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ORIGINAL ARTICLE

Reduction in Blood Loss with Tranexamic Acid use in Dynamic Hip Screw Surgery for Intertrochanteric Fractures

MUHAMMAD AKRAM[1], ALI MUQADAS[2], ARIF MAHMOOD[3], FAHEEM MUBASHIR FAROOQI[4], SHUMAILA JABBAR[5]
[1]*Assistant Professor of Orthopedic Surgery and Traumatology, KEMU/Mayo Hospital Lahore*
[2]*Senior Registrar, Ortho-I, Mayo Hospital Lahore*
[3]*Assistant Professor, Department of Orthopedic Surgery, SIMS/Services Hospital Lahore*
[4]*Senior Registrar, Department of Orthopedic Surgery and Traumatology, KEMU/Mayo Hospital Lahore*
[5]*Pathologist, Qarshi University Lahore*
Correspondence to Dr. Muhammad Akram, Email: akramaz@gmail.com, Contact: 03334264350

ABSTRACT

Aim: To compare the mean decrease in hemoglobin levels in fixation of intertrochanteric fractures with or without use of Tranexamic acid.

Methods: This study was conducted at Orthopedics Unit II, Mayo Hospital Lahore, Pakistan. Total 78 patients were included in the study. Duration of study was from 15-07-2017 till 15-01-2018.Study was approved by hospital ethical committee. A written informed consent was taken. Diagnosis was made clinically and with help of radiology. Patients were randomly divided into two groups. Patients in intervention Tranexamic acid (TXA) group received 15 mg/kg of Tranexamic acid at the time of induction of anesthesia and repeated after three hours, while those in the control group received placebo which is normal saline, intravenously.

Results: There were 16(41%) males and 23(59%) females in group-A. There were 15(38.5%) males and 24(61.5%) females in group-B. Mean age in group A (control) with standard deviation was 44.2051±9.64141. Mean age in group B (TXA) was 45.9744±9.03061. p value 0.0046. Mean BMI in group A was 25.65±5.136. Mean BMI in group B was 24.307±2.153. p value 0.233. In group A 13(33.3%) patients had hypertension and 26(66.67%) did not have hypertension in group-A. In group B 16 (46.2%) patients had hypertension and 21 (53.8%) did not have hypertension in group-B. Mean fall in Hb in Group A was 9.47±1.054. Mean fall in Hb in group B was 9.547±0.9402. p value 0.001. Statistically significant difference was present in Group B (TXA) in term of mean fall in Hb (p value 0.001).

Conclusion: We in our study concluded that the patients in TXA group who were given tranexamic acid 1g intravenously before start of surgery had a lesser fall in mean Hb for the operative treatment of per trochanteric fractures with dynamic hip screw. Hence injecting tranexamic acid intravenously can effectively reduce the blood loss during DHS surgery for the intertrochanteric fractures.

Keywords: Interochanteric fracture, tanexamic acid, blood loss

INTRODUCTION

Intertrochanteric fractures are considered one of the three types of hip fractures. The other two types of hip fractures are fractures of the femoral neck and sub trochanteric fractures, which are distal to or below the trochanters. The anatomic site of this type of hip fracture is the proximal or upper part of the femur or thigh bone. A trochanteric hip fracture occurs between the greater trochanter, where the gluteus medius and the gluteus minimus (hip extensors and abductors) attach, and the lesser trochanter, where the iliopsoas (hip flexor) attaches.

The classic clinical presentation of a hip fracture is an elderly patient who sustains a low-energy fall and now has groin pain and is unable to bear weight[1]. On examination, the affected extremity is often shortened and unnaturally, externally rotated compared to the unaffected leg[2].

Even though all the three types of hip fracture are mostly mentioned as simple hip fracture but they are classified because the morphology of fracture type, its prognosis and treatment option for the fracture are different for each type.

Literature in early 1800s published that the intertrochanteric fracture can be managed conservatively but after healing they mostly unite in varus position resulting in deformity and hip function is markedly reduced due to abductor weakness and limping. However, conservative treatment of these fractures can lead to intolerable morbidity and mortality and because of these simultaneous medical problems and prolonged bed rest and immobilization resulting in non-union non operative treatment was thought to be intolerable by patients and doctors irrespective of mortality.

