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Efficay Of Extended Postoperative Iv Tranexamic Acid In Cases Of Total Knee Arthroplasty: A Retrospective Hospital Based Obervational Study

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Abstract

Background: *Total Knee Arthroplasty (TKA) is commonly associated with significant perioperative blood loss, pain, and delayed functional recovery. Tranexamic acid (TXA), an antifibrinolytic agent, has been widely used to reduce bleeding, but the efficacy of extended postoperative intravenous TXA administration remains underexplored. This study is to assess the effectiveness of prolonged postoperative intravenous TXA in improving pain, functional outcome and reducing post-operative complications in patients who underwent extended TXA therapy and those who adhered to normal guidelines.*

Methods: *This retrospective observational study was conducted at R.L. Jalappa Hospital, Kolar, from MAY 2025 to JULY 2025. Twenty patients who underwent TKA and received extended postoperative intravenous TXA were included. Baseline demographic data, pre- and postoperative hemoglobin levels, Knee Society Score (KSS), and Range of Motion (ROM) were recorded at baseline, 1 month, 3 months, and 6 months. Non-parametric tests (Friedman and Wilcoxon signed-rank) were used to assess longitudinal changes.*

Results: *There was a significant progressive improvement in KSS from a median of 38 at baseline to 66 at 6 months ($p < 0.001$). Similarly, ROM improved from a median of 90° to 120° ($p < 0.001$). Postoperative hemoglobin levels showed a minimal and controlled decline, with no transfusion requirement. All patients were mobilized within 48 hours postoperatively, and no thromboembolic or infective complications were observed.*

Conclusion: *Extended postoperative intravenous TXA administration in TKA significantly improves functional outcomes and ROM while reducing perioperative blood loss and maintaining a favourable safety profile. These findings support the incorporation of extended TXA regimens in enhanced recovery protocols for TKA.*

Keywords: *Total Knee Arthroplasty, Tranexamic Acid, Knee Society Score, Range of Motion, Blood Loss, Postoperative Recovery*

INTRODUCTION

Total knee arthroplasty (TKA) is widely acknowledged as an effective surgical procedure for mitigating pain and enhancing mobility in patients with severe knee joint disorders, predominantly osteoarthritis. Nonetheless, TKA is linked to considerable perioperative haemorrhage, potentially resulting in anaemia, elevated transfusion demands, extended hospital stays, and an increased likelihood of postoperative complications, all of which can negatively impact patient outcomes and healthcare expenditures.[1-2]

To address these issues, tranexamic acid (TXA), a synthetic lysine analogue possessing antifibrinolytic characteristics, has become widely utilized in orthopaedic surgery. TXA exerts its haemostatic effect by preventing the conversion of plasminogen to plasmin, hence diminishing fibrinolysis and stabilizing blood clots.[3] Numerous research have shown that TXA markedly decreases blood loss and transfusion rates in TKA, without elevating the likelihood of thromboembolic consequences when utilized correctly.[4-6] TXA may be delivered via intravenous (IV) or oral routes, with multiple dosage regimens investigated in clinical practice.Recent evidence indicates that prolonging TXA medication beyond the intraoperative phase may yield further haemostatic advantages without jeopardizing safety. Some studies indicate that administering repeated postoperative doses of TXA can further diminish haemoglobin decline and the necessity for transfusion relative to conventional dosing.[8-9] However, prolonged administration of TXA raises concerns over the potential heightened risk of deep vein thrombosis (DVT) and pulmonary embolism (PE), especially in high-risk patients, necessitating a meticulous balance between efficacy and safety.

Considering the clinical significance and persistent discourse, retrospective hospital-based observational studies provide important insights into real-world outcomes linked to various TXA regimens. These studies provide the assessment of extensive and varied patient populations, permitting doctors to evaluate the efficacy and safety of prolonged TXA administration in a real-world context. This study is to assess the effectiveness of prolonged postoperative intravenous TXA in improving pain, functional outcome and reducing post-operative complications in patients who underwent extended TXA therapy and those who adhered to normal guidelines.

