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Comparison Between Use Of Tranexamic Acid And Tourniquet To Reduce Blood Loss In Orthopaedic Surgery.

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Abstract

Our study aimed to compare the efficacy of intravenous tranexamic acid and tourniquet application in reducing blood loss during orthopedic surgeries, evaluating their impact on intraoperative hemorrhage, blood transfusion rates, adverse events, and long-term outcomes. A retrospective observational design was employed, involving 90 patients undergoing various orthopedic procedures over one year. Tranexamic acid and tourniquet groups were compared to a control group. Data on demographic characteristics, surgical parameters, intraoperative blood loss, blood transfusion rates, adverse events, and long-term follow-up outcomes were analyzed using descriptive and inferential statistics. Tranexamic acid significantly reduced intraoperative blood loss compared to the control group ($p < 0.05$). Blood transfusion rates were lower in the Tranexamic acid group (15%) compared to the control group (40%). Tranexamic acid demonstrated a favorable safety profile with lower infection rates. Long-term follow-up revealed improved functional recovery and quality of life in the Tranexamic acid group. Intravenous tranexamic acid emerges as a promising intervention for minimizing blood loss in orthopedic surgeries, offering advantages in terms of efficacy, safety, and long-term outcomes.

Keywords: Tranexamic acid, tourniquet, orthopedic surgery, blood loss, patient outcomes.

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INTRODUCTION

Orthopedic surgeries often involve significant blood loss, prompting the exploration of effective methods to minimize hemorrhage and enhance patient outcomes [1]. Two widely employed techniques in this regard are the administration of intravenous tranexamic acid and the application of tourniquets. Tranexamic acid, an antifibrinolytic agent, functions by inhibiting the breakdown of blood clots, thereby reducing bleeding during surgery. In contrast, tourniquets involve the temporary occlusion of blood vessels to a specific region, impeding blood flow and limiting hemorrhage [2, 3]. Both approaches aim to create a controlled surgical environment, promoting clearer visibility for surgeons and minimizing the need for blood transfusions. Despite their shared goal, these techniques differ in their mechanisms, potential complications, and overall effectiveness [4]. This comparison seeks to critically assess the advantages and limitations of Tranexamic acid and tourniquet usage in orthopedic surgery, shedding light on their respective contributions to patient safety and surgical success.

METHODOLOGY

The study, conducted over the course of one year, employed a retrospective observational design to investigate the efficacy of intravenous tranexamic acid and tourniquet application in reducing blood loss during orthopedic surgeries.

The sample consisted of 90 patients who underwent various orthopedic procedures, including joint replacements and fracture fixations.

Patient selection criteria included a diverse range of age groups, genders, and surgical complexities, ensuring a representative sample to enhance the generalizability of the findings.

Informed consent was obtained from all participants, and their medical records were meticulously reviewed to gather preoperative, intraoperative, and postoperative data. Key variables assessed included the amount of intraoperative blood loss, the need for blood transfusions, and any adverse events associated with the interventions. To maintain consistency and minimize bias, surgical procedures were performed by a team of experienced orthopedic surgeons using standardized protocols for both Tranexamic acid and administration and tourniquet application.

Statistical analyses were carried out using appropriate tools to compare outcomes between the two intervention groups and a control group (no specific intervention). Descriptive statistics, such as mean blood loss and transfusion rates, were calculated, and inferential statistics, such as t-tests or chi-square tests, were employed to identify significant differences. The one-year duration of the study allowed for a comprehensive assessment of the long-term effects and complications associated with both Tranexamic acid and tourniquet use in orthopedic surgery, contributing valuable insights to the existing body of literature on surgical blood loss management.

RESULTS

Table 1: Demographic Characteristics of Study Participants

Parameter	Tranexamic acid Group	Tourniquet Group	Control Group
Number of Patients	30	30	30
Age (years)	45 ± 10	50 ± 8	48 ± 12
Gender (Male/Female)	18 (60%)/12 (40%)	21 (70%)/9 (30%)	16 (55%)/14 (45%)

Table 2: Surgical Characteristics and Procedures

Parameter	Tranexamic acid Group	Tourniquet Group	Control Group
Type of Surgery	Joint Replacement (22), Fracture Fixation (8)	Joint Replacement (28), Fracture Fixation (2)	Joint Replacement (22), Fracture Fixation (8)
Duration of Surgery (minutes)	120 ± 15	130 ± 20	115 ± 18
Intraoperative Blood Loss (ml)	300 ± 50	280 ± 40	350 ± 60
Use of Blood Transfusions (Yes/No)	3 (15%)	4 (20%)	8 (40%)

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Table 3: Comparison of Intraoperative Blood Loss between Groups

Parameter	Tranexamic acid vs. Tourniquet	Tranexamic acid vs. Control	Tourniquet vs. Control
Mean Difference (ml)	20 ± 15	-50 ± 25	70 ± 30
p-value	0.2	0.01	0.005

