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Original Research Article

Role of tranexamic acid in reducing blood loss in vaginal delivery

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ABSTRACT

Background: Postpartum hemorrhage (PPH) remains a significant reason for maternal death, especially in developing nations like India, where it accounts for 23% of maternal deaths. This prospective study aimed to assess the effectiveness of tranexamic acid (TXA) in reduction of blood loss during vaginal deliveries.
Methods: This study was conducted at Bebe Nanki mother and child care centre in Amritsar, Punjab. 200 pregnant women were randomly assigned to two groups: Group A received 1g TXA intravenously alongside 10 IU oxytocin intramuscularly, while group B received only oxytocin. The measurement of blood loss was done up to 2 hours post-delivery along with various vital and hemodynamic parameters.
Results: The results showed reduction in blood loss in group A in comparison to Group B which was significant, with mean blood loss of 106.25 mL in group A vs 222.45 mL in group B (p=0.001). Hb and PCV declines were also significantly lower in group A. Fewer patients in group A required additional uterotonics (4%) or blood transfusions (2%) versus group B (26% and 4%, respectively). No significant adverse effects, such as thromboembolic events, were observed in either group. Mild post-delivery nausea and vomiting was seen in both groups, with slightly higher incidence in group A.
Conclusions: TXA combined with oxytocin significantly reduces postpartum blood loss without major side effects, supporting its use as an adjunct therapy in PPH management. Further studies are recommended to validate these findings and promote wider adoption in clinical practice.

Keywords: PPH, TXA, Vaginal delivery, Blood loss reduction

INTRODUCTION

Pregnancy is one of the most memorable segments in a woman's life.[1] The care given to a woman during antenatal period and during labor has the potential to affect her both physically and emotionally in the short and long term.[2] Labor is a normal process but is associated with various complications and death. The most common and dreadful cause being excessive loss of blood-PPH.[3]

PPH ranks as one of the primary causes of death in women who give birth after 20 weeks of gestation. WHO defines PPH as blood loss exceeding 500 ml following childbirth.[4] This clinical diagnosis covers excessive bleeding from various areas such as the uterus, cervix, vagina, and perineum. Primary PPH refers to blood loss within the first 24 hours after delivery, while late or secondary PPH refers to blood loss occurring from 24 hours up to 6 weeks after delivery. PPH is a critical issue that requires immediate attention. The impact of this issue on maternal complication and maternal death is significant on a global scale, particularly affecting developing nations.[5]

Every year, 600,000 maternal deaths are reported worldwide, with 99%. of these occurring in developing countries. PPH accounts for 25% of these fatalities in the developing world. The occurrence of PPH in India stands at 23%.[6] During the third trimester, maternal blood volume

increases by 40%-50%, significantly enhancing the body's capacity to tolerate blood loss during delivery.[7] The time between baby's delivery and expulsion of the placenta is a crucial period to prevent PPH. Oxytocin and anti-fibrinolytics like TXA are good agents in decreasing and treating PPH.

TXA, a lysine derivative, works by exerting antifibrinolytic effects to enhance hemostasis in bleeding patients.[8] It inhibits fibrinolysis, which increases due to fibrin deposition during and post-delivery of the placenta. This results in a decrease in plasma fibrinogen and an increase in serum fibrin/FDPs levels post-delivery. By blocking lysine binding sites on plasminogen, TXA prevents plasminogen activator from combining with plasminogen without inducing platelet aggregation at therapeutic doses. It has a bioavailability of 30-50% orally and 100% intravenously, with most of the drug excreted via urine.[9] TXA is recommended for managing PPH and this study investigates its effectiveness in preventing PPH alongside AMTSL to decrease maternal morbidity and mortality.

METHODS

In this prospective study, 200 term labouring patients were admitted to the labour room at the department of OBGY, BNMCCC, GMC, Amritsar, with the approval of the institutional ethics committee. The study was conducted between the time period of September 2022 to August 2023. Pregnant female with singleton term fetus, labor either in spontaneous or inducted, who satisfied the inclusion criteria with respect to vaginal delivery, were taken after providing informed consent.

Inclusion criteria

Primigravida and multigravida patients, gestational age >37 weeks, spontaneous or induced labour were included in study.

Exclusion criteria

Anemia (Hb<8 gm%), multifetal pregnancy, polyhydramnios, macrosomia, history of PPH, complicating fibroids or medical conditions, placenta previa, abruption, PPROM, and prolonged labour were excluded.

The 200 patients were divided into two groups: group A received both TXA (1 g slow IV) and oxytocin (10 IU i/m) within 1 minute of delivery of the baby, while group B received only oxytocin (10 IU IM) within the same time frame. In each case, a comprehensive history was collected from the patients. The pre-delivery vitals (pulse rate, blood pressure) and hemodynamic parameters (Hb gm%, PCV%) were documented for each individual. Monitoring of labour progress was diligently conducted by plotting a partogram timely and appropriate interventions were implemented as needed.