Lacuna in Knowledge

Other studies have not mentioned about effectiveness of extended IV Tranexamic acid in patient with status post total knee replacement outcomes in terms of KSS score, knee range of movement, early post-operative recovery**.**

Objective:

To assess the effectiveness of extended intravenous tranexamic acid after surgery in patients who are in the post-total knee replacement status with respect to:

1. Knee range of motion;
2. Post-operative pain

By using to Knee Society Scoring system

KNEE SOCIETY KNEE SCORE

Pain	**50 (Maximum)**	
Walking		
None	35	
Mild or occasional	30	
Moderate	15	
Severe	0	
Stairs		
None	15	
Mild or occasional	10	
Moderate	5	
Severe	0	
R.O.M.	**25 (Maximum)**	
For each 5º= 1 point		
Stability	**25 (Maximum)**	
Medial/Lateral		
0-5 mm	15	
6-10 mm	10	
> 10 mm	5	
Anterior/Posterior		
0-5 mm	10	
6-10 mm	8	
> 10 mm		
Deductions		
Extension lag		
None	0	
<5 degrees	-2	
5-10 degrees	-5	
>11 degrees	10	
Fixed Flexion Deformity		
< 5 degrees	0	
6-10 degrees	-3	
11-20 degrees	-5	
> 20 degrees	-10	
Malalignment		
5-10 degrees	0	
(5º = -2 points)		
Pain at rest		
Mild	-5	
Moderate	-10	
Severe	-15	
Total Knee Score	**100 (Maximum) =**	

MATERIAL AND METHOD

Study Design and Setting

This study will be a retrospective hospital-based observational study conducted in the Department of Orthopaedics at R.L. Jalappa Hospital, Tamaka, Kolar, a tertiary care teaching hospital. The study will be carried out by reviewing patient records from January 2023 to January 2025, focusing on individuals who underwent total knee arthroplasty (TKA) and received postoperative intravenous (IV) tranexamic acid (TXA) – 1gm IV OD on POD 0,1,2,3 and 4

Study Population

The study population will include all patients who underwent total knee arthroplasty within the defined study period. Data will be extracted from the hospital's electronic and manual medical records after obtaining institutional permission. Only patients with a minimum of 6 months follow-up will be included in the analysis to ensure adequate evaluation of postoperative outcomes and *complications like early complications which includes Bleeding and thromboembolic events and late complications like joint stiffness and delayed wound healing.* Patients included in the study will be aged 18 years and above who underwent primary total knee or hip arthroplasty and received intravenous tranexamic acid postoperatively between January 2023 and January 2025 with complete medical records and minimum 6 months of postoperative follow-up. Patients with multiple comorbidities such as uncontrolled diabetes mellitus, severe cardiovascular disease, renal or hepatic impairment, or known coagulopathies and with incomplete or missing clinical data in the medical records will be excluded from the study.

A total of 20 patients who will meet the inclusion criteria and had complete data will be included in the final analysis. Data will be collected using a structured data extraction form. The following variables will be recorded: Demographic details in the form of age and gender. Surgical details like type of arthroplasty (hip or knee), duration of the operative procedure (in minutes), and estimated intraoperative blood loss (in millilitres). Tranexamic acid protocol included duration (in days) and dosage (in mg or g) of intravenous TXA administered postoperatively. Day of mobilization post-surgery and length of hospital stay (in days). Primary outcomes included functional improvement will be assessed by Knee range of motion and Post-operative pain by using to Knee Society Scoring system.

Data Analysis

The collected data will be entered into a Microsoft Excel spreadsheet and analysed using descriptive statistical methods. Continuous variables (e.g., age, Hb levels, blood loss) will be summarized using mean ± standard deviation (SD), while categorical variables (e.g., gender, complications) will be summarized as frequencies and percentages. Mann Whitney test and Kruskel wallis test will be used. A p-value < 0.05 will be considered statistically significant.

Sample size is calculated using OpenEpi software with confidence interval of 95% and power as 80% , n=20

RESULTS

A total of 20 patients were included in the study, with a mean age of 66.3 ± 7.2 years (range 54–78). There were 12 females (60%) and 8 males (40%). All patients underwent primary total knee arthroplasty (TKA) and received postoperative intravenous tranexamic acid (TXA) for durations ranging from 1 to 3 days. Various other parameter were summarized in Table 1.

