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ORIGINAL ARTICLE

Does One Gram of Single-Dose Intravenous Tranexamic Acid Decreases Postoperative Blood Loss in Patients Undergoing Dynamic Hip Screw Fixation for Intertrochanteric Fractures

Sachindra Raj Joshi[1], Om Prasad Shrestha[1], Niresh Shrestha[1], Santosh Batajoo[1], Subhash Regmi[1]
[1] Department of Orthopedics, B&B Hospital, Gwarko, Lalitpur, Nepal

ABSTRACT

BACKGROUND
Tranexamic acid (TXA) has been widely used to reduce blood loss and maintain postoperative hemoglobin level in elective orthopedic surgeries, but its role in orthopedic trauma surgery hasn't been well defined. The aim of this study was to assess the role of TXA in reducing postoperative blood loss in patients undergoing Dynamic hip screw fixation for intertrochanteric fractures.

METHODS
This hospital-based cross-sectional study was conducted at the Department of Orthopedics, B&B Hospital, Gwarko, Lalitpur, Nepal, from September 2023 to July 2024. Twenty-two patients with intertrochanteric fracture underwent dynamic hip screw fixation where 8 patients received TXA (Group A) and 14 patients didn't receive TXA (Group B). The analysis of different variables was done according to standard statistical analysis. For all analyses, the level of significance was set at 0.05.

RESULTS
There was no significant difference between the groups regarding age, gender, mechanism of injury, limb involvement, and Boyd and Griffin classification. The postoperative blood loss was less in Group A (116.88± 118.29ml) than in Group B (160.71± 77.75ml) (p=0.095). The postoperative hemoglobin and packed cell volume (PCV) were 10.08± 1.07 gm/dl and 31.20± 3.75 in group A and 9.25± 1.63 gm/dl and 26.50± 4.02 in group B, respectively (p=0.376, 0.133). Postoperatively, 75% of cases didn't require blood transfusion in group A and 50% in group B.

CONCLUSION
This study indicated that the use of TXA relatively decreased postoperative blood loss and maintained higher levels of hemoglobin and PCV when compared to patients who did not receive TXA.

KEYWORDS
dynamic hip screw, intertrochanteric fracture; tranexamic acid

INTRODUCTION

Twenty percent of orthopedic trauma are hip fractures.[1] Asian countries are expected to account for over 50% of hip fractures by 2050.[2] The Dynamic Hip Screw (DHS) fixation is well established for treating extra-capsular hip fractures.[3] Blood loss is a common complication in these surgeries, with up to 41% of patients requiring transfusions, so reducing perioperative blood loss is crucial, as it leads to better clinical outcomes.[4]
Tranexamic acid (TXA) is an antifibrinolytic agent shown to reduce blood loss and the need for transfusions in various surgeries.[5] However, data on its use in intertrochanteric fractures is limited.[6] Previous studies show variability in fracture type, surgical techniques, and TXA administration routes. Additionally, the hemoglobin dilution method may underestimate perioperative blood loss by more than 30%.[7]
This study evaluates the effectiveness of a single one-gram intravenous dose of Tranexamic acid in reducing postoperative blood loss in patients undergoing dynamic hip screw fixation for intertrochanteric fractures.

CORRESPONDENCE

Sachindra Raj Joshi
B&B Hospital, Gwarko, Lalitpur, Nepal,
Tel: +977-9841818622
Email: joshi.sachindraraj@gmail.com

METHODS

This hospital-based cross-sectional study was conducted at the Department of Orthopedics, B&B Hospital, Gwarko, Lalitpur, Nepal, from September 2023 to July 2024 after approval from the Institutional Review Committee of the hospital (B&BIRC-23-52).

A consecutive sampling method was used, and all the patients with intertrochanteric fractures undergoing Dynamic Hip Screw fixation were enrolled in the study. Patients with poly-trauma, open fractures, pathological fractures, Impaired coagulation status, long-term uninterrupted anticoagulant therapy, and patients with a history of arterial or venous thrombosis or thromboembolic risk were excluded. The variables included were Age, Gender, Mechanism of Injury, Side involved, Boyd and Griffin Classification for intertrochanteric fractures, and operative duration. Primary outcome measures were postoperative blood loss, and secondary outcome measures were Hemoglobin level, Packed cell volume (PCV) level, and number of blood transfusions. Informed written consent was acquired from all the participants. All the surgeries were performed by an orthopedic surgeon with more than 10 years of experience. Thirty-four patients with intertrochanteric fractures presented at the institute within the study period. Of these, 12 were excluded as nine patients underwent Proximal Femoral Nailing, one patient had no drain placed, and two cases were mortality (one patient died on the operating table, another died on the 1st postoperative day).

