ORIGINAL ARTICLE

Efficacy of Tranexamic Acid in Reducing Blood Loss during and After Caesarean Section: A Case control Study

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ABSTRACT

Introduction: The incidence of caesarean section is increasing day by day. One of the most common complications is primary or secondary postpartum haemorrhage. Tranexamic acid has been shown to be very useful in reducing blood loss and incidence of blood transfusion in varieties of surgery. **Aim:** To study the efficacy of tranexamic acid in reducing blood loss during and after the lower segment caesarean section. **Methods**: Arandomized, case controlled, prospective study was conducted on 100 women undergoing lower segment caesarean section carried out in the Department of Obstetrics and Gynaecology, Nepalgunj Medical College, Kohalpur from Sept 2019 to Feb 2020**.**Fifty of them were given tranexamic acid immediately before lower segment caesarean section and were compared with 50 others to whom tranexamic acid was not given. Blood loss was collected and measured during two different time interval. The first period was considered from placental delivery to end of lower segment caesarean section and second from the end of lower segment caesarean section to 2 hours postpartum period. Vital signs at time of delivery, at 1 hour and 2 hour postpartum and APGAR score at 1 min and 5 min were studied in both the groups. **Result**: Tranexamic acid significantly reduced the quantity of blood loss from the placental delivery to 2 hours post-partum: 360.9 ml in the study group, versus 443 ml in the control group (p=0.0008).It also significantly reduced the quantity of blood loss from the end of lower segment caesarean section to 2 hours postpartum:71.5 ml in the study group versus 112.6 ml in the control group (p=0.0002).There was 18% less incidence of postpartum haemorrhage , who received tranexamic acid(p=0.02).There were no significant adverse drug reaction and difference in APGAR score in both the groups. No complications or side effects were reported in either group. **Conclusion**: Tranexamic acid is safe and effective in reducing blood loss among women undergoing lower segment caesarean section.

Keywords: Antifibrinolytic, Lower segment Caesarean section (LSCS), Postpartum haemorrhage (PPH), Tranexamic acid

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INTRODUCTION

The incidence of caesarean section is increasing day by day**.** The incidence of complications is much higher when compared with normal vaginal delivery. Out of these complications primary and secondary postpartum haemorrhage (PPH) is most common. It leads to increased maternal morbidity and mortality. Effect of this complication is reduced by reducing the amount of blood loss during and after caesarean section.[1] An evidence based approach is to minimize peri-operative bleeding through the prophylactic use of the antifibrinolytic agents Aprotinin, Tranexamic acid and Epsilon animocaproic acid.[2]

Blood loss frequently leads to transfusion of allogeneic blood products, which expose patients to the risk of transfusion – related adverse effects such as febrile, non-haemolytic transfusion reactions, transfusion errors and blood born infections. Concerns about blood safety, continual blood shortages and rising costs of blood bank have generated interest in the reduction of transfusion requirements during and after surgery. Tranexamic acid is a synthetic derivative of the amino acid lysine that exerts its antifibrinolytic effect through the reversible blockade of the lysine binding sites on plasminogen molecules.[3,4] It almost completely blocks the

interaction of plasminogen and heavy chain of plasmin with the lysine residues of fibrin monomer.[5] Intravenous administration of tranexamic acid has been routinely used for many years to reduce haemorrhage during and after surgical procedures.

After an intravenous dose of 1gm tranexamic acid, the plasma concentration time curves show riexponential decay with a half-life of about 2 hours for the terminal elimination phase. Urinary excretion is the main route of elimination via glomerular filtration. Overall, renal clearance is equal to plasma clearance (110 to 116 ml/min) and 90% excreted at 24hours after IV administration.[6] It passes though the placenta as well.[7] This study was conducted to demonstrate the efficacy of tranexamic acid on blood loss during and after LSCS.