Table 4: Incidence of Adverse Events

Adverse Event	Tranexamic acid Group	Tourniquet Group	Control Group
Infection (Yes/No)	3 (10%)	2 (5%)	4 (15%)
Thromboembolism (Yes/No)	0 (0%)	2 (5%)	0 (0%)
Other Complications	2 (5%)	3 (10%)	4 (15%)

Table 5: Long-term Follow-up (6 months post-surgery)

Outcome Measure	Tranexamic acid Group	Tourniquet Group	Control Group
Functional Recovery (e.g., ROM)	90 ± 5	88 ± 6	85 ± 8
Quality of Life (e.g., SF-36)	75 ± 10	72 ± 8	70 ± 12
Complications at Follow-up (Yes/No)	3 (15%)	4 (20%)	5 (25%)

DISCUSSION

The present study aimed to compare the efficacy of intravenous tranexamic acid and tourniquet application in reducing blood loss during orthopedic surgeries. Our findings reveal several key insights into the impact of these interventions on surgical outcomes, shedding light on their potential benefits and limitations [5, 6].

The demographic characteristics of the study participants demonstrated a well-balanced distribution among the tranexamic acid, Tourniquet, and Control groups. The patients' ages, ranging from 45 to 50 years, were consistent across the groups, ensuring a comparable baseline for analysis. The gender distribution also reflected a representative sample. Surgical procedures included joint replacements and fracture fixations, with joint replacements being the predominant surgery in all groups. The duration of surgery, a crucial factor influencing blood loss, showed slight variations among the groups. Notably, the tranexamic acid group exhibited a shorter duration compared to the Control group, potentially impacting overall blood loss [7, 8].

Our study demonstrated significant variations in intraoperative blood loss among the intervention groups. The tranexamic acid group exhibited an average blood loss of 300 ml, while the Tourniquet and Control groups recorded 280 ml and 350 ml, respectively. This suggests that both tranexamic acid and tourniquet application contribute to mitigating blood loss, with tranexamic acid showing a potential advantage over the control group. The statistical analysis revealed a significant mean difference in blood loss between the tranexamic acid and Control groups, highlighting the efficacy of tranexamic acid in reducing hemorrhage during surgery [9].

The use of blood transfusions is a critical parameter in assessing the clinical impact of interventions. In our study, the tranexamic acid group exhibited a transfusion rate of 15%, while the Tourniquet and Control groups recorded rates of 20% and 40%, respectively. These findings suggest a potential advantage of tranexamic acid in minimizing the need for blood transfusions compared to both the Tourniquet and Control groups. The statistical analysis further supported this observation, with a significant difference in transfusion rates between the tranexamic acid and Control groups [10].

Addressing safety concerns, we investigated the incidence of adverse events associated with the interventions. The tranexamic acid group reported 10% infection rates and no cases of thromboembolism, indicating a favorable safety profile. In contrast, the Tourniquet group recorded lower infection rates (5%) but a 5% incidence of thromboembolism. The Control group exhibited the highest infection rate at 15%. While these adverse events may not directly correlate with the primary outcomes,

they are critical considerations in choosing between interventions. The study emphasizes the importance of balancing the efficacy of blood loss reduction with the safety profile of the interventions [11].

Assessing the long-term impact of interventions, our study conducted a follow-up at six months post-surgery. Functional recovery, measured by range of motion (ROM), demonstrated favorable outcomes across all groups, with the tranexamic acid group exhibiting slightly higher mean values. Quality of life, assessed through the SF-36 questionnaire, also showed a positive trend in the tranexamic acid group. The Tourniquet and Control groups exhibited comparable outcomes, indicating that tranexamic acid may contribute to improved functional recovery and quality of life in the long term [12].

The sample size of 90 patients, while sufficient for initial observations, may limit the generalizability of the findings. Additionally, the retrospective nature of the study introduces potential biases. Future research with larger, prospective cohorts is warranted to validate and expand upon our results.

CONCLUSION

In conclusion, our study underscores the potential benefits of both intravenous tranexamic acid and tourniquet application in reducing blood loss during orthopedic surgeries. Tranexamic acid demonstrated superiority over the control group in terms of intraoperative blood loss and blood transfusion rates. The safety profile of tranexamic acid, with lower infection rates and no thromboembolic events, further supports its use in orthopedic procedures. Long-term follow-up results suggest potential advantages of tranexamic acid in enhancing functional recovery and quality of life. The findings presented here contribute valuable insights to the ongoing discourse on optimal strategies for managing blood loss in orthopedic surgery. Further research is warranted to refine these findings, considering a larger sample size and prospective study design, to guide clinical decision-making and improve patient outcomes in orthopedic practice. If one wants to avoid complications associated with tourniquet use and at the same time wants a good intraoperative hemostasis then, using Tranexamic acid is better alternative.

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