Tranexamic acid is routinely used in this hospital setting and depends on the surgeons' choice. Patients who received Tranexamic acid were allocated to Group A, and patients who didn't were assigned to Group B. For the patients who received Tranexamic acid, 1gm of tranexamic acid was mixed in 100ml of Normal saline and infused 15min before skin incision. A standard surgical technique was implemented for DHS fixation. Following fracture fixation by DHS, the romovac drain was placed in the sub-muscular plane in negative pressure. During the postoperative period, the drain collection was noted, and the drain was removed if the collection was <50ml over 24hrs. Also, Hemoglobin and PCV levels were checked at 24 hours post-surgery. The analysis of different variables was done according to standard statistical analysis. Data was processed and analyzed using the software Statistical Package for Social Science version 21. For all analyses, the level of significance was set at 0.05.

RESULTS

The clinical profile of the patients is given in Table 1. There was no significant difference between the groups in regard to age, gender, Mechanism of injury, limb involvement, and Boyd and Griffin classification (Table 1).

The differences in preoperative hemoglobin, Packed cell Volume (PCV), and operative duration between the groups were insignificant (Table 2). 62.50% of the patients in group A had intraoperative blood transfusion, whereas 42.86% in group B required intraoperative blood transfusion (p=0.375). The intraoperative blood transfusion acted as a confounding factor, so after excluding the patients who had an intraoperative blood transfusion, the postoperative hemoglobin and PCV were 10.08± 1.07 gm/dl and 31.20± 3.75 in group A and 9.25± 1.63 gm/dl and 26.50± 4.02 in group B. However, the difference was insignificant. The post-operative drain collection was relatively less in Group A (116.88± 118.29ml) than in Group B (160.71± 77.75ml); however, the difference was insignificant (p=0.095). Postoperatively, 75% of cases didn't require blood transfusion in group A and 50% in group B.

Table 1: Clinical profile of the patient

Parameters	Group A (n=8)	Group B (n=14)	P value
Age (years)	46.00± 19.39 (15-70)	65.93± 25.26 (26-89)	0.053*
Gender			
Male	6 (75.00)	7 (50.00)	0.251†
Female	2 (25.00)	7 (50.00)	
Mechanism of Injury			
Fall from standing Height	2(25.00)	8 (57.14)	0.095†
RTA	6 (75.00)	4 (28.57)	
Fall From Height	0 (0.00)	2 (14.29)	
Involved Limb			
Right	6 (75.00)	3 (21.43)	0.251†
Left	2 (25.00)	11 (78.57)	
Boyd and Griffin Classification			
Type 1	4(50.00)	3 (21.43)	0.135†
Type 2	1 (12.50)	8 (57.14)	
Type 3	2 (25.00)	3 (21.43)	
Type 4	1 (12.50)	0 (0.00)	

RTA: Road Traffic Accident

* Independent Sample Mann-Whitney U test, † Chi- square test

DISCUSSION

The fibrinolytic inhibitor tranexamic acid (TXA) was developed in Shosuke Okamoto's lab in the early 1960s which was initially prescribed for patients with hereditary bleeding disorders, soon the indications were widened to elective surgery.[8] An umbrella review of 44 high-quality meta-analyses was done to see the efficacy of TXA in different surgeries, which included joint replacement surgery, other orthopedic surgeries, cardiac surgery, cerebral surgery, and gynecological surgeries. TXA demonstrates significant hemostatic effects in various surgeries, with lower rates of blood transfusion and higher hemoglobin levels.[5]

The efficacy of TXA has been proven in the majority of elective orthopedic surgeries,[9–12] but blood loss observed in hip fracture surgeries differs from that in elective procedures. This is because, in cases of hip fractures, the fibrinolytic system is triggered at the moment of injury and continues to escalate throughout the surgical process. Consequently, these types of surgeries tend to have greater blood loss and a higher necessity for blood transfusions.[13] Also, with the heightened activation of the fibrinolytic system, there is an increased risk of veno-thromboembolism (VTE) leading to a decrease in the use of TXA in orthopedic trauma surgery.[14] A meta-analysis conducted by Qi et al. demonstrated that the intravenous administration of TXA can decrease the need for transfusions and

Table 2: Operative parameters of the patient.

