

Original Article

A Study on Effectiveness of Tranexamic Acid as an Anti-fibrinolytic Agent to Reduce the Intra-operative and Immediate Post-operative Bleeding During Caesarean Section.

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Abstract

Background: Blood is the essence of life and unfortunately women are prone to loose it. This study is an attempt to reduce the chances of blood loss during Caesarean Section, the commonly done operation for child birth now a days. **Methods:** A total number of 108 patients were selected for the study. They were divided into two groups; Control group and Study group. The patients who were not administered tranexamic acid during caesarian section were taken as the control group and those who did receive the tranexamic acid formed the study group. Study was made to evaluate the effectiveness of Tranexamic Acid to reduce blood loss during Intraoperative and immediate post operative period of Cesarean Section. **Results:** : In this randomized control study, tranexamic acid was found to reduce the blood loss by about 15 % after the placental delivery till end of the surgery. This amounts to about 40 ml blood loss reduction on an average. In addition, it was found that the average blood loss was also decreased by about 9 % from the onset of surgery to the end of the surgery. This amounts to about 100 ml of blood loss reduction due to tranexamic acid, which is quite significant. **Conclusion:** In the present study, it was found that there was an effective reduction in the blood loss in the study group with tranexamic acid. No side effects were noted due to administration of tranexamic acid on the mother or the neonate.

Key words: Tranexamic Acid, Caesarean Section, Blood loss.

Introduction

Blood is essence of life and the women are prone to loose it. With the increasing trend of cesarean section worldwide, India too is not an exception. The rate of cesarean section has increased to about 30% and one of the major complications that it carries is hemorrhage, which can be life threatening. Our maternal mortality ratio is 407 / 100,000 life births, compared to the global scenario of 400 / 100,000 life births². Major cause was held to be hemorrhage – 29% (anti-natal or post-natal). Anemia is not only an important cause of death in a developing country like in India, but also an aggravating factor in hemorrhage, sepsis and pregnancy induced hyper-tension². It is undoubtedly true that cesarean birth in present time is safer than it ever used to be due to contribution of improved anaesthetic techniques, advent of powerful and effective antibiotics, availability of blood transfusion and surgical and operative skills¹. Even though it is so, it is not without morbidity. ACOG evaluation of cesarean delivery 2000 found that overall mortality rate from cesarean delivery is 6 / 100,000, which is 3 –

7 times greater than that of vaginal delivery⁴.

Recent studies show that primary cesarean increases the risk of blood transfusion to about 4.2 times higher than vaginal delivery. Some clinicians are prompted by the idea that injury sustained during child birth might contribute to the subsequent development of pelvic flood disorder, which led to question the potential benefit of a prophylactic cesarean delivery³. A critical analysis of the blood loss during cesarean section is a valuable factor in order to prevent complications, particularly hemorrhage. To reduce this hemorrhage the idea of injecting anti-fibrinolytic agent like tranexamic acid one gm IV ten minutes prior to the surgery has been utilized in this study. The purpose of choosing tranexamic acid is because it is inexpensive, easily accessible, well tolerated, 6 – 7 times more efficacious than its co-drugs. The present study is to study the effect of Tranexamic Acid in reducing bleeding intra-operatively during cesarean section and to assess the effect of

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Tranexamic Acid in reducing blood loss after placental delivery.

Material and Methods

This study was conducted in the Department of Obstetrics and Gynaecology at Kempegowda Institute of Medical Science Hospital and Research Centre, Bangalore. One hundred and eight term primigravidas between 37 to 42 weeks of gestation were taken for the observation and allocated to study group and control group. Patients with history of allergic reactions, thromboembolic disease, hypertension, colour vision, antipartum hemorrhage etc. were not considered for the study.

After the selection of the subject for the study injection tranexamic acid one gm IV slowly (over ten minutes) administered ten minutes before the abdominal incision for cesarean section, after informing the anesthetist for the study group of 51 patients and 57 patients tranexamic acid was not administered as control group.

