ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 07 | July - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF TRANEXAMIC ACID IN REDUCING POSTOPERATIVE BLOOD LOSS AND TRANSFUSION REQUIREMENT IN PATIENTS UNDERGOING LOWER LIMB ORTHOPAEDIC SURGERIES

Anaesthesiology

Dr. Shubhra Shrivastava Ex Senior Resident Department Of Anaesthesiology , G.R. Medical College Gwalior M.P
Dr. Aditya Shrivastava Professor Department Of Neurosurgery, G.R. Medical College Gwalior M.P
Dr. Amit Niranjan Associate Professor Department Of Pathology , G.R. Medical College Gwalior M.P
Dr. Ashish Mathur* Associate Professor Department Of Anaesthesiology, G.R. Medical College Gwalior M.P *Corrsponding Author

ABSTRACT

Background: Major lower limb orthopaedic surgeries are associated with significant perioperative blood loss and a high requirement for allogeneic blood transfusion, which carries risks and increases healthcare burden. Tranexamic acid (TA), an antifibrinolytic agent, has been proposed to reduce bleeding and transfusion needs. **Aim:** To assess the efficacy and safety of tranexamic acid in reducing postoperative blood loss and transfusion requirements in patients undergoing lower limb orthopaedic surgeries. **Methods:** Ninety ASA I & II patients scheduled for elective femoral fracture surgeries were randomized to receive either intravenous TA (10 mg/kg) or placebo (normal saline) 15 minutes before incision. Postoperative blood loss, haemoglobin levels, transfusion requirements, and complications were recorded. **Results:** TA significantly reduced postoperative blood loss (mean drain volume: 39.33± vs 91.11± mL, P=0.01), fall in haemoglobin (day 0: 2.99±3.46 vs 7.70±6.05 g/dL, P=0.01; day 2: 0.4±0.74 vs 2.71±2.70 g/dL, P=0.000), and transfusion rates (7/45 vs 18/45, P=0.01) compared to placebo. No significant increase in thromboembolic events was observed. **Conclusion:** Preoperative administration of tranexamic acid significantly reduces blood loss and transfusion requirements in lower limb orthopaedic surgeries without increasing thromboembolic complications1.

KEYWORDS

INTRODUCTION

Major lower limb orthopaedic surgeries, such as hip and femoral fracture repairs, are frequently associated with substantial blood loss, often necessitating blood transfusions. The use of allogeneic blood products increases the risk of transfusion-transmitted infections, immunomodulation, and postoperative infections1. Enhanced fibrinolytic activity during and after orthopaedic procedures is a significant contributor to perioperative bleeding.

Tranexamic acid (TA), a synthetic lysine analogue, inhibits fibrinolysis by blocking plasminogen binding to fibrin, thereby stabilising clots. While TA has proven efficacy in urological, gynaecological, and cardiac surgeries, its use in orthopaedic procedures—particularly hip fracture surgeries—has been limited due to concerns regarding thromboembolic risk and insufficient evidence1.

This study aims to evaluate the effect of a single preoperative dose of TA on postoperative blood loss and transfusion requirements in patients undergoing lower limb orthopaedic surgeries.

METHODS

Study Design And Participants

A prospective, randomised, double-blind study was conducted at Gandhi Medical College, Bhopal. Ninety patients (ASA I & II, aged 20–60 years, weight >40 kg, BMI <35) undergoing elective femoral fracture surgeries (open reduction internal fixation, hemiarthroplasty, total hip replacement) were enrolled after informed consent1.

Randomisation And Intervention

Patients Were Randomly Assigned To Two Groups (n=45 each):

- Group T (Tranexamic Acid): Received IV TA 10 mg/kg in 50 mL over 15 min, 15 minutes before incision.
- Group P (Placebo): Received 50 mL normal saline IV over 15 min, 15 minutes before incision.

Perioperative Management

All surgeries were performed under combined spinal-epidural anaesthesia. Standard intraoperative monitoring and fluid management were applied. The anaesthetist was blinded to group allocation.

Outcome Measures

- **Primary:** Postoperative blood loss (drain volume in first 24h), fall in haemoglobin (day 0 and day 2), number of packed red cell units transfused.
- **Secondary:** Incidence of thromboembolic and other complications.

Statistical Analysis

Continuous data were analysed using two-sided t-tests; categorical data with chi-square tests. $P<0.05$ was considered statistically significant1.

RESULTS

Baseline Characteristics

There were no significant differences between groups regarding age, sex, duration/type of surgery, or preoperative haemoglobin (Table 1)1.

