e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(3); 1447-1451

Original Research Article

Tranexamic acid to Reduce Blood Loss in Women at High Risk for Postpartum Hemorrhage undergoing Cesarean Section: A Randomized Controlled Trial

Priyanka[1], Minakshi Bajpayee[2], Abha Rani Sinha[3]

[1]Senior Resident, Department of Obstetrics and Gynaecology, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar.
[2]Senior Resident, Department of Obstetrics and Gynaecology, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar.
[3]Professor and Head of Department, Department of Obstetrics and Gynaecology, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar.

Received: 02-02-2023 / Revised: 03-03-2023 / Accepted: 26-03-2023
Corresponding author: Dr Minakshi Bajpayee
Conflict of interest: Nil

Abstract

Background: One of the leading causes of maternal death worldwide is postpartum haemorrhage. Significant blood loss raises the risks associated with blood transfusions and, as a result, raises the possibility of needing urgent surgical operations like artery ligation or hysterectomy. In low- or middle-income nations in particular, it can also result in prolonged anaemia. This study goal was to find out whether tranexamic acid effectively and safely reduces blood loss during and after lower segment caesarean sections.

Method: From January 2022 to December 2022, 200 women who were having lower segment caesarean sections (LSCS) at the Obstetrics and Gynecology Department at SKMCH, Muzaffarpur, Bihar, participated in a randomised, controlled trial. One gramme of tranexamic acid was administered intravenously to 100 of them 20 minutes prior to making a skin cut so that they could be compared to 100 additional individuals who did not receive it. During two sessions, blood loss was measured and collected. The first period covered the time from placental delivery to the end of LSCS, while the second covered 2 hours after delivery.

Results: Tranexamic acid significantly decreased blood loss from the conclusion of LSCS to two hours after delivery; it went from 128.57±23.72 ml in the control group to 79.0±14.18 ml in the experimental group (p=0.0001). The amount of blood loss from placental delivery to end of LSCS was also considerably less in the study group than in the control group (308.80±43.60 ml versus 349.18±42.17 ml) (P=0.0001). In neither group were there any complications or negative effects noted.

Conclusion: The use of tranexamic acid significantly reduces the amount of blood loss during and after the lower segment caesarean section and has no adverse side effects or problems, such as thrombosis. Tranexamic acid can be used effectively and safely in women having LSCS.

Keywords: Tranexamic Acid, Cesarean Section.

Introduction

In many parts of the world, rates of Caesarean sections have risen by as much as 25 to 30% [1], and so have the problems that can arise from them, the most significant of which is post-partum haemorrhage, which includes raised rates of maternal death. The leading cause of mortality, or at least one of the top five causes, is postpartum haemorrhage (PPH) [2]. Every year, 14 million women have PPH, and 1-2% of them pass away within 2-4 hours of the start of bleeding. Moreover, 2 to 11% of them go on to develop anaemia later in life [3].

The World Health Organization (WHO) defines PPH as occurring when there is a clinical blood loss of at least 500 ml during vaginal delivery or 1000 ml following caesarean section (CS). Even a small amount (under 200 ml) of blood loss during pregnancy is seen as a health risk, particularly in low- and middle-income nations where anaemia is more common [4]. Hence, it's crucial to keep the bleeding under control both during and after LSCS. Tranexamic acid is a synthetic lysine derivative that inhibits the lysine binding sites on plasminogen molecules in order to have an antifibrinolytic action. Transexamic acid given intravenously has been found to be particularly helpful in lowering blood loss and the need for blood transfusions during a variety of procedures, including total hip or knee replacement, liver transplantation, coronary artery bypass, and urinary tract surgery. The effectiveness and safety of tranexamic acid in minimising blood loss during and after LSCS were examined in this study.

Material and Methods

From January 2022 to December 2022, this prospective, randomised, case-control study was carried out in the Department of Obstetrics and Gynecology, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. Randomization was done using the even-odds principle, with two groups, T & C, each consisting of 100 patients. One gram of tranexamic acid was slowly administered intravenously over five minutes to group T 20 minutes before to the skin incision, and the blood loss was compared to that of 100 other patients to whom tranexamic acid was not administered. Full-term primiparas/ multiparas with singleton pregnancies delivered via LSCS were included in the study, but participants with blood abnormalities, difficulties with the heart, liver, kidney, or brain were omitted. The study did not include participants with tranexamic acid history of allergies, thromboembolic disorder, malformed placentas, severe pre-eclampsia, multiple pregnancies, macrosomia, polyhydramnios, or those who needed blood transfusions because of anaemia.

After a comprehensive pre-anesthesia evaluation of the selected people, laboratory tests including haemoglobin level, hematocrit, blood sugar (fasting), ECG, blood urea, serum creatinine, prothrombin time, and International Normalized Ratio (INR) were carried out. Every patient had their haemoglobin and hematocrit levels checked the day before surgery in the hospital lab. LSCS was carried out under subarachnoid block with 2.2 ml of 0.5% hyperbaric bupivacaine after getting written informed consent. An adequate degree of anaesthesia was determined to be provided by a blockade up to the T4–T6 level. Following the birth of the baby, 500 ml of normal saline and 20 units of oxytocin were infused intravenously at a rate of 8 mU/min. Monitoring of the heart rate, blood pressure, and pulse oxygenation (SpO2) as well as the respiratory rate was carried out every two minutes for the first ten minutes following the start of the study drug, every five minutes thereafter until the baby was delivered, and then every fifteen minutes thereafter until the surgery was complete. The blood loss was calculated from placental delivery to the

conclusion of the procedure, as well as from the end of the procedure to two hours after birth. We noticed placental separation, neonatal signs, uterine contractility, and tranexamic acid side effects.

