfusion in post-operative period was statistically significant, more in the group that did not receive tranexamic acid with a p value less than 0.05 (p=0.00214). There was a significant difference in the amount of blood loss with a p value 0.001, the mean in the control group was 554.97 ml SD + 171.05 ml, and the mean in the control group was 397.27 ml SD + 140.69 ml. The amount of blood loss measured by gravimetric method was statistically significantly more in the group that did not receive tranexamic acid with a p value less than 0.05 (p= <0.0001).

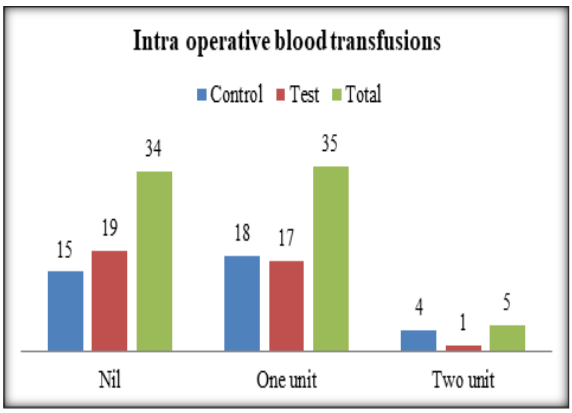

Figure 3: Intra operative blood transfusions

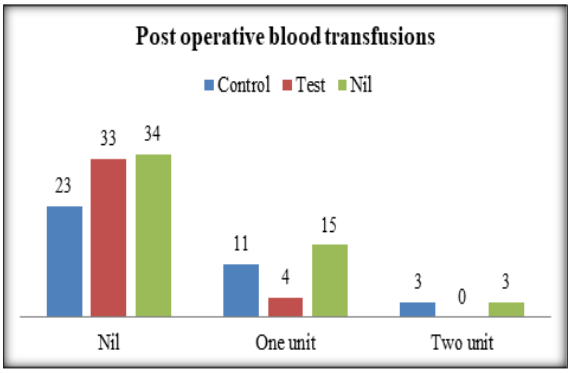

Figure 4: Post-operative blood transfusions

DISCUSSION

Total hip arthroplasty and hip hemi arthroplasty surgery are one of the most commonly occuring surgeries in our hospital. The most common complication of the surgery is that the patients tend to develop post-operative anaemia due to blood loss during surgery which can lengthen the duration of hospital stay and also delay the physical rehabilitation of the patient.1 Multiple blood transfusions carried out to correct the anaemia has been proved to be an economical burden for the patients and the introduction of tranexamic acid has proven to be a cost effective remedy to treat the condition.2 The use of tranexamic acid also helps to overcome the problem of non-availability of blood at the blood bank required for transfusion. Normal haemoglobin levels are often associated with beneficial outcomes for patients in terms of early ambulation and a better overall quality of life.4 Tranexamic acid is a synthetic derivative of amino acid lysine, which competitively inhibits the conversion of plasminogen to plasmin and delays fibrinolysis in already formed clots. It thus helps to decrease the blood loss during surgery. In this study we proved the beneficial effects tranexamic acid in controlling blood loss in total hip arthroplasty and hip hemi arthroplasty. Below we compare the results of this study with other similar studies. The outcome was good in most cases (86%), however in 2 cases the compliance of the patient was poor but the patient had no comorbidities and hence the outcome was good. In 2 patients who were diabetic with uncontrolled sugars and a post-operative, follow-up revealed ketonuria had a poor outcome.

Benoni and co-workers noted that there is significant reduction with tranexamic acid in the need for transfusion.[9] Ekback et al,[10] in the year 2000 noted the difference in the blood loss and rate of complications when tranexamic acid was given at the time of incision and repeated after three hours. Shahryar et al,[11] Clay A.Spitler et all,[12] Chad D et al,[13] and Jonathan Peck et al,[14] concluded that tranexamic acid reduced the overall transfusion rates. Rajesparan K et al,[15] noted that tranexamic did reduce the overall blood loss. Benoni and co-workers noted that there was significant reduction

with tranexamic acid in the amount blood loss.[9] Ekback et al noted the difference in the blood loss, both in intra operative and the postoperative blood loss.[10] Johansson and co-workers noted that there was significant reduction in the overall blood loss in those who received the drug.[16] Shahryar et al,[11] Clay A.Spitler et al,[12] Chad D et al,[13] Jonathan Peck et al,[14] and Rajesparan K et al,[15] in all in different studies noted tranexamic produced a significant reduction in the rate of loss of blood. Benoni and co-workers, they noted significant reduction in complications, when tanexamic acid was given9. Ekback et al noted there was no difference in the rate of complications.[10] Garneti et al, noted no significant difference in the rate of complications , rate of blood transfusion or the loss of blood , both in intra operative and post-operative period.[17] Rajesparan K et al,[15] noted that tranexamic did reduce the overall blood loss but there was no significant difference in the intra operative blood loss as compared to the placebo group and the difference in the postoperative blood loss was statically significant. The need for the post-operative blood transfusions was also significantly lesser in those who received tranexamic acid.

CONCLUSION

Good early clinical outcome was noted in both hemiarthroplasty and total hip arthroplasty. Post-operative need for blood transfusion was significantly lower in the group who received tranexamic acid pre-operatively compared to the group who did not receive tranexamic acid. Post-operative rehabilitation was significantly better and faster in the group who received tranexamic acid. Blood loss during the surgery was comparatively lower during the intra-operative and post-operative period when compared in the group who received tranexamic acid. In patients undergoing major arthroplasty surgeries around the hip joint, the chances of the patients being subjected to significant blood loss during the surgery is significant. The use of tranexamic acid in prophylactic doses pre-operatively, helps to reduce the loss of blood that occurs during the surgery and in the post-operative period. This indirectly also improves and aids the over-all rehabilitation of the patient in the post-operative period which decreases the incidence various complications such as hospital acquired infections, reduced duration of hospital stay, delayed return to daily activities, joint stiffness etc. Hence the use of tranexamic acid in major surgeries around the hip joint has a positive impact on the overall wellbeing of the patient following the surgery.

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