

A Clinical Analysis of Pre-operative Tranexamic Acid and Wound Closure without Suction Drain in Decreasing the Blood Loss in Surgical Treatment of Fractures of Hip

Sathis Chandran¹, Sasikumar Sasidharan²

¹Associate Professor, Department of Orthopaedics, Kannur Medical College, Anjarakandy, Kannur, Kerala, India, ²Assistant Professor, Department of Orthopaedics, Kannur Medical College, Anjarakandy, Kannur, Kerala, India

Abstract

Background: Fractures of the hip region are very common in the elderly population and include fracture neck of femur, intertrochanteric fractures, and subtrochanteric fractures. All of these are routinely treated by surgery to make the patient ambulant early. Most of these elderly people are anemic with poor blood reserve, and many of them need pre-operative blood transfusion to improve their hemoglobin concentration to make them fit for surgery. Hence, an additional blood loss during surgery and in the immediate post-operative period is to be avoided as much as possible. A common practice is to use suction drains in fracture surgery to decrease the incidence of post-operative blood collection (hematoma inside the wound). Tranexamic acid is a drug which reduces blood loss during surgery and post-operative period.

Materials and Methods: Kindly provide text part: A total of 210 patients with fracture hip joint were divided into three groups of 70 each. Group A consisted of patients with fracture hip joint undergoing surgery, treated pre-operatively with tranexamic acid but no suction drain. Group B consisted of patients with fracture hip joint undergoing surgery in which only suction drain was used (no tranexamic acid). Group C consisted of patients with fracture hip joint undergoing surgery without tranexamic acid and suction drain. Both pre-operative and post-operative hemoglobin concentration estimations were done. All surgeries were done under epidural/spinal anaesthesia. In Group A, tranexamic acid intravenous (I.V.) injection of tranexamic acid 1 g was given 10 min before incision and repeated as 500 mg I.V after 6 h in the post-operative period. The post-operative hemoglobin was compared with pre-operative hemoglobin value.

Conclusions: It was found that average fall of hemoglobin in the group with pre-operative intravenous tranexamic acid with drain less wound closure was less compared to other groups and to known standard loss after hip surgery.

Keywords: Arthroplasty, Closed wound, Fractures, Hemoglobin, Hip, Suction drain, Tranexamic acid

INTRODUCTION

Hip fracture surgeries are the most common semi-emergency orthopedic procedure conducted at Kannur Medical College Hospital. Most of the patients are the elderly with

comorbidities and low hemoglobin concentration. Blood loss during and in the post-operative period adds up an additional insult to these patients. One of the accepted methods of preventing blood loss is using tourniquets which are not possible in fractures of the hip. Hidden blood loss in hip fractures, in addition to intraoperative blood loss, may be as high as 1500 cc.^[1,2] The rate of blood transfusion in the Intra-operative period for hip fracture patients is reported between 20% and 60%.^[3,4] Total blood loss and thus rate of transfusion are greater for extracapsular hip fractures compared to intracapsular hip fractures.^[1] A meta-analysis of 20 studies found a significantly increased risk of post-operative bacterial infection in patients who

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Corresponding Author: Dr. Sasikumar Sasidharan, Assistant Professor, Kannur Medical College, Anjarakandy, Kannur, Kerala, India. Phone: +91-7558833386 E-mail: drssasikumar@yahoo.com