As tranexamic acid is known to cross the placental barrier, the newborn's apgar were also recorded for any sign of toxicity due to the drug in the study group. The blood loss during and immediately after the caesarian section was calculated from: blood collection in the suction container, blood collection into the kidney tray, increase in the weight of the mops used to soak the blood during the operation. The average gestational age was about 39 weeks in both the groups with P value of 0.948. This implies that the samples are matched in the control and the study group in terms of gestational age of the mother. All the patients were aged between 18 and 35 years and the maximum age distribution was in the age group of 21 - 25 years with about 63.2% in control group and about 49% in study group. The average age of the two groups was nearly the same and about 23 years. Patients' characteristics in view of height and weight were similar, with not much statistical difference between the two groups. This uniformity in height and weight between the two groups ensures a fair comparison of blood loss during caesarian section. The average birth weight of the babies is about 3 Kg in both the groups and there is no statistically significant difference in birth weights in the two groups. In both the groups amniotic fluid volume was statistically comparable (Table 1). That means, subsequently, the measured volume of blood and amniotic fluid during caesarian section will have similar amount of amniotic fluid on an average in both the control and study groups and its impact is

nullified from the measurements. With this assumption, amniotic fluid volume was neglected while determining the differential blood loss between the control group and the study group.

The blood and liquor volume in the suction container after the placental delivery and at the end of the surgery were measured. The difference between the two measurements gives the blood loss from placental delivery till end of the surgery, which is 151 ml for the control group and 124 ml for the study group on an average and has a P value of less than 0.001. This result is significant and suggests that there is indeed reduction in the blood volume collection in the study group compared to the control group. The blood collected in the kidney tray due to vaginal toileting is nearly the same for both the groups and quite small compared to the total blood loss. Similarly, the blood soaked by the mops for the Control and Study groups are measured. The blood volume from the mops are found by the following formula. Blood Volume (ml) = weight of the mops after surgery (gms) - weight of dry mops before surgery / Blood density (1.05 gm/ml)

The following Table 2 shows the result of the total intraoperative and immediate post operative blood loss.

Results

The total blood loss after placental delivery till the end of the surgery was largely unaffected by the liquor (Table 3). It is seen that the total blood loss after placental delivery till end of the surgery was about 264 ml for the control group and 224 ml for the study group on an average, with a P value of less than 0.001. This result is significant in statistical sense. There is about 15% reduction of blood loss on an average between the control group and study group due to the use of tranexamic acid (Figure 1). The total intra-operative blood loss plus liquor was about 1186 ml for the control group and 1082 ml for the study group on an average, with a P value of 0.001. This result is statistically significant.

AF volume	AFI Value (cm)	Control group	Study group
Oligohydramnios	5 cm	3 (5%)	2 (4%)
Borderline	5.1 - 8.0 cm	26 (46%)	21 (42%)
Normal	8.1 - 18.0 cm	24 (42%)	25 (49%)
Polyhydramnios	> 18.0 cm	4 (7%)	3 (5%)
Mean ± SD	9.33±4.29	9.87±3.98	P = 0.500

Table :1 - Amniotic fluid volume

There is about 9% reduction of intra-operative blood loss, on an average between the control group and the study group due to the use of tranexamic acid. This calculation also includes liquor and therefore the percentage of reduction of blood loss may not be accurate.

Intraoperative Collection of Blood & Liquor	Control (n=57)	Study (n=51)	P value
Collection in Suction Container After Placental Delivery(ml)V1	921.58± 160.66	858.33± 128.42	0.027
Collection in Suction Container at the end of Surgery(ml)V2	1072.63± 166.97	981.86± 125.84	0.002**
Collection in Suction Container After Placental Delivery till the end of the Surgery(V2-V1)	151.14± 49.01	123.53± 19.24	<0.001**
Blood in Kidney Tray due to Vaginal Toileting (V3)	13.95 ± 8.33	11.37 ± 5.39	0.063+
Blood in 'ml' from used mops(V4)	99.08± 23.80	89.17± 21.71	0.026*

Table 2: Intraoperative Collection of blood and liquor (Results are presented in Mean ± SD)

Blood loss calculations	Control (n=57)	Study (n=51)	Reduction in Blood Loss	P value
Total blood loss after Placental Delivery till end of the Surgery V5 = (V2 - V1)+V3 + V4	264.17 ± 54.21 (165.0 - 334.7)	224.07 ± 32.45 (158.1 - 239.5)	15.18%	<0.001**
Total Intra-operative blood loss + Liquor V6 = V2 + V3 + V4	1185.66 ± 166.93 (681.2 - 1515.2)	1082.40 ± 128.56 (716.2 - 1309.8)	8.71%	0.001**

Table 3: Reduction of blood loss due to tranexamic acid. Results are presented in Mean ± SD (Min-Max)

Discussion

Tranexamic acid is an anti-fibrinolytic agent that competitively inhibits the activation of plasminogen to plasmin and hence prevent breakdown of clot. It blocks the lysine binding sites on plasminogen molecules, which prevents the bonding of fibrin with the plasminogen or plasmin. Blocking this bonding reduces the degradation of fibrin and thereby reduces the fibrinolytic effects. In the present study of effectiveness of tranexamic acid to reduce blood loss during caesarian section 108 primigravida subjects

were observed, of which 57 subjects did not receive tranexamic acid and formed the control group and the remaining 51 subjects received tranexamic acid and formed the study group.