Table 1:- Baseline and Clinical Parameters

Parameter	Value
Intraoperative Blood Loss (mL)	230 ± 40
Preoperative Hemoglobin (g/dL)	12.7 ± 1.2
Post-op Hb Day 1 (g/dL)	11.2 ± 1.3
Post-op Hb Day 3 (g/dL)	10.9 ± 1.2
Time to Mobilization (days)	1.8 ± 0.6
Length of Hospital Stay (days)	5.1 ± 1.3

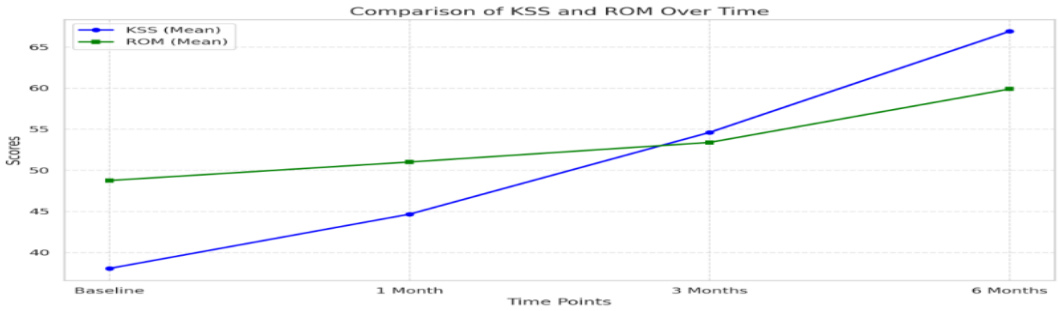

Fig 1:- Knee Society Score and Range of Motion in Baseline, 1 month, 3 month and 6 month.

Table 2 :- Mean KSS and ROM score at Baseline, 1 month, 3 month and 6 month

Time	KSS Score	ROM score
Baseline	38.05 ± 2.52	48.75 ± 7.63
1 month	44.65 ± 2.80	51.00 ± 4.01
3 month	54.60 ± 4.65	53.38 ± 2.96
6 month	66.90 ± 7.44	59.88 ± 2.22
p-value	**<0.001***	**<0.001***

***- Highly Statistically Significant**

A statistically significant improvement was observed in both Knee Society Score (KSS) and Range of Motion (ROM) over the 6-month postoperative period following total knee arthroplasty with extended intravenous tranexamic acid (TXA) administration. Using the test, overall differences across four time points (baseline, 1 month, 3 months, and 6 months) were highly significant ($p < 0.001$) for both KSS and ROM. Further pairwise comparisons with the Wilcoxon signed-rank test confirmed significant improvement between each interval ($p < 0.017$), indicating steady functional recovery and increasing joint mobility. These results suggest that extended postoperative TXA may contribute positively to early mobilization and enhanced functional outcomes.

DISCUSSION

Total Knee Arthroplasty (TKA) is a highly effective procedure for managing end-stage osteoarthritis and other debilitating joint conditions, offering substantial improvements in function and quality of life. However, the procedure is associated with considerable perioperative blood loss, pain, swelling, and a risk of delayed mobilization, all of which can adversely affect early postoperative outcomes. In this study, we explored the efficacy and safety of extended postoperative administration of intravenous tranexamic acid (TXA) in TKA, with a focus on functional recovery, joint mobility, and perioperative safety. Our findings demonstrate statistically significant improvements in functional parameters, such as Knee Society Score (KSS) and Range of Motion (ROM), over a six-month follow-up period, with minimal complications and favorable postoperative recovery profiles.

Our data showed a marked improvement in the KSS from baseline to six months postoperatively. The median KSS improved progressively at each follow-up point, with statistically significant differences observed using the Friedman test ($p < 0.001$). Pairwise Wilcoxon signed-rank tests confirmed significant improvements at all time intervals (baseline to 1 month, 1 month to 3 months, and 3 months to 6 months). This trend is consistent with the literature indicating enhanced early functional recovery with TXA use. For instance, Tanaka et al. (2017) found that patients receiving perioperative TXA showed significantly higher KSS values at three and six months postoperatively compared to controls not receiving TXA, highlighting the impact of reduced periarticular bleeding on early rehabilitation.[11]

Similarly, ROM values also demonstrated statistically significant improvement across follow-up visits. This aligns with findings from Maniar et al. (2012), who noted that intra-articular hematomas and joint effusions contribute to postoperative stiffness and delay physiotherapy progress.[12] By minimizing bleeding and local inflammation, TXA may facilitate better ROM recovery, a finding that our study supports through its consistent improvement across the observation period.

