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Original Research Article

Efficacy of Tranexamic Acid in Controlling Bleeding Following Percutaneous Nephrolithotomy

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Abstract:

Background and Aim: Tranexamic acid is a fibrinolysis suppressor that is used for a variety of bleeding control procedures such as hematuria, surgery bleeding, and trauma caused bleeding. The advantages of using tranexamic acid are bleeding control and less need for blood transfusion. Current study's objective was to assess how well tranexamic acid functions in minimising overall blood loss after percutaneous nephrolithotomy.

Material and Methods: The present analysis is the double blind clinical study done for the period of one year. The inclusion and exclusion criteria followed in the study were as follows: A total of 150 patients having kidney or upper ureteral stones and the candidate of PCNL were included in the study. According to Goodman & Gilman's The Pharmacological Basis of Therapeutics Dosing Protocol, 2.5 mg/kg - 100 mg/kg, patients in group (A) got 1 gm (10 cc) of tranexamic acid on call to surgery 20 minutes before to the operation, whereas patients in group (B) received 10 cc of normal saline injection.

Results: Nine patients in group B had prior ipsilateral open renal surgery, while 15 patients in group A had a history of ipsilateral open renal surgery, 6 patients had a history of PCNL, and 6 patients had a history of ESWL. Three patients had a history of ESWL, and six patients had a history of PCNL. The total blood loss in millilitres for group A was 73.80 ± 60.1, while for group B it was 117.24 ± 87.9. Both groups had statistically and clinically significant blood loss. Additionally, the haemoglobin decrease mean with standard deviation for group A was 0.45 ± 0.35 g/dl and group B was 1.00 ± 0.46 g/dl, both of which had a statistically and clinically significant.

Conclusion: In percutaneous nephrolithotomy, tranexamic acid is a safe and efficient medication for lowering total blood loss and blood transfusion rates. It is linked to a quicker surgical time and fewer intraoperative and postoperative problems.

Keywords: Normal Saline, Percutaneous Nephrolithotomy, Tranexamic acid, Ureteral stones.

Introduction

Kidney stone treatment that is both minimally invasive and effective is percutaneous nephrolithotomy (PCNL). This is the first-line therapy for lower calyx stones and big or complicated renal pelvis stones. For big, infected, stiff, and obstructive upper ureteral stones, it is advised when extracorporeal shock wave lithotripsy is ineffective. [1,2]

Compared to an atrophic nephrolithotomy, this technique is associated with shorter hospital stays. Nevertheless, a quarter of individuals (23.3%) have problems after PCNL. In so far as bleeding during and after PCNL still serves as a significant contributor to morbidity, haemorrhage is one of the most frequent and concerning consequences. [2-4]

Tranexamic acid (TXA) is a lysine derivative that functions as an antifibrinolytic drug by binding to plasminogen and reducing plasmin production. TXA's antifibrinolytic qualities have been tested in a variety of contexts to evaluate outcomes such intraoperative blood loss, blood transfusion, and mortality. It has been discovered that TXA is helpful for a number of surgical operations, including heart surgeries, oral surgeries, orthoplasties, and trauma in both the military and the civilian population. [5,6]

By inhibiting the lysine-binding sites of plasminogen to fibrin, tranexamic acid, a synthetic lysine analogue, inhibits fibrinolysis. Fibrin is the fundamental component that forms the basis of a

blood clot during hemostasis. With normal renal function, it has a half-life of around 80 minutes and a 34% lower chance of blood transfusion after elective surgery. Without raising the risk of intraoperative and postoperative problems, antifibrinolytic medications have been demonstrated to decrease blood loss in individuals with both normal and heightened fibrinolytic reactions to surgery. [7,8] In patients who have sustained trauma and significant bleeding, it also lowers mortality. As a result, the current study's objective was to assess how well tranexamic acid functions in minimising overall blood loss after percutaneous nephrolithotomy.

Material and Methods

The present analysis is the double blind clinical study done for the period of one year. The study was done in the department of the urology, medical college and associated hospital. The inclusion and exclusion criteria followed in the study were as follows: A total of 150 patients having kidney or upper ureteral stones and the candidate of PCNL were included in the study, whereas patients with history of DVT, PTE and Creatinine> 1.5, having heart transplant, using coagulation factors were excluded from the study.

The patients who meet the inclusion and exclusion criteria were included in the study. The patients were randomly divided into two equal groups. Group A was considered as test group and group B was considered as control group. The patients were randomized into 2 equal groups: (group A and group B).