The average gestational age of the subjects in the control group and the study group was similar. The majority of the subjects underwent emergency caesarian operations with major indication for caesarian section was either fetal distress or CPD. This trend was similar in both the groups. Further the amniotic fluid index of both the groups was statistically comparable. All the above observations suggest that the two groups had subjects with uniform profiles of age, height, weight, gestational age and AFI. Therefore, the subsequent estimation of blood loss during caesarian section was not unduly affected by the dissimilarity of the profiles of subjects in the two groups.

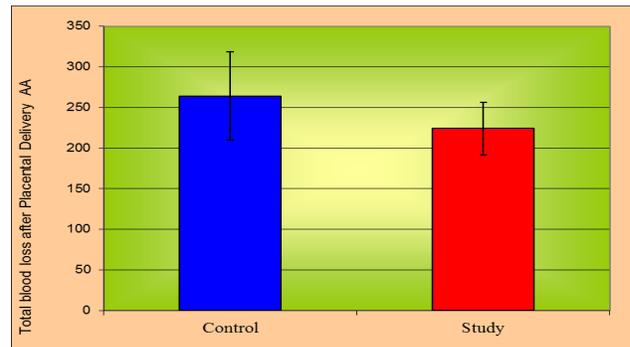


Figure 1: Total blood loss after placental delivery till end of the surgery in ml

In both the groups amniotic fluid volume was statistically comparable. That means, subsequently, the measured volume of blood and amniotic fluid during caesarian section will have similar amount of amniotic fluid on an average in both the control and study groups and its impact is nullified from the measurements. This observation is very important and the basis for the fundamental assumption that the volume of amniotic fluid need not be subtracted from the total volume of blood and amniotic fluid measurement during the caesarian section. With this assumption, amniotic fluid volume was neglected while determining the differential blood loss between the control group and the study group.

The total blood loss after placental delivery till the end of the surgery was largely unaffected by the liquor. It is seen that the total blood loss after placental delivery till end of the surgery was about 264 ml for the control group and 224 ml for the study group on an average, with a P value of less than 0.001. This

result is significant in statistical sense. There is about 15% reduction of blood loss on an average between the control group and study group due to the use of tranexamic acid.

The total intra-operative blood loss plus liquor was about 1186 ml for the control group and 1082 ml for the study group on an average, with a P value of 0.001. This result is statistically significant. There is about 9% reduction of intra-operative blood loss, on an average between the control group and the study group due to the use of tranexamic acid. This calculation also includes liquor and therefore the percentage of reduction of blood loss may not be accurate. In another similar study Goswami et al found TXA in doses of 10 mg/kg and 15 mg/kg, was found to be effective in significantly reducing blood loss and transfusion requirements in anemic parturients undergoing LSCS. A good safety profile was seen for both the doses⁶. Further, it was seen that the total intra-operative blood loss reduction was nearly uniform of about 10% in the study group compared to the control group for 'adequate' and 'decreased' categories of subjects in both the groups.

It has been found to be useful in PPH also, a Cochrane review (2011) regarding this being ample evidence⁵. A study by Movafegh et al⁸ in 2011, found that the total oxytocin administration after the delivery of the fetus was less in the TXA group when compared to the control group. In obstetrics, Tranexamic acid use was generally well-tolerated: The major adverse effects described were rare and the minor adverse effects were moderate (nausea and visual disturbances⁷).

Conclusion

In this randomized control study on the effectiveness of tranexamic acid as an anti-fibrinolytic agent during caesarean section, tranexamic acid was found to reduce the blood loss by about 15 percent after the placental delivery till end of the surgery. This amounts to about 40 ml blood loss reduction on an average.

In addition, it was found that the average blood loss was also decreased by about 9 percent from the onset of surgery to the end of the surgery.

This amounts to about 100 ml of blood loss reduction due to tranexamic acid, which is quite significant. Therefore, the use of tranexamic acid can reduce the requirement of blood transfusion and that will in turn reduce the problems associated with the blood transfusion.

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