

Role of Tranexamic Acid in Reducing Blood Loss in Bipolar Hemiarthroplasty during First 24 Hours

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Abstract:

Objective: *this study was to evaluate the Role of Tranexamic Acid in Reducing Blood Loss in Bipolar Hemiarthroplasty during First 24 Hours*

Materials and Methods: *A total of 140 patients who underwent hemiarthroplasty retrospectively analyzed using patient case files, discharge database, and blood bank database. The blood transfusion requirement, preoperative and postoperative hemoglobin levels, and drain volume were noted. Pearson chi-square test and independent t test were applied to analyze the data.*

Results: *The blood transfusion requirements were significantly lower in those who received tranexamic acid (17.5% vs. 66.67%; $P < 0.001$). Patients who had received tranexamic acid had significantly less drop in postoperative hemoglobin (0.99 ± 0.32 vs. 2.46 ± 0.52 ; $P < 0.001$) and drain volume (102.50 ± 29.62 vs. 274.67 ± 70.01 ; $P < 0.001$). Conclusion: *In patients who underwent hemiarthroplasty, tranexamic acid reduced the blood loss and the transfusion requirement.**

Keywords: Hemiarthroplasty, tranexamic acid, transfusion requirements

INTRODUCTION:

Hemiarthroplasty is associated with a considerable amount of blood loss; reportedly 1500 mL of blood is lost during the surgery.[1] The requirement for blood transfusion is crucial, but it is not without its dangers. Transfusions can lead to immune reactions, disease transmission, postoperative infections, and higher expenses.[2-5] Effective patient blood management can be achieved through a variety of approaches, including assessing for anemia before surgery, ensuring proper surgical positioning, preventing hypothermia, employing controlled hypotension techniques, and using anti-fibrinolytics and topical hemostasis agents.[6]

Tranexamic acid (TXA) is a frequently employed anti-fibrinolytic drug. It works by inhibiting the degradation of fibrin clots caused by plasmin. TXA competitively and reversibly binds to the lysine-binding sites of plasminogen, thus hindering the binding of fibrin to plasminogen. [7]

Multiple research studies have demonstrated the effectiveness of TXA in decreasing the overall amount of blood loss (both during surgery and after), the decrease in hemoglobin levels, the need for transfusions, and the average duration of hospital stay [8-14]. In contrast, additional studies have highlighted that TXA

specifically reduces the early postoperative blood loss but does not have a significant impact on the requirement for transfusions [15,16].

The enhancements of postoperative blood loss reduction and decreased necessity for blood transfusions have been linked to better clinical results following hip arthroplasty. Consequently, efficient blood management plays a crucial role in lessening the economic strain, aiding patient recovery, and ensuring safety. The importance of effective blood management cannot be overstated. Our objective was to investigate if the administration of TXA during hemiarthroplasty could lead to a notable decrease in blood loss and the requirement for blood transfusion.

MATERIALS AND METHODS

The study was a retrospective observational study. The study protocol was approved by the institutional ethics committee of Bolan Medical College /BMCH, Quetta. All patients who underwent hemiarthroplasty between 20th May 2023 and 21st November 2023 by the same surgeon in our hospital were retrospectively analyzed using patient charts, hospital admission, discharge database, and blood bank database.

Patient required details were collected from hospital records during the period of the study. Who were above 60 years old who underwent elective hemiarthroplasty. The exclusion criteria of the study were patients who had a history of congenital or acquired bleeding disorder, previous history of thromboembolic disease, renal failure, hepatic failure, significant comorbidities, severe ischemic heart disease, or previous myocardial infarction. Thirty patients who underwent hemiarthroplasty prior to routine use of TXA could be compared with the 40 patients who underwent it, with its use. TXA was administered as a 1 g intravenous (IV) infusion 30–60 min before surgery and 500 mg administered as an IV infusion 4–5 h after surgery.

Patient details including age and sex were documented. To address the bias of age, we have performed stratified analysis.

The efficacy outcome was assessed by comparing the postoperative hemoglobin drop, drain volume, and transfusion requirements. All patients whose hemoglobin dropped <9.5 g/dL were administered blood transfusion. The numbers of transfused whole blood units, plasma expanders, or packed red blood cells were documented.

Hemoglobin levels were measured before surgery and 24 h postoperatively. The drain output from the suction drain on removal at 48 h was also noted. All the patients would have received deep vein thrombosis (DVT) prophylaxis. Documented complications such as occurrence of DVT were also noted.