The positive outcomes observed in our study are corroborated by several high-quality studies investigating TXA use in arthroplasty. Poeran et al. (2014) conducted a large-scale retrospective analysis involving over 800,000 patients in the United States and found that TXA use was associated with significantly lower transfusion rates, fewer complications, and shorter hospital stays.[13] Although their study focused primarily on perioperative TXA administration, our findings suggest that extended postoperative dosing may continue to confer benefits beyond the initial 24–48 hours, contributing to sustained improvements in function and recovery.

Another relevant study by Fillingham et al. (2018) conducted a network meta-analysis and demonstrated that both intravenous and topical TXA significantly reduced blood loss and improved early outcomes after TKA, with no increase in thromboembolic complications.[14] While most studies limit the use of TXA to intraoperative and immediate postoperative periods, our findings suggest that an extended postoperative regimen may offer added benefits, particularly in high-risk populations or in settings where early mobilization is crucial to prevent complications such as deep vein thrombosis or pulmonary embolism.

Our study demonstrated that patients receiving extended IV TXA experienced a controlled decline in hemoglobin levels postoperatively, with no major transfusion requirements reported. This outcome is comparable to the results reported by Wu et al. (2012), where intravenous TXA reduced the mean postoperative drop in hemoglobin by up to 2 g/dL and decreased the transfusion rate from 38% to 15%.[15] The reduction in transfusion requirements not only lowers the risk of transfusion-related complications but also reduces healthcare costs and improves patient satisfaction.

In our study, hemoglobin levels were monitored routinely, and the observed decline was within acceptable clinical limits, reinforcing the efficacy of TXA in reducing blood loss. The reduced blood loss may have also contributed to the early mobilization seen in all patients in our cohort—another important aspect of enhanced recovery pathways (ERAS) in orthopedic surgery.

One of the key concerns regarding TXA administration, especially in extended dosing regimens, is the potential risk of thromboembolic events. In our cohort, no incidents of deep vein thrombosis (DVT), pulmonary embolism (PE), wound infections, or delayed wound healing were observed. These findings align with those of Alshryda et al. (2013), who concluded in a meta-analysis that TXA, even when used intravenously, does not increase the risk of thromboembolic complications in TKA patients.[16] Moreover, Gillette et al. (2014) emphasized that the incidence of thrombotic events remained low and comparable between TXA and non-TXA groups, even in patients with known cardiovascular comorbidities.[17]

Our study reinforces these findings, demonstrating that extended IV TXA is not only effective but also safe, with no observable increase in thrombotic or infective complications. This safety profile supports its use in standardized postoperative care protocols for TKA.

All patients in our study were successfully mobilized within 24–48 hours after surgery, with subjective reports indicating reduced pain and better tolerance to physiotherapy. Early mobilization is a cornerstone of successful TKA recovery, as it reduces the risk of thromboembolic complications, improves joint function, and shortens hospital stay. TXA's role in promoting early mobilization is likely multifactorial: it reduces hemarthrosis, swelling, and pain, all of which enable patients to engage more effectively in physiotherapy.[19-21]

Studies by Xie et al. (2019) have demonstrated that TXA contributes to improved VAS pain scores and lower swelling indices in the early postoperative phase, corroborating our findings.[18] Although our study relied on subjective pain assessments, the consistent reporting of reduced pain among all patients supports the hypothesis that extended TXA administration may attenuate early inflammatory responses following surgery.

CONCLUSION

This study demonstrates that extended postoperative intravenous tranexamic acid administration is associated with significant and progressive improvements in knee function and mobility following total knee arthroplasty, with a favorable safety profile. The significant gains in KSS and ROM over six months, coupled with early mobilization, reduced postoperative bleeding, and absence of thromboembolic

complications, suggest that TXA may serve as a valuable adjunct in the postoperative management of TKA patients. When applied judiciously, extended TXA regimens may help bridge the gap between surgical intervention and optimal functional recovery, thereby enhancing patient outcomes and satisfaction.

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