Nowadays with advancement in care of intertrochanteric fractures, there are less chances of malunion and non-union of these fractures. Thus resulting in an improvement in the functions of the hip in these patients. Intertrochanteric fractures were treated surgically by using metallic devices which were fixed angled (internal devices) designed to achieve and maintain the fracture fragments in anatomical position or acceptable position. Fractures stability contributes in the uncomplicated healing of the fracture and in addition it also results in post op care and reduction in post op complications in terms of mortality and morbidity

Currently treatment of intertrochanteric fractures includes surgical management. Regardless of satisfactory results with conservative management, surgery has become the gold standard for intertrochanteric fracture because conservative methods require prolonged bed rest with traction and immobilization with full body spica[3,4,5]. The

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conservative management along with good healing was also associated with other non-orthopedic complications associated with prolonged bed rest and immobilization. Hence the surgical intervention also described as Open Reduction and Internal Fixation (ORIF) remains the ideal treatment for intertrochanteric fracture. The surgical devices which are used include dynamic hip screw, gamma nail, proximal femoral nail and proximal femoral locking plate.

Tranexamic acid is a medication which is used to treat or prevent excessive blood loss from major trauma, post partum bleeding, surgery, tooth removal, nose bleeds, and heavy menstruation[6]. It is taken either by mouth or injection into a vein. Tranexamic acid is in the antifibrinolytic family of medications[1].

Tranexamic acid has been found to decrease the risk of death in people who have significant bleeding due to trauma[8]. Its main benefit is if taken within the first three hours[9]. Tranexamic acid is used in orthopedic surgery to reduce blood loss, to the extent of reducing or altogether abolishing the need for perioperative blood collection[10,11].

The objective of the study was to compare the mean decrease in hemoglobin levels in fixation of intertrochanteric fractures with or without use of Tranexamic acid.

MATERIAL AND METHODS

This study was conducted in the department of orthopedic surgery Unit-II of Mayo Hospital, Lahore. It was randomized controlled trial and was conducted from July 2017 to January 2018. A total of 78 cases were included by keeping confidence level at 90 % confidence and margin of error at 9 %. All the patients of either gender from 18 to 80 years with Boyd and Griffin Type 1, 2 and 3 intertrochanteric fractures were included. Patients having bleeding diathesis, hemoglobin < 8 g/d and open fractures were excluded. Study was approved by hospital ethical committee. A written informed consent was taken. Diagnosis was made clinically and with help of radiology.

Using computer generated method patients were randomly divided in two groups. Patients in intervention TXA group received 15 mg/kg of Tranexamic acid at the time of induction of anesthesia and repeated after three hours, while those in the control group received placebo which is normal saline, intravenously by a resident not part of surgical team.

All patients underwent dynamic hip screw surgery under spinal anesthesia. All procedures were done by trainees under supervision of senior registrar.

Hemoglobin levels were checked preoperatively, on1st, 2nd and 4th post-operative day. Lowest hemoglobin value on any of the above days was taken and its difference from preoperative value was calculated. Mean decrease in Hb levels was calculated. Measurements were done by venous sampling. The patients were transfused with blood if level of hemoglobin fell below 9 g/dl at any time during their hospital stay.

RESULTS

There were 16(41%) male and 23(59%) females in group-A. There were 15(38.5%) male and 24(61.5%) females in group-B (Table 1). Mean age in group A (control) with standard deviation was 44.2051±9.64141. Mean age in group B (TXA) was 45.9744±9.03061. p value 0.0046 (Table 2). Mean BMI in group A was 25.65±5.136. Mean BMI in group B was 24.307±2.153. p value 0.233 (Table 3). In group A 13(33.3%) patients had hypertension and 26(66.67%) did not have hypertension in group-A. In group B 16(46.2%) patients had hypertension and 21 (53.8%) did not have hypertension in group-B (Table 4). Mean fall in Hb in Group A with standard deviation was 9.47±1.054. Mean fall in Hb in group B with standard deviation was 9.547±0.9402. p value 0.001. Statistically significant difference was present in Group B (TXA) in term of mean fall in Hb. p value 0.001 (Table 5).

Table 1: Gender of the patients in both groups

	Group A	Group B
Male	16	15
Female	23	24

Table 2: Mean Age Group of the Patients in Both Groups

	Group A	Group B
Mean	44.2051	45.9744
Median	46.0000	47.0000
Standard Deviation	9.64141	9.03061

Table 3: Mean BMI of the Patients in Both Groups

	Group A	Group B
Mean	25.65	24.307
Median	25.0	25.0
Standard Deviation	5.136	2.153

Table 4: Hypertension of patient in both groups

	Group A	Group B
Yes	13	16
No	26	21

Table 5: Independent t Test of both Group A & Group B (With) Hemoglobin

Variables	N	Mean	St. Deviation	t	P value
Age of patients				3.831	0.001
Group A	39	9.47	1.054		
Group B	39	10.36	0.9402		