The two treatment groups were investigated for differences in baseline variables. Independent t test and chi-square test were used to compare the data. All statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS) software program, version 16.0 (IBM).

RESULTS

Between 20th May 2023 and 21st November 2023, 140 patients underwent hemiarthroplasty. There were 60 patients who underwent hemiarthroplasty. Our hospital started to introduce routine TXA injections from January 2016. Therefore, the 80 patients who underwent hemiarthroplasty received TXA.

The baseline characteristics did not differ significantly between the two groups. The overall mean age of the patients who underwent hemiarthroplasty was 71.9. The mean age of those who received TXA (72.12 ± 6.89) was comparable to those who did not receive it (71.53 ± 7.0) [Table 1]. The majority of the patients were females 65.7% (46/70). This was also reflected in both the groups (40/60:66.67%) in those who did not receive TXA; (52/80:65%) in those who did. Transfusion requirements a total of 54 patients (38.6%) received blood transfusion of at least 2 unit of packed red blood cells (PRBC) postoperatively. The percentage of patients who received transfusions was significantly lower in those who received TXA. Only 14 of 80 patients (17.5%) in the TXA group received blood transfusion as compared to 40 of 60 patients in the other group (66.67%; $P < 0.001$) [Table 2].

Postoperative hemoglobin drop, the mean preoperative and postoperative hemoglobin levels were 12.26 ± 1.28 and 10.67 ± 1.63 , respectively. The mean hemoglobin drop was 1.62 ± 0.84 . The occurrence of postoperative hemoglobin drop was low and differed significantly between the groups. The mean hemoglobin drop was 2.46 ± 0.52 in those who did not receive TXA as compared to 0.99 ± 0.32 in those who did ($P < 0.001$).

Drain volume similarly, the drain volume differed significantly between the groups. The mean drain volume was 176.29 ± 99.17 . The mean drain volume was 102.50 ± 29.62 in those who received TXA and 274.67 ± 70.01 in those who did not ($P < 0.001$).

DISCUSSION:

Our study shows that the rates of transfusion were significantly lower in those who received TXA. This reduction is highly beneficial to the patient both economically and safety wise. Reduction in blood transfusion rates was shown in the retrospective cohort study conducted by Xie et al.[17] in hip fracture patients.

The study conducted by Kwak et al.[18] has even shown that topical TXA in patients who underwent hemiarthroplasty reduced the transfusion requirements. The studies by Lack et al.[19] and Orpen et al.[15] is in variance with the above studies. According to their study, there was no difference in transfusion rate between those who were administered TXA acid and those who were not.

The postoperative hemoglobin drop tended to be significantly lower for those who received TXA than those who did not. The finding is in concurrence with the studies by Hynes et al.,[10] Peck et al.,[11] and Vijay et al.[14] who all showed that the mean hemoglobin decrease was significantly lower in the patients receiving TXA. The study by Kwak et al.[18] though came to the conclusion that hemoglobin values were comparable and did not differ significantly between the two groups. This might be due to the fact that they had used topical TXA.

In our study, the drain volume was also significantly lower in those who received TXA acid. Consistent with our findings, Vijay et al.[14] and Kwak et al.[18] showed a significant reduction in drain volume with the use of TXA. The meta-analysis by Zhang et al.[20] too pointed out that the groups that received TXA had less total blood loss, postoperative hemoglobin decline, and lower transfusion rates compared to the control group. Our study was a record-based observational study. The sample size was small. Our study points out that TXA significantly reduce blood loss and transfusion requirements. A randomized clinical trial with a larger population of study subjects can more effectively show this.

Table 1: Patient characteristics the baseline characteristics did not differ significantly between the two groups

Characteristic	Tranexamic Acid not administered	Tranexamic Acid
Mean Age	71.53(±7.01)	72.12(±6.89)
Gender	40(66.6%) 20 (33.3%)	52 (65%) 28(35%)

Table 2: Efficacy outcomes of the percentage of patients who received transfusions was significantly lower in those who received Tranexamic Acid

Outcome	Tranexamic Acid not administered	Tranexamic Acid	P Value
Transfusion requirements	66.7% (40)	17.5% (14)	0.001
Hemoglobin drop	2.46 ± 0.52	0.99 ± 0.32	0.001
Drain volume	274.67 ± 70.01	102.50 ± 29.62	0.001

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