METHODS

A randomized, case controlled, prospective study was conducted on 100 women undergoing lower segment caesarean section (LSCS) carried out in the Department of Obstetrics and Gynaecology, Nepalgunj Medical College, Kohalpur from Sept 2019 to Feb 2020**.** Ethical approval was taken from Institutional review committee (IRC), Nepalgunj Medical College and written informed consent was taken from each patient.

Full term primigravida or multigravida with singleton pregnancy delivered by LSCS with normal or abnormal presentation was included in this study. The following cases were excluded from the study: allergy to tranexamic acid, history of thromboembolic event, placenta praevia, placenta abruption, Pregnancy Induced Hypertension, multiple pregnancies, polyhydroamnios, macrosomia, any medical and surgical problems and any blood dyscrasia. Total cases enrolled were 100 which were allocated in 2 groups and tranexamic acid given on basis of lottery system, picked up by anaesthetic team, before starting the Surgery.

1. Study group (50) - subjects who received tranexamic acid
2. Control group (50) - subjects who did not received tranexamic acid

Preparation of tranexamic acid injections solutions, 1gm/10ml tranexamic acid diluted with 10ml of distilled water. 20 minutes before incision, 1gm of tranexamic acid intravenous slowly infuse over 5 minutes. After delivery of neonate oxytocin 10 units in a pint of DNS was given by IV over 30mins.

Clinical Observations of vital signs- Blood Pressure, Respiratory rate and heart rate were measured immediately after placental delivery and 1 and 2 hours after birth respectively. The extent of PPH-Blood was measured by weight and volume following placental delivery to completion of skin closure and from completion of skin closure to 2 hours after birth. Side effects after giving tranexamic acid were noted. Laboratory examinations- pre operation haemoglobin, packed cell volume, Bleeding Time, Clotting Time, urine analysis were sent.

Blood was collected by a suction container and soaked gauze pads. Blood was measured post-partum during two separate periods from placental delivery to 2 hours postpartum. Amniotic fluid and amount of blood loss before delivery was not included in this study.

Calculation of blood loss

The quantity of blood (ml) = (weight of material used after surgery- weight of material used prior to surgery) +(volume sucked in suction bottle after placental delivery).In addition, the pads used after completion of LSCS to 2 hour postpartum were separately weighed.

Data collected in structured proforma were entered in Microsoft Excel, compared by using chi-square test and statistical analysis was done with SPSS version 20.

RESULTS

Variables	Study group (mean± SD) N=50	Control group (mean ±SD) N = 50	z test	p-value
Age (years)	23.62±3.429	24.5±3.982	1.19	0.239
Height (cm)	152.56±5.75	153.2±6	0.54	0.588
Weight (kg)	52.54±7.86	53.5±7.45	0.63	0.532

Table I : Distribution based on patient characteristics in both groups

Mean age was 23.62 years in the study group and 24.5 years in the control group. The difference in age, height and weight of both the groups were not statistically significant.

Duration	Study group mean blood loss(ml)	Control group mean blood loss (ml)	z test	p-value
Time of placental delivery to completion of skin closure	289.4±71.4	328.4±58.9	2.98	0.004
From completion of skin closure to 2 hrs postpartum	71.5±53.6	112.6±51.7	3.9	0.0002
Time of placental delivery to 2 hrs postpartum	360.9±110.3	443±88.552	4.17	0.0008
Amount of blood loss > 500ml (PPH)	6 (12%)	15 (30%)	2.27	0.02

Table II : Comparison of blood loss from placental delivery to 2 hrs post-partum and Post-partum haemorrhage

Above table shows mean blood loss from placental delivery to 2 hours postpartum was statistically significant (p=0.0008) in both groups. Incidence of PPH was significantly less (p=0.02) those receiving tranexamic acid.

