ORIGINAL RESEARCH

Assessment of impact of tranexamic acid during total knee arthroplasty in Reduction of blood loss

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ABSTRACT
Background: Total knee arthroplasty (TKA) is one of the most cost-effective and consistently successful surgeries performed in orthopedics. Hence; the present study was conducted for assessing impact of tranexamic acid during total knee arthroplasty in Reduction of blood loss. **Materials & methods:** 40 individuals were admitted to this facility for total knee arthroplasty, and were then separated into two groups through random allocation. Group A consisted of 20 patients who received intravenous tranexamic acid, while Group B consisted of 20 patients who did not receive tranexamic acid. A tourniquet was utilized in each case at the correct pressure and for the appropriate length of time. Tranexamic acid was administered 30 minutes before the operation. The quantity of blood loss was measured and all findings were documented and examined using SPSS software. **Results:** The average perioperative blood loss for patients in group 1 was 353.2 ml, while for those in group 2 it was 524.8 ml. Upon statistical comparison, it was evident that the mean perioperative blood loss was significantly higher in group 1 patients compared to group 2 patients. The average postoperative blood loss for patients in group 1 was 813.9 ml, whereas for group 2 patients it was 1275.9 ml. Upon comparing the mean postoperative blood loss, it was observed that subjects in group 1 had a significantly lower amount of postoperative blood loss compared to subjects in group 2. **Conclusion:** TXA may play a part in improving the general conditions of patients given TKA by maintaining a hemodynamically stable state and reducing the chance of transfusion-associated side effects and complications.
Key words: Tranexamic acid, Blood loss, arthroplasty

INTRODUCTION

Knee arthroplasty is a reconstruction of the knee joint. It is more commonly referred to as a total knee replacement and is a very reliable procedure with predictable results. Total knee arthroplasty (TKA) is an excellent treatment option for individuals with symptomatic osteoarthritis in at least 2 of the 3 compartments of the knee and who have failed conservative treatment. Additionally, partial knee arthroplasty (PKA) is an excellent treatment option for individuals with symptomatic osteoarthritis localized to 1 compartment of the knee and who have failed conservative treatment. The primary goal of either surgery is durable pain relief with the improvement of functional status.[1- 3]

Various techniques have been introduced to reduce blood loss in the perioperative period and perioperative antifibrinolytic therapy is recommended as part of a comprehensive perioperative blood management strategy. The use of antifibrinolytic agents is based on the fact that surgical trauma besides promoting clot formation by activating the intrinsic and extrinsic coagulation cascades also leads to a concomitant activation of plasminogen inducing a state of hyperfibrinolysis accelerating clot degeneration and increasing surgical site bleeding.[4, 5]Tranexamic acid (TXA) is a synthetic analogue of the amino acid lysine that reversibly occupies lysine-binding sites on plasminogen preventing its binding to the surface of fibrin and activation, resulting in inhibition of fibrinolysis.[6] Hence; the present study was conducted for assessing impact of tranexamic acid during total knee arthroplasty in Reduction of blood loss.

MATERIALS & METHODS

The present study was conducted for assessing the effects of tranexamic acid during total knee arthroplasty in Reduction of blood loss. 40 individuals were admitted to this facility for total knee

arthroplasty, and were then separated into two groups through random allocation. Group A consisted of 20 patients who received intravenous tranexamic acid, while Group B consisted of 20 patients who did not receive tranexamic acid. A tourniquet was utilized in each case at the correct pressure and for the appropriate length of time. Tranexamic acid was administered 30 minutes before the operation. The quantity of blood loss was measured and all findings were documented and examined using SPSS software. Chi-square test and student t test were used for evaluation of level of significance.

RESULTS

Mean age of the patients of group 1 and group 2 was 61.3 years and 607 years respectively. Both the groups were comparable in terms of age-wise distribution of patients.60 percent of the patients of group 1 and 70 percent of the patients of group 2 were females while the remaining were males. The average perioperative blood loss for patients in group 1 was 353.2 ml, while for those in group 2 it was 524.8 ml. Upon statistical comparison, it was evident that the mean perioperative blood loss was significantly higher in group 1 patients compared to group 2 patients. The average postoperative blood loss for patients in group 1 was 813.9 ml, whereas for group 2 patients it was 1275.9 ml. Upon comparing the mean postoperative blood loss, it was observed that subjects in group 1 had a significantly lower amount of postoperative blood loss compared to subjects in group 2.

