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THE ROLE OF TRANEXAMIC ACID IN REDUCING BLEEDING DURING TRANSURETHRAL RESECTION OF THE PROSTATE (TURP)

General Surgery

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ABSTRACT

Introduction: Benign prostatic hyperplasia (BPH) is a common condition among aging men, often requiring transurethral resection of the prostate (TURP) for symptomatic relief. One of the major intraoperative and postoperative complications of TURP is bleeding, which can lead to increased transfusion rates and higher morbidity. Tranexamic acid (TXA), antifibrinolytic agent, has been used in various surgical settings to minimize blood loss, but its role in TURP remains under investigation. Study aimed to evaluate the efficacy of intravenous TXA in reducing intraoperative blood loss, preserving hemoglobin levels, and improving postoperative recovery in patients undergoing TURP. **Materials And Methods:** A randomized controlled trial was conducted at KD Medical College, involving 66 patients undergoing TURP for BPH. Patients were randomly assigned into two groups: Group A received intravenous TXA, while Group B did not receive TXA. Parameters assessed included intraoperative blood loss and postoperative complications. **Results:** Group A had significantly lower intraoperative blood loss (149.69 ± 50 ml vs. 296.21 ± 75 ml, p=0.01). Postoperative complications, including fever (p=0.03), clot retention (p=0.01), and transfusion requirements (p=0.01), were lower in the TXA group. **Conclusion:** Intravenous TXA effectively reduces blood loss and improves postoperative recovery in TURP patients. It minimizes transfusion rates without increasing thromboembolic risks, making it a valuable adjunct in TURP procedures.

KEYWORDS

Benign prostatic hyperplasia, Tranexamic acid, Transurethral resection of the prostate (TURP)

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common condition among aged men and it is estimated that over 80% of men aged 70 and above experience BPH, which is often linked to various degenerative and metabolic comorbidities [1]. While BPH is a benign enlargement of the prostate gland, untreated cases can lead to lower urinary tract symptoms (LUTS) that impact approximately 50% of men aged 60 and 90% of men aged 70 and older [2]. Transurethral resection of the prostate (TURP) is a commonly performed surgical procedure for managing benign prostatic hyperplasia (BPH), particularly in patients with obstructive urinary symptoms [3]. Despite its efficacy, one of the major intraoperative and postoperative complications associated with TURP is bleeding, which can lead to poor visualization during surgery, increased risk of blood transfusions, prolonged hospital stays, and other related morbidities[4]. Efforts to minimize bleeding during TURP have included optimizing surgical techniques, perioperative haemostasis strategies, and the use of pharmacological agents [5]. Tranexamic acid (TXA), an antifibrinolytic agent, has shown promising results in various surgical settings for reducing blood loss by inhibiting the conversion of plasminogen to plasmin, thereby stabilizing fibrin clots. The use of antifibrinolytic drugs like TXA may help mitigate postoperative blood loss. Among surgical treatments, transurethral resection of the prostate (TURP) is considered the gold standard [6]. Several strategies have been proposed to reduce bleeding during TURP, including the use of intraprostatic vasopressin, estrogen, and 5-alpha-reductase inhibitors. However, these methods have not been routinely adopted in clinical practice. Plasminogen activators present in the urothelium and urine enhance fibrinolysis, further increasing blood loss. This has prompted investigations into the role of antifibrinolytic agents like TXA in minimizing bleeding during TURP. TXA, a lysine derivative, binds to plasminogen and prevents its interaction with fibrin, thus stabilizing fibrin clots and reducing clot dissolution [7,8]. The present study aims to assess the effectiveness of high-dose TXA administration in patients undergoing TURP for large prostates. By evaluating its impact on perioperative bleeding, transfusion requirements, and surgical outcomes, this study seeks to provide evidence for the integration of TXA into routine clinical practice for TURP.

MATERIALS AND METHODS

Study Design

The present study was conducted in the Department of General Surgery at Kanti Devi Medical College, Hospital & Research Centre, Mathura, to evaluate the effect of tranexamic acid on bleeding during TURP. The study was designed as a randomized controlled trial (RCT) and was carried out over a period of two years after obtaining ethical clearance from the institute and written informed consent from all participants. Sample size was 59. To account for a 10% design effect, the final sample size was determined to be 65 patients, divided into two groups:

- **Group A (TXA group):** 33 patients received tranexamic acid
- **Group B (Control group):** 32 patients did not receive tranexamic acid

Inclusion Criteria

- Patients who willingly participated in the study.
- Age above 50 years undergoing TURP for benign prostatic hyperplasia (BPH) under spinal anesthesia.
- Patients with clinical and radiological evidence of BPH.

Exclusion Criteria

- Patients on anticoagulant therapy.
- Patients with a history of coronary artery bypass graft (CABG) or other cardiac illnesses.
- Patients diagnosed with prostate diseases other than BPH.
- Patients with a history of liver disease or congenital bleeding disorders.
- Patients with a known allergy to tranexamic acid or any other medications.

All patients who exhibited both clinical and laboratory evidence of prostatic enlargement caused by benign prostatic hyperplasia (BPH) were enrolled in the study.

The prostate size was determined using abdominal ultrasonography. Patients scheduled for transurethral resection of the prostate (TURP) underwent pre-anesthetic evaluation. Data collection included preoperative, intraoperative, and postoperative parameters for all patients in the study. Those deemed fit for surgery were randomly assigned into two groups-

Group A received 10 mg/kg intravenous tranexamic acid during the first 30 minutes of the operation, followed by a maintenance infusion of 1 mg/kg/hour. Group B did not receive tranexamic acid and served as the control group.

