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ORIGINAL ARTICLE

The Effect of Tranexamic Acid on Blood Loss during Laparoscopic Sleeve Gastrectomy

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ABSTRACT

Background: Tranexamic acid (TXA) is an antifibrinolytic drug that has the property to reduce intraoperative and postoperative bleeding. This study was intended to establish the effect of TXA in minimizing the intraoperative and postoperative blood loss in laparoscopic sleeve gastrectomy.

Materials and methods: This was a prospective follow-up study conducted in Sabah Hospital, Kuwait, over 4 months from September 2014 to December 2014. A total of 50 patients who underwent laparoscopic sleeve gastrectomy were included in this study; 25 patients were given tranexamic acid during induction and 25 did not receive. Selection of patients was done on a random basis. Intraoperative blood loss, visibility of field of surgery, and amount of blood collected in suction apparatus used during surgery.

Results: Each group consisted of 25 patients. Preoperative intravenous bolus administration of TXA at 10 mg/kg reduces blood loss.

Conclusion: Tranexamic acid is an antifibrinolytic agent that inhibits the action of plasmin. There is also reduction in blood level of D-dimer. It is seen to significantly reduce intraoperative blood loss during surgery. Additionally, there seems to be no alterations of coagulation parameters or untoward systemic effects. This should prompt further trials.

Keywords: Blood loss, Laparoscopic sleeve gastrectomy, Tranexamic acid.

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INTRODUCTION

Tranexamic acid (TXA) is an antifibrinolytic agent and its predecessor epsilon aminocaproic acid has been used to treat postoperative bleeding in healthy adults for over 30 years (Fig. 1). Tranexamic acid has also been used in the prophylaxis and treatment of patients at high risk of intra- and postoperative hemorrhage such as hemophiliacs and patients on thrombolytic therapy and has been found to be highly effective, without significant side effects.[1-6]

To reduce intraoperative blood loss and the need for blood transfusion, new pharmacologic agents have been developed. The clinical efficacy of these agents has been reviewed, and it has been reported that antifibrinolytic agents such as aprotinin and TXA are effective in reducing packed red blood cell transfusion.[7] The lysine analog inhibitor TXA is particularly effective in reducing perioperative blood loss in various surgical procedures, with no reported adverse effects.[8]

The intravenous and tropical TXA formulations have been reported to be effective in decreasing blood loss in some studies.[9-11]

The aim of this study was to assess the effect of single intravenous preoperative dose of TXA on blood loss during laparoscopic sleeve gastrectomy.

SITE OF ACTION

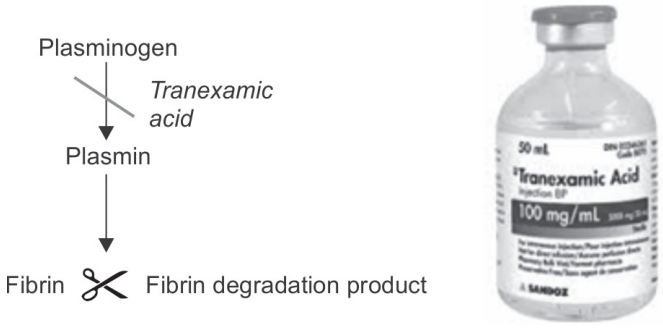

Fig. 1: Source: Wikipedia

MATERIALS AND METHODS

This is a prospective randomized study. The study period is 4 months from September 2014 to December 2014. A total of 50 patients who underwent laparoscopic sleeve gastrectomy were included in the study. The patients were grouped as treatment (case) group and control group. The randomization was done by the rules of odd and even. In 25 patients of treatment group, a single dose of TXA, 10 mg/kg bodyweight was given

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intravenously during induction. The second group included the remaining 25 patients in whom TXA was not given and was considered as control group. Injection TXA was administered in a dose of 10 mg/kg as bolus injection (treatment group) given intravenously over 5 minutes. The heart rate, respiratory rate, and blood pressure were checked and charted intraoperatively and postoperatively.

A single brand of TXA from a reputed firm was used in all cases in order to minimize the brand-related bias and for standardization. Intraoperative blood loss was calculated by galanometric method, weighing the sponges used and soiled by blood during surgery and measuring the amount of blood collected in suction apparatus used during the surgery. Postoperatively, the drained fluid collected in the drain was measured till the drain was removed.

The hemoglobin level was assessed postoperatively and was compared with preoperative hemoglobin level. The data were collected in an excel sheet. The patients were followed up till they were discharged from the hospital and were followed up in outpatient department.

RESULTS

There were 50 patients in our study of whom 25 (50%) patients who received TXA were in the treatment group and remaining 25 (50%) patients who did not receive the drug were in the control group (Table 1).

Table 1: Distribution of patients

Drug	*Total*	*Percentage*
Control	25	50
Treatment	25	50
Total	50	100

There were 42 females and 8 males

Intraoperative Blood Loss

In the treatment group, 20 patients out of 25 had blood loss below 300 ml, and 2 patients had blood loss of more than 400 ml. In the control group, 5 patients out of 25 had blood loss below 300 ml, and 20 patients had blood loss of more than 400 ml (Table 2).