Table 1: Perioperative blood loss (ml)

Perioperative blood loss (ml)	Group 1	Group 2
Mean	353.2	524.8
SD	35.3	68.1
p-value	0.000*	

*: Significant

Table 2: Total volume of postoperative blood loss

POSTOPERATIVE BLOOD LOSS (ML)	GROUP 1	GROUP 2
MEAN	813.9	1275.9
SD	138.1	562.8
P- VALUE	0.000*	

*: Significant

DISCUSSION

Mean age of the patients of group 1 and group 2 was 61.3 years and 607 years respectively. Both the groups were comparable in terms of age-wise distribution of patients. 60 percent of the patients of group 1 and 70 percent of the patients of group 2 were females while the remaining were males. The average perioperative blood loss for patients in group 1 was 353.2 ml, while for those in group 2 it was 524.8 ml. Upon statistical comparison, it was evident that the mean perioperative blood loss was significantly higher in group 1 patients compared to group 2 patients. Shen et al evaluated the effectiveness and safety of tranexamic acid (TXA) to reduce perioperative blood loss in patients receiving TKA. A total of 92 patients who accepted unilateral TKA randomly received either 15 mg/kg TXA in 100 mL normal saline solution (TXA group, n=46) or the same amount of normal saline solution (placebo group, n=46) at 15 min before the tourniquet was loosened. The following data were recorded: intraoperative blood loss; post-operative drainage at 12 h; total drainage amount; hidden blood loss; total blood loss; transfusion volumes; number of transfusions; post-operative hemoglobin at 1, 3, and 5 days; D-dimer; number of lower limb ecchymoses; and deep vein thrombosis (DVT). A total of 81 patients were available for analysis (TXA group, n=41; placebo group, n=40). Post-operative12-h drainage, post-operative 24-h D-dimer values, total drainage volume, hidden blood loss, total blood loss, and the rate of postoperative ecchymosis were lower in the TXA group than in the placebo group ($p<0.05$). The post-operative 3-day Hgb was higher in the TXA group than in the placebo group ($p=0.000$). The rate of transfusion and DVT was similar in both groups (n.s.). They concluded that perioperative blood loss could be reduced after TKA by intravenously injecting 15 mg/kg TXA at 15 min before the tourniquet was loosened.[9]

The average postoperative blood loss for patients in group 1 was 813.9 ml, whereas for group 2 patients it was 1275.9 ml. Upon comparing the mean postoperative blood loss, it was observed that subjects in group 1 had a significantly lower amount of postoperative blood loss compared to subjects in group 2.Karaaslan et al examined the role of a novel method of TXA administration in TKA. TXA was administered as a bolus dose of 15 mg/kg 10 min before the inflation of the tourniquet on the first side. IV infusion of 10 mg/kg/h was continued for 3h following completion on the second side. They measured volume of drained blood 48 h postoperatively, decrease in hemoglobin levels 12h postoperatively, amount of blood transfused (BT), and number of patients requiring allogenic BT. Median postoperative volume of drained blood was lower in the group receiving TXA (500.00 mL) than in control subjects (900.00 mL) ($p <0.05$) [95% CI (-525.00) to (-300.00)]. The median hemoglobin decrease 12 h postoperatively was lower in patients receiving TXA (2.10 g/dL) than in control subjects (3.10 g/dL) ($p<0.05$) [95% CI (-1.60) to (-0.60)]. The amount of BT and number of patients requiring BT were lower in patients receiving TXA than in control subjects. Nevertheless, the number of allogeneic units of packed red blood cells transfused in the postoperative period was not significantly higher in the control group than in the TXA group ($p=0.109$) [95% CI (0.101) to (0.117)]. Their study showed that during simultaneous bilateral TKA, TXA reduced blood loss with negligible side effects.[10]Lin et al reviewed data supporting the safety, efficacy, and cost-effectiveness

of TXA in orthopedic surgery. Numerous research studies have reported favorable safety and efficacy in orthopedic cases, although there is no universal standard on its administration and its use has not yet become the standard of practice. The incidence of both arterial and venous thromboembolic events, particularly deep venous thrombosis and pulmonary embolism, has not been found to be significantly different with TXA use for healthy patients. The route of administration and dosage do not appear to affect complication rates either. However, data on patients with higher-risk conditions are deficient. In addition, TXA has shown potential to reduce blood loss, transfusion rates and volumes, perioperative hemoglobin change, and hospital-related costs at various degrees among the published studies.[11]

CONCLUSION

TXA could potentially enhance the overall well-being of patients undergoing TKA by ensuring hemodynamic stability and minimizing the risk of transfusion-related adverse effects and complications.

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