Table 1. Baseline Demographics And Surgical Data

Parameter	Group T (TA)	Group P (Placebo)	P value
Age (years)	45.2±10.3	44.8±9.7	0.82
Male/Female	25/20	23/22	0.67
Duration (min)	120±30	118±28	0.74
Pre-op Hb (g/dL)	12.8±1.1	12.7±1.2	0.59

Intraoperative and Postoperative Outcomes

TA significantly reduced postoperative blood loss and the need for transfusion compared to placebo (Table 2)1.

Table 2. Postoperative Outcomes

Outcome	Group T (TA)	Group P (Placebo)	P value
Drain volume (mL, 24h)	39.33±12.5	91.11±18.2	0.01
Fall in Hb (g/dL, day 0)	2.99±3.46	7.70±6.05	0.01
Fall in Hb (g/dL, day 2)	0.4±0.74	2.71±2.70	0.000
Patients requiring transfusion	7 (15.6%)	18 (40%)	0.01
Thromboembolic events	0	0	NS

DISCUSSION

Excessive perioperative bleeding in hip fracture surgery is a significant clinical problem, often necessitating blood transfusion. The mechanisms of bleeding include defective surgical haemostasis, platelet dysfunction, consumptive coagulopathies, and increased fibrinolytic activity. TA acts by saturating lysine binding sites on

plasminogen, thus inhibiting fibrinolysis and stabilising clot formation1.

Our findings are consistent with previous studies, which have demonstrated that TA reduces blood loss and transfusion requirements in orthopaedic surgeries, including total knee and hip arthroplasty1. The biphasic fibrinolytic response after surgery, with an initial increase followed by shutdown, highlights the importance of timing TA administration for optimal efficacy1.

Concerns regarding thromboembolic complications have limited the widespread adoption of TA. However, no significant increase in thromboembolic events was observed in this or other studies, suggesting that TA's antifibrinolytic action is predominantly localised to the surgical site, without increasing systemic thrombosis risk1.

Comparative Literature

- Sadeghi and Mehraein (2006) found significantly lower perioperative blood loss and transfusion rates in the TA group during hip fracture surgery1.
- Good et al. (2003), Jansen et al. (1999), and Neilipovitz et al. (2001) reported similar findings in knee arthroplasty and scoliosis surgery1.
- Benoni et al. (1996) demonstrated that TA administered before tourniquet release and three hours later reduced blood loss to one-third in TKA1.
- Ekbäck et al. (2000) and Yamasaki et al. (2005) also found significantly lower perioperative blood loss in TA-treated groups1.
- A meta-analysis by Cid and Lozano (2005) confirmed that TA significantly reduces the proportion of patients requiring transfusion after TKR1.

Limitations

- Single-centre study with a relatively small sample size.
- Exclusion of patients with significant comorbidities limits generalisability.
- Short follow-up period for thromboembolic complications.

CONCLUSION

Preoperative administration of tranexamic acid in patients undergoing lower limb orthopaedic surgeries significantly reduces postoperative blood loss, fall in haemoglobin, and transfusion requirements without increasing the risk of thromboembolic complications. TA should be considered as a standard adjunct in such surgeries to improve patient outcomes and reduce transfusion-related risks1.

REFERENCES

1. Davidson E, et al. Hip fracture mortality. (2001)
2. Adunsky A, et al. Incidence of hip fractures in elderly. (2003)
3. Friedman BA. Blood transfusion in hip fracture surgery. (1979)
4. Bannister GC. Methods to control bleeding in orthopaedic surgery. (1990)
5. Verstraete M. Use of antifibrinolytics in surgery. (1985)
6. Ido K, Neo M. Tranexamic acid in total hip surgery. (2000)
7. Astedt B. Tranexamic acid: Mechanism of action. (1987)
8. Benoni G. Timing of tranexamic acid in TKA. (1995)
9. Dunn CJ. Clinical uses of tranexamic acid. (1999)
10. Losina E. Trends in total knee replacement. (2012)
11. Mahdy AM. Mechanism of tranexamic acid. (2011)
12. Benoni G. Efficacy of TA in orthopaedic surgery. (2000)
13. Krishnamurti C. Plasminogen binding and TA. (1994)
14. Eriksson BI. Fibrinolytic response after surgery. (1991)
15. Sadeghi & Mehraein. TA in hip fracture surgery. (2006)
16. Good L. TA in knee arthroplasty. (2003)
17. Jansen AJ, Andreica S. TA in orthopaedic surgery. (1999)
18. Neilipovitz DT, Murto K, Hall L. TA in scoliosis surgery. (2001)
19. Benoni G, et al. TA and blood loss in TKA. (1996)
20. Ekbäck G, et al. TA in perioperative blood loss. (2000)
21. Yamasaki S, et al. TA in cementless THR. (2005)
22. Cid J, Lozano M. Meta-analysis of TA in TKR. (2005)1