Table 2: Intraoperative blood loss

	Less than 300 ml	*300–400 ml*	*More than 400 ml*	*Total*
Treatment	20	3	2	25 patients
Control	5	15	5	25 patients
Total				50 patients

Postoperative Blood Loss

Drain was kept for all patients who underwent laparoscopic sleeve gastrectomy. Most of the drains were removed within 72 hours. The fluid collected in the postoperative drains was measured. In the treatment group, 20 patients out of 25 patients had blood drain below 100 ml on 1st postoperative day. In the control group, 16 patients out of 25 patients had drained blood more than 100 ml on the 1st postoperative day (Table 3).

Table 3: Postoperative blood loss

	50–100 ml	*100–150 ml*	*150–200 ml*	*Total*
Treatment group	20	2	3	25
Control group	2	16	7	25
Total	22	18	10	50

Change in Hemoglobin Level

In patients who had laparoscopic sleeve gastrectomy, 23 patients out of 25 patients in the treatment group had preoperative and postoperative hemoglobin difference of less than 1 mg/dl. In the control group, 18 patients out of 25 patients had preoperative and postoperative hemoglobin difference of more than 1 mg/dl (Table 4).

Table 4: Measurement of hemoglobin level

Preoperative hemoglobin	*Treatment*	*Control*	*Total*
Less than 1	23	2	
1.1–2	2	18	
2.1–3	0	3	
More than 3	0	2	
Total	25	25	50

DISCUSSION

Reduction of bleeding during laparoscopic sleeve gastrectomy is a major benefit for the operating surgeon. Tranexamic acid inhibits plasminogen activity and fibrinolysis and thereby reduces capillary ooze. It thus increases clot formation and decreases blood loss. The added advantage is no postoperative alteration of patient's coagulation profile and absence of major side effects.

A randomized controlled trial (RCT) was conducted in 274 hospitals in 40 countries. This RCT named clinical randomization of an antifibrinolytic in significant hemorrhage-2 (CRASH-2) assessed the efficacy and safety of TXA by investigating 20,211 adult trauma patients who had or were at risk of significant hemorrhage. In the trial, the injured patients were randomly separated into two groups within 8 hours of injury. One group received an initial dose of 1 gm of TXA and a second dose of 1 gm as infusion over 8 hours. The other group received a matching placebo. A total of 10,096 patients received TXA and 10,115 received placebo; of these

10,060 and 10,067, respectively were analyzed. The CRASH-2 RCT established the safety and efficacy of TXA administration for trauma patients. It showed a significant reduction in mortality without any significant increase in thromboembolic events.[12] Tranexamic acid is thus both safe and effective in reducing the risk of death due to blood loss in trauma cases.[13]

Though the safety and the efficacy of the drug have been established, there is no consensus about the dosage and the best time for administration of this drug. The prescribed dosage is 1–1.5 gm or 15–25 mg/kg two to four times daily. The dosage of TXA advocated ranges from 1 gm[14] to 100 mg/kg transfused over 15 minutes with a second infusion of 10 mg/kg/hour transfused until wound closure is achieved.[15]

The dose administered in the CRASH RCT was 2 gm with 1 gm as bolus and 1 gm as continuous infusion over the next 8 hours.[12,13] In general surgical conditions and in trauma where life-threatening hemorrhages are anticipated, a continuous infusion is advocated. However, since laparoscopic sleeve gastrectomy is of much shorter time duration, we have employed a single bolus administration, preoperatively, in order to prevent intraoperative blood loss.

A total of 148 patients undergoing cardiac surgery with extracorporeal circulation were divided into six groups. One group did not receive TXA. The other five received loading doses before incision ranging from 2.5 to 40 mg/kg, and one-tenth, the loading dose was infused hourly for 12 hours. The quantity of blood collected by test tubes over 12 hours represented blood loss. This prospective, randomized, double blind study concluded that the group that received prophylactic administration of 10 mg/kg of TXA, followed by continuous infusion of 1 mg/kg/hour, had the least hemorrhage. Larger doses did not provide additional hemostatic benefit.[16]

Since TXA has a plasma half-life of 1.9 hours,[17] and our anticipated duration of surgery averaged 2 hours, a bolus injection of 10 mg/kg weight was chosen as the dosage to maintain a therapeutically effective concentration between 5 mg/dl. Though 30% of the intravenous dose of 10 mg/kg of TXA was detected in the urine during the first hour after administration and the total excretion rose to 45% after 3 hours, approximately 55% remains in circulation up to 24 hours.[18] Therefore, laparoscopic sleeve gastrectomy surgery does not require a continuous infusion since postoperative hemorrhage is of lesser concern than management of immediate hemorrhage in order to clear the field during surgery.

Our results have shown that none of the TXA patients needed a transfusion and the average fall in hemoglobin and the volume of blood lost is much less in the TXA group. This concludes that a single preoperative dose (10 mg/kg) of TXA given intravenously immediately before surgery reduced blood loss during laparoscopic sleeve gastrectomy. No thromboembolic incidents, adverse reactions, or complications were encountered with the administration of TXA in this study.

SUMMARY

The aim of this study was to see if TXA given as a short-term dose reduced blood loss in laparoscopic sleeve gastrectomy.

Tranexamic acid reduces capillary oozing, thus increasing the operative field visibility. It does not alter the coagulation profile and no lasting systemic or hemodynamic effects were seen in our study.

Tranexamic acid may well be an efficient and cheap method to control bleeding during laparoscopic sleeve gastrectomy.

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