Statistical Analysis Plan

The collected data were entered into SPSS Version 25. Continuous variables were analyzed using means and standard deviation, while categorical variables were analyzed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Blood loss was significantly higher in Group B, with a mean value of 296.21 ± 75 ml, compared to Group A, where the mean blood loss was 149.69 ± 50 ml.

The p-value of 0.01 indicates a statistically significant difference in blood loss between the two groups by using independent t test and suggesting that Group B experienced considerably more intraoperative blood loss than Group A. (Figure 1)

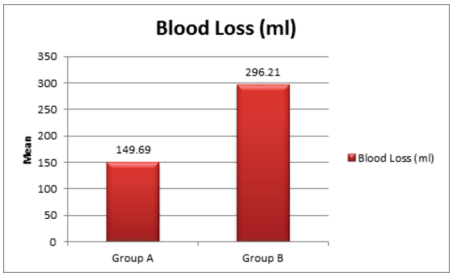

Figure 1: Comparison of Blood Loss Between Groups

Postoperative complications were observed more frequently in Group B compared to Group A. The incidence of fever was significantly higher in Group B (30.30%) compared to Group A (12.12%), with a p-value of 0.03. Hematuria was present in 15.15% of patients in Group B and 9.09% in Group A, but this difference was not statistically significant (p = 0.07). Blood transfusions were required in 18.18% of patients in Group B, compared to only 3.03% in Group A, with a p-value of 0.01, indicating a significant difference. Similarly, clot retention was observed in 18.18% of patients in Group B and 9.09% in Group A (p = 0.01). The need for cystoscopy and clot evacuation was also significantly higher in Group B (18.18%) compared to Group A (9.09%), with a p-value of 0.01, indicating that Group B had a higher incidence of postoperative complications. (Table 1)

Table 1: Post-Operative Complications Comparison

Complication	Group A Yes (N%)	Group A No (N%)	Group B Yes (N%)	Group B No (N%)	p-value
Fever	4 (12.12%)	29(87.87 %)	10(30.30 %)	23(69.69 %)	0.03*
Hematuria	3(9.09%)	30(90.90 %)	05(15.15 %)	28(84.84 %)	0.07
Blood Transfusion	1(3.03%)	32(96.97 %)	06(18.18 %)	27(81.81 %)	0.01*
Clot Retention	3(9.09%)	30(90.90 %)	06(18.18 %)	27(81.81 %)	0.01*
Cystoscopy and Evacuation of clot	3(9.09%)	30(90.90 %)	06(18.18 %)	27(81.81 %)	0.01*

Test used- chi square, p*≤0.05 significant

DISCUSSION

Our study demonstrated that patients in **Group A (TXA group) experienced significantly lower intraoperative blood loss (149.69 ± 50 ml) compared to Group B (296.21 ± 75 ml, p = 0.01).** These findings align with multiple studies, including **Ahmed Tawfick et al. (2022)**,[9]who reported significantly reduced intraoperative and postoperative blood loss in the TXA group compared to controls ($p < 0.05$). Similarly, **Gupta et al. (2021)[6]** observed that TXA administration significantly reduced blood loss (174.60 ± 125.38 ml vs. 232.47 ± 116.8 ml, p = 0.04).** Further supporting evidences from **Karkhanei et al. (2020)[10]**, who found that TXA effectively reduced intraoperative blood loss and improved surgical visibility ($p < 0.05$). **Samir et al. (2022)[11]** also demonstrated a statistically significant reduction in intraoperative blood loss ($p < 0.001$), further corroborating the efficacy of TXA.

Postoperative complications were more frequent in **Group B**, which did not receive tranexamic acid (TXA), compared to **Group A**, which received TXA. **Fever was significantly higher in Group B (30.30%) compared to Group A (12.12%), with a p-value of 0.03.** Hematuria, although slightly higher in Group B (15.15%) than Group A (9.09%), was not statistically significant (p = 0.07). **Blood transfusion rates were notably higher in Group B (18.18%) than in Group A (3.03%), with a significant p-value of 0.01.** Clot retention and the need for cystoscopy with clot evacuation were also significantly higher in Group B (18.18% vs. 9.09%, p = 0.01).These findings are consistent with the **study by Ahmed Tawfick et al. (2022)** [9] Additionally, the study found no significant difference in the 4-week complication rate between the two groups, suggesting that TXA does not increase the risk of adverse events. Similarly, **Ahmed Tawfick et al. (2022)[9]** and **Diab et al. (2024)[12]** reported **reduced clot formation and improved postoperative outcomes with TXA.** Future studies should explore **optimal TXA dosing and administration routes to maximize benefits while ensuring patient safety.**

CONCLUSION

Study findings indicate that TXA effectively minimized the need for blood transfusions, reduced postoperative complications and facilitated faster postoperative recovery. In conclusion, **the use of intravenous TXA in TURP significantly reduces perioperative blood loss and decreases postoperative complications.** Given its favorable safety and efficacy profile, TXA should be considered as an adjunct in TURP to enhance surgical outcomes and patient recovery. Future studies with larger sample sizes and long-term follow-up are recommended to further validate these findings and optimize TXA dosing strategies in TURP.

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