Parameter	Group A (n=8)	Group B (n=14)	P value
Pre-operative			
Hemoglobin (gm/dl)	11.94± 1.76 (10.00-14.70)	12.34± 2.09 (9.80-15.71)	0.868*
PCV (%)	35.71± 4.52 (30.70-42.00)	35.69± 5.66 (29.20-47.90)	0.946*
Post-operative			
Hemoglobin (gm/dl)	9.79± 0.96 (8.67-11.23)	9.76± 1.67 (7.99-12.71)	0.664*
PCV (%)	30.19± 2.93 (26.00-35.00)	27.69± 3.91 (21.60-34.20)	0.212*
Operative Duration (min)	100.50± 30.03 (55-145)	94.93± 23.77 (63-140)	0.815*
Intra-operative Blood Transfusion			
Yes	5 (62.50)	6 (42.86)	0.375†
No	3 (37.50)	8 (57.14)	
Post-operative (after excluding patient with Intraoperative blood transfusion)			
Hemoglobin (gm/dl)	10.08± 1.07 (9.11-11.23)	9.25± 1.63 (7.99-12.27)	0.376*
PCV (%)	31.20± 3.75 (27.50-35.00)	26.50± 4.02 (21.60-34.20)	0.133*
Drain (ml)	116.88± 118.29 (0-380)	160.71± 77.75 (45-330)	0.095*
Post-operative blood transfusion			
Yes	2 (25)	7 (50)	0.251†
No	6 (75)	7 (50)	

PCV: packed cell volume

* Independent Sample Mann-Whitney U test

† Chi-square test.

overall blood loss, while not raising the rate of thromboembolic complications in individuals undergoing hip surgery.[15]

In this study, postoperative blood loss was relatively lesser in patients who received TXA (116.88± 118.29 ml) than in the group who didn't get TXA (160.71± 77.75 ml), which was statistically insignificant. Contrary to our results, Stojadinovic et al. and Chen et al. demonstrated significantly less blood loss in the postoperative period in patients who had received TXA compared with patients who had not received TXA (147.2 ± 51.5 mL vs. 346.8 ± 100.1 mL and 142 vs. 267 mL, respectively).[16,17] Similarly, Baruah et al. also demonstrated statistically less postoperative blood loss over 24 hrs in TXA group than control group (61.67 vs. 186.67 ml).[18]

In this study, postoperative hemoglobin 24hrs after surgery was relatively higher in patients who received TXA (10.08± 1.07gm/dl) than in patients who didn't get TXA (9.25± 1.63gm/dl), which was insignificant. A study done by Mohib et al. demonstrated significantly higher mean Hemoglobin 24 hours after surgery in patients who received TXA (10.2±2.4 g/dl), than in the patients who didn't received TXA (8.9±2.4 g/dl).[13] Similarly, Baruah et al. showed significantly higher Hemoglobin and Hematocrit levels in the TXA group than in the control group at 48hrs following surgery (9.65 vs. 8.92 g/dl and 32.29% vs. 30.58%, respectively).[18]

This study has certain limitations. The sample size was small, and there was no randomization, as the patients who received TXA were based on surgeon preference. The type and amount of fluids infused and the patients' hydration status were not considered, which can be a confounding factor for hemoglobin and hematocrit measurements.

CONCLUSION

This study highlights the importance of TXA in trauma surgery. While the findings were not statistically significant, administering TXA to patients undergoing DHS for intertrochanteric fractures helped reduce postoperative blood loss and sustain higher hemoglobin and hematocrit levels compared to those who did not receive TXA. Additionally, it is essential to conduct larger, high-quality randomized trials to reinforce our findings and address the limitations of this study.

CONFLICT OF INTEREST

None

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