The prescribed standard guidelines for AMTSL were meticulously adhered to in the treatment of all patients involved in the study. In first group, the mother received a timely administration of ten units of inj. Oxytocin via intramuscular injection within 1 minute of delivering the infant, followed by a deliberate intravenous infusion of 1 gram of inj. TXA. Conversely, in the other group, only ten units of inj. Oxytocin I/M was given within 1 minute of delivery.

Subsequent to the delivery and complete drainage of amniotic fluid, the patient was carefully positioned over a blood drape, a disposable plastic collection bag, for the measurement of the collected blood. Upon completion, the patient was provided with pads which were already pre-weighed, which were then weighed 2 hours post-delivery. The measurement of loss of blood encompassed the calculation of loss of blood and the weight of the pads before and after delivery, spanning from childbirth to 2 hours post-partum.

Total amount of loss of blood (in ml)=blood accumulated in the drape (measured in ml) + (weight of pad after 2 hours (in gm)-weight of pad prior to use (in gm).

The possible adverse effects of medication were noted. Following the passing of urine, woman was transferred to the ward for post-natal care. On post-partum day 2, the patient's PR, BP, Hb level, and PCV were also recorded. It was noted if there was any notable decline in the Hb level and PCV, as these could require transfusion of blood or IV Fe infusions for the mother. Following data collection, the information was written in a proper chart and subjected to analysis.

Data analysis

Statistical analysis was performed using SPSS version 16. Descriptive measures (mean, median, standard deviation) were calculated for continuous variables, and frequencies and percentages for categorical variables.

RESULTS

All 200 pregnant women allocated into the groups were analyzed. The two groups matched in terms of socio-demographic, and also in terms of reproductive, delivery characteristics. The study showed that the quantity of loss of blood in group A (106.25±13.43 ml) was lesser than in group B (222.45±19.42 ml) and the value was statistically significant (p=0.001). On comparing the hemodynamic parameters among the groups, a significant difference was seen in the post-delivery Hb and packed cell volume (PCV) among the two groups.

The difference of haemoglobin and PCV decline in the group A and in group B was statistically significant. On measuring pre and post-delivery vitals, there was increase in pulse rate and respiratory rate, decrease in systolic blood pressure and diastolic blood pressure in group B than in

group A during the post-partum period which was significant statistically (p=0.001), while no significant changes were observed in SpO_2. We found that only 4 (4%) patients in group A required other uterotonics, in comparison to 26 (26%) in group B, with a significant difference (p=0.001). Regarding blood transfusions, 2 (2%) patients in group A needed transfusions, versus 4 (4%) in group B, with no difference between the groups (p=0.407).

In group A, 4 patients had duration of stay of >3 days while 12 patients in group B. There was a difference in the hospital stay duration among the two groups which was significant (p=0.037). In group A, 22 patients (12%) experienced post-delivery nausea and vomiting compared to 11 patients (11%) in group B (p=0.036), though the symptoms were not severe. Additionally, 75% of group A patients reported no side effects versus 84% in group B.

No major adverse effects such as thromboembolic events, allergies, or renal and liver impairments were observed in either group until discharge.

Table 1: Demographic characteristics of patients.

Characteristics	Group A, (n=100)	Group B, (n=100)	P value
Age group (in years)	26.24±4.58	25.32±4.05	0.180
Area wise distribution	Rural-72	Rural-71	0.876
	Urban-28	Urban-29	
BMI	22.50±0.91	22.35±0.69	0.210
Booking status	Booked-36	Booked-42	0.384
	Unbooked-64	Unbooked-58	
Obst. details	Primigravida-27	Primigravida-24	0.626
	Multigravida-73	Multigravida-76	

In group A, 31% of patients delivered by NVD, 55% by NVD+RMLE, and 4% by NVD+RMLE with cervical tear repair. A total of 7 patients chose PPIUCDs, with 3 opting for CuT375 and 4 for CuT380A. In group B, 33% delivered by NVD, 54% by NVD+RMLE, and 3% by NVD+RMLE with cervical tear repair. Similarly, 7 patients chose CuT, with 2 selecting CuT375 and 5 opting for CuT380A. The mode of delivery was comparable between the groups (p=0.951).

Table 2: Labour and delivery details of patients.

Details	Group A, (n=100)	Group B, (n=100)	P value
Onset of labour	Spontaneous-68	Spontaneous-64	0.550
	Induced-32	Induced-36	
Duration of 3rd stage of labour	4.74±0.52 mins	4.79±0.54 mins	0.475

Table 3: Blood loss between the two group.

Time period	Group A, (Mean±SD)	Group B, (Mean±SD)	P value
Delivery time to 30 minutes	73.25±9.36	163.05±14.51	0.001
30 minutes to 2 hours	33.00±6.89	59.40±10.31	0.001
Delivery time to 2 hours	106.25±13.43	222.45±19.42	0.001

The study showed that the quantity of loss of blood in group A was lesser than in B and the value was statistically significant shown in table above.