DISCUSSION

Blood loss in cases of hip surgery is a chief problem for orthopedic surgeons. Fracture of hip results in an immediate blood loss from the femoral canal in the compartments of thigh even before surgery. During surgery and postoperatively blood loss is assumed to be because of improper surgical hemostasis, platelets dysfunction, drug induced or might be due to coagulopathies. This extensive blood loss intraoperatively and post operatively can cause cardiovascular complications so patients with hip surgery often require blood transfusion. Allogenic blood transfusion can lead to the risk of non-immunological and immunological side effect, such as transfusion reactions or transmission of disease like hepatitis or HIV AIDS. Furthermore, allogenic blood transfusion is expensive.[12] In elderly patients undergoing allogenic blood transfusion have high chances of developing urinary tract infection as compared to those who don't receive the transfusion.[13]

Different modalities are there to prevent perioperative and post-operative blood loss and need of intraoperative allogenic blood transfusion like having autologous blood transfusion, intraoperative blood salvage, cautious hypotension and use of drugs causing fibrinolytic inhibition. But these drugs and techniques have some drawbacks like time period of autologous blood preservation, use of expensive devices and difficulties in intraoperative blood maintenance.

Fibrinolysis is inhibited by drugs such as tranexamic acid which displaces the plasminogen from the fibrin surface by saturating the lysine binding sites of the human plasminogen. This drug is also widely used in other conditions like acute upper gastrointestinal bleed, oral surgery, and cardiac surgery and gynecological bleedings.[7] In case of hip surgery the administration of tranexamic acid reduces the blood loss from the femoral canal. However results in a study did not favour some earlier studies showing reduced blood loss in total hip arthroplasty (THA).[14] In 2000 Benoni *et al.*[15] published that there was no effective reduction in post-operative blood loss if tranexamic acid given at the end of surgery. Different authors at different time published that use of tranexamic acid in orthopedic procedures like total knee arthroplasty (TKA) and scoliosis surgery effectively reduced the blood loss and need of blood transfusion[15,16,17]. However, the amount of blood loss in procedures like TKA or scoliosis surgery can be lesser or higher comparing with hip surgery so straight forward comparing with these studies has very limited value. There are different reasons for these discrepancies like dosage, number of times the drug administered and time of administration of the drug. Literature supported that postoperative status of the patients is directly related to postoperative blood loss in cases of TKA and THA.[17] Reduction in blood loss after use of tourniquet is because of the fact that the fibrinolytic system gets temporarily activated by tourniquet. Benoni *et.al.*[15] in patients undergoing TKA gave intravenously tranexamic acid intraoperative and postoperatively after three hours showed one third reduction in postoperative blood loss, however in elective hip surgery the fibrinolytic system is activated by trauma and is increased during surgery.

Hence in our study we administered an intravenous dose of tranexamic acid preoperatively at the time of induction of anesthesia and was repeated after three hours. As the half-life of the drug is about two hours, so duration of the procedure can easily be covered. Jansen *et al.*[17] and Tanaka *et al.*[18] published in their studies a reduction of 40-58% in blood loss when tranexamic acid injected preoperatively and post operatively. In our study we did not assess the postoperative blood loss as previously literature supported no significant change in postoperative blood loss in patients administered placebo or tranexamic acid[18]. We in our study considered the risk of hypercoagulability associated with administration of tranexamic acid. As the drug (tranexamic acid) hinders fibrinolysis resulting in potential risk of having thromboembolic events. However in 2000 Benoni *et al.* [15] recommended that use of tranexamic acid only hinders fibrinolysis in wound but had no effect in general circulation, so it had no potential risk of causing deep venous thrombosis. This indicates that tranexamic acid does not induce overall prothrombotic state. Similarly many suggested that tranexamic acid had no effect on coagulation but it activates the fibrinolysis. Hence using tranexamic acid rarely leads to thrombosis.

In our study we did not rule out pulmonary embolism, deep venous thrombosis and post-operative thrombosis, however we made a follow-up of minimum six weeks postoperatively and none of the patients complained of having any thromboembolic events.

CONCLUSION

We in our study concluded that there was statistically significant difference in terms of mean fall in Hb between both groups. Patients in TXA group who were given tranexamic acid 1g intravenously before start of surgery had a lesser fall in mean Hb for the operative treatment of per trochanteric fractures with dynamic hip screw. Hence injecting tranexamic acid intravenously can effectively reduce the blood loss during DHS surgery for the intertrochanteric fractures.

Conflict of interest: Nil

Contribution of authors: MA: Primary Surgeon Co – supervisor, **AM:** Co Author, Assistant Surgeon and Data keeping, **AM:** Co Author and Data keeping, **FMF:** Author, Assistant Surgeon and Statistical and data analyzer, **SJ:** Statistical and data analyzer

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