receive an allogeneic blood transfusion in the peri-operative period.^[5] In addition to the increased risk of infection, patients who require blood transfusion following hip fracture have an increased hospital length of stay.^[6] Closed-suction drainage has been widely used in many orthopedic surgical procedures, including total hip arthroplasty (THA), based on the theory of effectively decreasing hematoma formation, which is theoretically associated with decreasing post-operative pain and limb swelling, accelerating wound healing, and prevention of infection.^[7,8] However, some authors have advocated that not using drainage would have more benefits in THA^[9,10] because closed drainage leads to blood loss after THA by eliminating the tamponade effect and potentially allows retrograde infection. Tranexamic acid is a lysine analog which is also an inhibitor of fibrinolysis. It acts by competitively inhibiting the conversion of plasminogen to plasmin. It also matures fibrin clots, to be maintained and coagulation to continue uninhibited. Most orthopedic surgeons use closed suction drains to decrease hematoma collection and chances of infection. However, suction drains leads to increased blood loss in the post-operative period. Furthermore, drain may even act as a portal for the bacteria to enter the wound increasing the chances of post-operative infection. In this context, a study was conducted in this tertiary teaching hospital to analyze the roles of tranexamic acid and drain less wound closure in fractures of hip surgeries.

Period of Study

The duration of this study was from January 2012 to December 2014.

Institute of Study

The study was conducted at Kannur Medical College hospital, Anjarakandy, Kannur, Kerala.

Type of Study

This was a prospective, randomized cross-sectional, and comparative study.

MATERIALS AND METHODS

A total of 210 patients with fracture hip joint, attending the Department of Orthopaedics, Kannur Medical College Hospital, Anjarakandy, Kannur, Kerala, a tertiary teaching hospital were included in the present study. They were divided into three groups of 70 each. Group A consisted of patients with fracture hip joint undergoing surgery, treated pre-operatively with tranexamic acid but no suction drain. Group B consisted of patients with fracture hip joint undergoing surgery in which only suction drain was used (no tranexamic acid). Group C consisted of patients with fracture hip joint undergoing surgery without tranexamic acid and suction drain.

Inclusion Criteria

Patients admitted through the emergency department or transferred to our institution who meet the following criteria were included in the study:

- Adults over the age of 18.
- Acute intertrochanteric or femoral neck hip fracture.
- Patients treated surgically with cephalomedullary nail, hemiarthroplasty, or THA.

Exclusion Criteria

Patients who meet any one or more of the following criteria were excluded from the study:

- Use of any anticoagulant at the time of admission (e.g., Vitamin K antagonists, antithrombin agents, antiplatelet agents, or factor IIa and Xa inhibitors).
- Documented allergy to tranexamic acid.
- History of deep vein thrombosis (DVT) or pulmonary embolus.
- Hepatic dysfunction (aspartate transaminase/alanine transaminase >60).
- Renal dysfunction (Cr >1.5 of glomerular filtration rate >30).
- Active coronary artery disease (event in the past 12 months).
- History of cerebrovascular accident (CVA) in the past 12 months.
- Presence of a drug-eluting stent.
- Color blindness.
- Leukemia or any active cancer.
- Coagulopathy based on admission laboratory values (international normalized ratio >1.4, partial thromboplastin time >1.4× normal, and platelets <50 000).
- Non-displaced femoral neck fractures treated percutaneously.

Randomization of patient selection was done using method available on online randomization.com. The surgical team, anesthesia team, and patients were blinded to the details of the patient in regard to the stud. The incidence of blood transfusion, total calculated blood loss, and acute adverse events (transfusion reaction, CVA, myocardial infarction, pulmonary embolism, symptomatic DVT, surgical site infection, and death) was observed and recorded. Patients were also assessed at 2 weeks, 6 weeks, and 3 months postoperatively to understand the long-term adverse events as well as determine mortality rate. The patients underwent appropriate pre-operative investigations and necessary specialist consultations to assess fitness for undergo surgery. Both pre-operative and post-operative hemoglobin concentration estimations were done in all the patients. All cases were done under epidural/spinal anesthesia. In Group A, tranexamic acid intravenous (I.V.) injection of tranexamic acid 1 g was given 10 min before incision and

Table 1: The analysis observations made in the study (n=210) (BN: number of blood bags used, BA: Amount of blood transfused in ml)