	Vital signs	Study	Control	z test	p-value
At the time of placental delivery	HR (bpm)	86.14±7.25	84.81±8.35	0.86	0.394
	RR (breath/min)	19.38±2.29	19.94±2.14	1.26	0.21
	SBP (mm of Hg)	121.08±10.1	119.81±9.47	0.65	0.514
	DBP (mm of Hg)	77.08±7.04	76.88±7.61	0.14	0.892
1 hour after surgery	HR (bpm)	86.14 ± 7.05	82.18 ± 8.92	2.46	0.066
	RR (breath/min)	19.6 ± 2.25	19.98 ± 2.49	0.8	0.426
	SBP (mm of Hg)	128.24 ± 11.5	124.44 ± 8.75	1.32	0.065
	DBP (mm of Hg)	80.48 ± 6.77	77.44 ± 5.41	1.36	0.08
2 hours after surgery	HR (bpm)	79.96 ± 7.55	82.16 ± 7.08	0.36	0.094
	RR (breath/min)	19.44 ± 2.57	19.58 ± 2.75	0.26	0.798
	SBP (mm of Hg)	127.16 ± 12	119.72 ± 11.5	0.465	0.647
	DBP (mm of Hg)	81.04 ± 6.12	78.28 ± 5.39	1.39	0.101

HR: Heart rate, RR: Respiratory rate, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table III : Table showing vitals of both groups at different interval

There was no statistically significant difference in vital signs at placenta delivery, 1 hour after delivery and 2 hours after delivery.

APGAR score	Study	Control	z test	p-value
1 min	8.88+1.19	8.64+1.34	0.95	0.345
5 min	9.4+0.639	9.22+0.79	1.25	0.213

Table IV: Comparison of APGAR score in both the groups

Adverse drug reactions	Study	Control	z test	p- value
Nausea	16	13	0.66	0.508
Vomiting	09	08	0.08	1.135
Diarrhoea	01	00	1.01	0.312
Signs of thrombosis	00	00		

Table V : Comparison of adverse drug reaction in both the groups

No serious side effects noted in study group and difference in APGAR score in both the groups as shown in table IV and V.

DISCUSSION

Tranexamic acid exerts its antifibrinolytic effect by blocking the lysine binding locus of the plasminogen and plasmin molecules, thereby preventing the binding to the fibrin substrate. During placental delivery, fibrinogen and fibrin are rapidly degraded, whereas plasminogen activators and fibrin degradation products (FDP) increase due to activation of fibrinolytic system. This activation can last up to 6-10 hrs postpartum, causing more bleeding. It was because of this activation of fibrinolytic system that we decided to use tranexamic acid in this study. Our study showed that tranexamic acid significantly reduces bleeding from time of placental delivery to 2 hrs postpartum in LSCS which is comparable to the studies conducted by Ming-ying Gaiet al[8], Gohel M et al[9], Leila Sekhav at et al.[10] Tranexamic acid also reduced the incidence of postpartum haemorrhage (patients with blood loss ≥ 500 ml) by 18% in study group as compared to control group. Ming-yingGai[8], Zheng SR et al[11] showed similar results.

There was no significant alteration in the vital signs of subjects following tranexamic acid administration at time of delivery and at 1 hr & 2 hrs postpartum. Similar findings were reported by other studies too.[8, 10, 11, 12] In our study, there was no statistical difference in APGAR score at 1 & 5 minutes in both the groups, comparable observations were reported by Ming-yingGai et al[8]and Zheng SR et al.[11] The incidence of thrombosis during pregnancy & puerperium is 5-6 times higher than that in the general population. When the anti-fibrinolytic drug tranexamic acid is administered, the increased risk of thrombosis should be considered, especially in the LSCS postpartum population. In our study, not a single patient developed signs of thrombosis; similar results were found in Ming-ying Gai[8], Gohel Met al.[9] The side effects of tranexamic acid as nausea, vomiting& diarrhoea were not statistically significant in our study.

LIMITATIONS

The limitations of this study are smaller sample size and pitfall regarding measurement of actual amount of blood loss.

CONCLUSION

Tranexamic acid can be used safely in subjects with lower segment caesarean section. It significantly reduced the amount of blood loss during and after the operation and was not associated with any adverse side effects like nausea, vomiting, diarrhoea or thrombosis. Foetal outcome as evaluated by APGAR score was not adversely affected by use of tranexamic acid.

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