The total volume sucked into the suction bottle during placental delivery plus the weight of the materials used at both times prior to the operation equals the amount of blood loss (measured in millilitres). The pads used from the conclusion of LSCS to two hours after delivery were also weighed individually. Amniotic fluid and the amount of blood lost before placental delivery were therefore excluded from the study's assessment of blood loss.

Result

There was no statistically significant variation between the two groups demographic traits (Table 1). Hemodynamic measurements like pulse rate, blood pressure, respiratory rate, and SpO2 were similar after statistical analysis using the student t test (P>0.05). Both groups showed similar levels of surgical intervention. (Table 2). With no statistically significant difference, all LSCS were carried out under spinal anaesthesia and took 57.25 minutes for the research group and 56.57 minutes for the control group.

There was a statistically significant variation in the volume of blood loss between the time of placental delivery and the end of LSCS. (P=0.0001). Additionally, there was a statistically significant change in blood loss between the conclusion of LSCS and two hours following delivery (P = 0.0001). (Table 3) Additionally, compared to the control group, the research group had less postpartum haemorrhage (PPH), or blood loss of more than 500 mL. (P=0.049) (Table 4)

Table 1: Demographic Profile of Group T and C

Parameters	Group T	Group C	P value
Age (in years)	24.3±2.6	23.6±2.5	0.99
Height (in cms)	158.9±3.4	159.2±3.3	0.99
Weight (in kgs)	57.7±4.7	58.0±5.5	0.798
Gravidity	1.3±0.4	1.2±0.4	0.212

Table 2: Causes for surgery of Group T and C

Causes of Surgery	Group T	Group C
Cord around neck	8	6
MSL	12	15
Breech	42	48
CPD	18	22
NPOL	20	9

Table 3: Quantity of the blood loss from end of LSCS to 2 hours postpartum

Group	Placental delivery to the end of LSCS (ml)	End of LSCS to 2 hrs postpartum (ml)
Study	308.80 ± 43.60	79.0±14.18
Control	349.18 ± 42.17	128.57 ±23.72
P- Value	0.0001	0.0001

Table 4: Blood loss from placental delivery to 2 hrs postpartum (ml)

Blood loss from placental delivery to 2 hrs postpartum (ml)	Study	Control
<500mL	84	64
>500mL	16	36

Discussion

By preventing plasminogen and plasmin from attaching to the fibrin substrate at their lysine-binding locus, tranexamic acid inhibits the activity of enzymes that break down fibrin. TXA also prevents plasminogen activators from converting plasminogen to plasmin. Okamoto originally discovered TXA as a strong inhibitor of fibrinolysis in 1962 [5]. In recent years, TXA has been widely used to treat severe menstrual bleeding [6]. and to lessen blood loss following elective surgery, where it lowers the need for blood transfusions by about one-third [7,8]. Plasminogen activators and fibrin degradation products (FDP) rise as a result of the activation of the fibrinolytic system after placental delivery, whereas fibrinogen and fibrin are rapidly broken down. Anti-fibrinolytic medications can control the further bleeding brought on by this activation, which can last for up to 6 to 10 hours postpartum. Thus, it appears that using TXA lessens blood loss. According to this study, tranexamic acid significantly reduces bleeding in LSCS from the time of placental delivery until two hours after delivery (P=0.001). According to this study, the incidence of blood loss of more than 500 mL has significantly decreased in the study group compared to the control group. Tranexamic acid considerably lessens bleeding from the time of placental delivery to two hours after birth, according to a similar study conducted by Ming-ying Gai *et al* [9]. in China. When compared to the control group, incidence of blood loss of more than 500 ml showed a substantial decrease (P=0.029) in the study group. Similar results after vaginal delivery were demonstrated by Zheng *et al* [10]. Similar results from a trial conducted in India by Mayur *et al* [8]. indicated that the study group experienced less blood loss. We found a handful of studies that used TXA on patients with LSCS after searching for similar studies. Additionally, it has been found to be beneficial for PPH, and a Cochrane review from 2011 supports this [11]. In a double-blind, randomised clinical study, TXA was used preoperatively in a very high dose of 10 g intravenously over 20 min prior to sternotomy, followed by another 10 g administered intravenously over 5 h to prevent bleeding during cardiopulmonary bypass [12]. Horrow *et al*. used prophylactic TXA at dosages between 2.5 and 40 mg/kg in patients undergoing cardiac surgery and discovered that 10 mg/kg followed by 1 mg/kg/h decreased bleeding after extracorporeal circulation. Higher dosages showed no additional hemostatic benefit in the study [13]. A large dose of infusion given at a rate of 10 g intravenously every 5 hours after a bolus of 10 g in their study did not, however, show any discernible advantages over placebo infusion. After receiving tranexamic acid, the subjects' vital signs did not substantially change [12]. No anomalies were found in the results of the examinations for hemoglobin, liver, and renal function. Compared to the general community, the incidence of thrombosis during pregnancy and puerperium is 5–6 times higher [14]. When using the antifibrinolytic drug tranexamic acid, it is important to remember the increased risk of postpartum thrombosis following LSCS.

In the present trial, there were no cases of thrombosis, and the incidences of side effects

like nausea, vomiting, and diarrhoea were not statistically different between the two groups. Many investigations have confirmed these [9,14].

Conclusion

The use of tranexamic acid significantly reduces the amount of blood loss during and after the lower segment caesarean section and has not been associated with any negative effects or problems, such as thrombosis. Therefore, it is safe and effective to give tranexamic acid to LSCS patients.

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