According to Goodman & Gilman's The Pharmacological Basis of Therapeutics Dosing Protocol, 2.5 mg/kg - 100 mg/kg, patients in group (A) got 1 gm (10 cc) of tranexamic acid on call to surgery 20 minutes before to the operation, whereas patients in group (B) received 10 cc of normal saline injection. The same surgeon performed all of the surgeries, was blinded to the randomization, and followed a comparable treatment plan for both groups.

Depending on the patient's request and health status, either spinal or general anaesthesia was used for the treatment. As per the 2017 recommendations for urological procedures by the American Urological Association (AUA), all patients were administered a single dose of cefuroxime 1 gm, which is a preventive antibiotic. Blood was drawn before the procedure, just after the procedure, and 24 hours later. Blood was measured in its whole. Both the volume of the fluid utilized for the operation and the volume of the irrigating fluid were measured and recorded.

Statistical analysis

The recorded data was compiled and entered in a spread sheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were described as means and standard deviations or median and interquartile range based on their distribution. Qualitative variables were presented as count and percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

The research had a total of 150 patients. In the research, the number of applicants in each group was equal. The average age ± standard deviation for group A was determined to be 41.02 ± 09.51, whereas group B's mean age ± SD was 42.12 ± 12.03. There was no statistically significant difference in the sex distributions between the two groups.

Nine patients in group B had prior ipsilateral open renal surgery, while 15 patients in group A had a history of ipsilateral open renal surgery, 6 patients had a history of PCNL, and 6 patients had a history of ESWL. Three patients had a history of ESWL, and six patients had a history of PCNL.

When the stone complexity of the two groups was compared, it was discovered that 42 patients in group A had Grade II complexity, 18 patients had Grade III, 12 patients had Grade I, and 3 patients had Grade IV. Group B included 30 patients with grade II stone difficulty, 18 patients with grade III complexity, 18 patients with grade I complexity, and 9 patients with grade IV complexity.

The total blood loss in millilitres for group A was 73.80 ± 60.1, while for group B it was 117.24 ± 87.9. Both groups had statistically and clinically significant blood loss, with a mean with ± SD of 0.047. Additionally, the haemoglobin decrease mean with standard deviation for group A was 0.45 ± 0.35 g/dl and group B was 1.00 ± 0.46 g/dl, both of which had a statistically and clinically significant P value of 0.001. Group A saw a lower rate of intraoperative and postoperative complications than group B.

Table 1: Pre-operative and post-operative data comparison of the groups

Variables	Group A	Group B
Diabetes Mellitus	12	6
Open surgical history	15	9
PCNL	6	6
ESWL	6	3
Blood loss	68 cc	110 cc
Operative time	41 mins	58 mins
Complications	18	27

Discussion

Derived from the amino acid lysine, tranexamic acid binds to the lysine-binding sites of plasminogen with great affinity.

This prevents plasminogen from being converted to active plasmin, the primary enzyme involved in fibrinolysis, and acts as a competitive inhibitor.

This inhibitor lessens bleeding by preventing blood clots from breaking down and reducing fibrin degradation. It has been demonstrated in the past that tranexamic acid effectively reduces perioperative bleeding in a variety of surgical procedures, such as radical retropubic prostatectomy and transurethral resection of the prostate. [5,9,10]

In a meta-analysis, Ker and colleagues came to the conclusion that tranexamic acid can lessen the need for transfusions during surgery. Strong evidence that tranexamic acid lowers the need for blood transfusions during surgery was found in this systematic review of the literature and cumulative meta-analysis published in 2012. However, tranexamic acid's impact on thromboembolic events and death is still unknown. [11]

According to Crescenti and colleagues, individuals treated with tranexamic acid who had radical retropubic prostatectomy for prostate cancer saw a 21% reduction in the transfusion rate and a relative risk of transfusion needs. There is relatively little data on the use of tranexamic acid to stop blood loss during percutaneous nephrolithotomy. [12]

In the current investigation, blinding was done for both the patients and the researcher. For each patient, the mean volume of blood lost, the length of the operation, the length of hospital stay, the pre- and postoperative haemoglobin levels, and the transfusion rate were noted.

These data were then compared between the two intervention groups and their corresponding control groups, taking into account the size of the stones.

Conclusion

In percutaneous nephrolithotomy, tranexamic acid is a safe and efficient medication for lowering total blood loss and blood transfusion rates. It is linked to a quicker surgical time and fewer intraoperative and postoperative problems.

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