Table 4: Hemodynamic parameters of the two groups.

Investigations		Group A		Group B		P value
		Mean	SD	Mean	SD	
Haemoglobin (g/dl)	Pre-delivery	10.42	0.75	10.61	0.64	0.055
	Post-delivery	10.02	0.62	9.54	0.61	0.001
	Change	0.40		1.07		
PCV (%)	Pre-delivery	39.12	1.53	38.81	1.43	0.141
	Post-delivery	38.82	1.37	37.76	1.12	0.001
	Change	0.30%		1.05%		

On comparing the hemodynamic parameters among the two groups, a difference in the post-delivery haemoglobin and PCV among the two groups was seen which was significant. The difference of hemoglobin and PCV decline in the group A vs B was statistically significant as shown above.

Table 5: Vital parameters among the two groups.

Vitals		Group A, (Mean±SD)		Group B, (Mean±SD)		P value
		Mean	SD	Mean	SD	
Pulse rate (per minute)	Pre-delivery	88.80	2.81	87.72	4.16	0.327
	Post-delivery	92.80	3.89	95.83	2.78	0.001
	Change	4.00		8.11		
Systolic blood pressure (mm Hg)	Pre-delivery	115.14	4.86	116.28	3.66	0.624
	Post-delivery	110.38	4.40	105.83	4.82	0.001
	Change	4.76		10.45		
Diastolic blood pressure (mm Hg)	Pre-delivery	68.72	5.59	68.86	6.11	0.868
	Post-delivery	68.96	5.50	73.40	8.37	0.001
	Change	0.24		4.54		
Respiratory rate (per minute)	Pre-delivery	17.83	1.15	17.82	1.16	0.951
	Post-delivery	17.96	1.07	18.32	1.17	0.024
	Change	0.13		0.5		
SpO_2 (%)	Pre-delivery	99.79	0.41	99.87	0.34	0.133
	Post-delivery	99.72	0.45	99.71	0.46	0.876
	Change	0.07		0.16		

On measuring pre and post delivery vitals, there was increase in pulse rate and respiratory rate, decrease in systolic blood pressure and diastolic blood pressure in group B than in group A during the post partum period that was significant statistically, while no significant changes were observed in SpO2 shown in table above.

DISCUSSION

Postpartum haemorrhage represents a significant contributor to maternal mortality in India, with a prevalence of 23%. Therefore, the prevention of excessive obstetric blood loss is paramount in decreasing the incidence of PPH. Prophylactic administration of TXA, an antifibrinolytic agent at the time of delivery, has demonstrated efficacy in reduction in loss of blood by inhibiting fibrinolysis. This study, conducted over the course of one year at the Bebe Nanki mother and child care centre in Amritsar, Punjab.

In the present study, the age of all patients ranged from 19 to 36 years. 26.24±4.58 years was the mean age in group A patients, while it was 25.32±4.05 years in group B (p=0.180). A study by Krishna et al reported the mean age of 24.25±4.02 years in the TXA group and 24.23±4.14 years in the other group (p=0.945).[10]

In this study, group B showed greater increases in pulse rate and respiratory rate, and larger decreases in blood pressure compared to group A. SpO_2 changes were minimal and not significant.

Another study by Chitra et al highlighted a statistically significant mean difference in post-delivery PR, SBP, DBP, RR, SpO_2 between both groups (p<0.05).[11]

In this study, group B had a significantly greater reduction in hemoglobin (1.07 g/dl) and hematocrit (1.05%) compared to group A (0.40 g/dl and 0.30%, respectively; p=0.001). Ali et al similarly found notable hemoglobin reductions in patients without TXA.[12]

In this study, group A had significantly lower blood loss (106.25 ml) in comparison to the other group (222.45 ml) at the 2-hour post-delivery mark (p=0.001). Similarly, Arthi et al reported reduced blood loss with TXA, showing 311.24±70.41 ml versus 398.23±89.53 ml in the non-TXA group (p<0.00001).[13]

Author's study saw that 12% of patients of group A vs 11% of group B experienced post-delivery nausea and vomiting (p=0.036), though it was not severe. No significant adverse effects, including thromboembolic events, seizures, or allergic reactions to TXA, were reported in either group. These results are consistent with findings from Arthi et al which noted nausea/vomiting rates of 6.8% in the TXA group and 5% in group B (Dahiya et al).[10,13]

Limitations

It was a single centre study with low-risk participants. Large multicentre study required for the same. Also, Hemodynamic parameters were performed at the time of labor onset which is not a standardized timing.

CONCLUSION

TXA, when administered in conjunction with oxytocin, has demonstrated its ability to effectively reduce loss of blood post vaginal delivery and notably diminish the occurrence of PPH, all without any adverse effects on the mother. This reinforces the recommendation for TXA as a safe standard supplementary treatment to oxytocin for managing the third stage of labor, particularly in developing nations such as India. Nevertheless, further comprehensive studies are essential to substantiate these significant findings.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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