Analysis Observation	Group A-70	Group B-70	Group C-70	P value
Mean pre-operative hemoglobin g%	12.2±1.05	11.8±0.98	12.06±1.10	0.045
Mean post-operative hemoglobin g%	11.23±0.78	10.10±0.90	10.75±1.02	0.037
Wound infection	11	12	10	0.021
Blood loss	03	04	02	0.041
BN	19	18	17	0.031
BA (Mean)	2.5±0.45	3.0±0.34	2.7±0.20	0.047
Wound hematomas	3	4	6	0.029
Limb swelling	3	5	4	0.026
Reinforcement	3	5	3	0.030
Oozing	4	3	6	0.029
Reoperation for wound healing	07	09	10	0.019
Thromboembolic complications (DVT)	02	01	03	0.021
Thromboembolic complications (PE)	03	02	05	0.017
Pain	02	03	03	0.018

DVT: Deep vein thrombosis, PE: Pulmonary Embolism

repeated as 500 mg I.V after 6 h in the post-operative period. The post-operative hemoglobin was compared with pre-operative hemoglobin value. The fall in hemoglobin values was compared with other Group B and C. All the values were analyzed using standard statistical methods.

OBSERVATIONS AND RESULTS

A total of 210 patients were included in the present study and divided into three groups. In Group A, there were 45 males (64.28%) and 25 females (35.71%) with a male-to-female ratio of 1.8:1. In Group B, there were 47 males and 23 females with a male-to-female ratio of 2.04:1. In Group C, there were 48 males and 22 females with a male-to-female ratio of 2.18:1. The mean age in group A was 78.4 ± 4.56 years. In Group B, it was 77.56 ± 5.41 years, and in Group C, it was 79.10 ± 3.85 years. All the observations noted in the three groups are analyzed and tabulated in Table 1.

DISCUSSION

Surgery for the hip joint fractures is one of the most common surgeries undertaken in this tertiary teaching hospital. There is clinical uncertainty and a lack of high-quality evidence regarding the use of tranexamic acid in hip fracture patients. Despite its proven efficacy in elective orthopedic surgery,^[11,12] the optimal dosing and timing of tranexamic acid administration are still debated.^[13] Furthermore, the efficacy and side effect profile of tranexamic acid in patients with fractures remain unclear. A larger percentage of hip fracture patients have significant medical comorbidities, and many have a history of cardiac disease.^[8] While tranexamic acid has demonstrated safety and efficacy in patients without significant cardiac disease undergoing elective surgery, there is still debate if tranexamic

acid will have the same effect in patients with significant comorbidities.^[14] The potential benefit of decreasing blood loss and decreasing the number of transfusions following hip fracture surgery is overwhelming and will likely result in improved patient outcomes, shorter length of stay, and lower cost.^[9] Since the closed suction drainage system was first reported in the 19th century,^[15,16] it has been used postoperatively for more than 100 years. The original aim of drainage system is to reduce hematoma formation and post-operative edema, decrease the possibility of infection, and minimize the probability of external contamination of the surgical site. The use of post-operative drainage has been increasingly questioned since the end of the 20th century. A series of RCTs comparing closed-suction drainage and no drainage have been published.^[17-19] Most of the patients in the present study were old-aged poor nutrition and blood reserves, and they cannot afford to also have blood loss during surgery. Pre-operative tranexamic acid definitely reduced blood loss during surgery and in the immediate post-operative period in Group A of this study when compared to other groups. The use of suction drains allows the blood loss due to negative pressure in the wound which is also present constantly. The suction drain also acts as a portal of entry for bacteria to the operative wound. As is evident in this study when I.V tranexamic acid was used, there was a decrease in post-operative blood ooze and therefore no recommendation of suction drain also. There was no hematoma formation following hip surgery in this study.

CONCLUSIONS

The study suggests I.V tranexamic acid combined with drain less wound closure which was proved to be safe and effective. It reduced blood loss during hip surgeries following trauma.

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