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# Associations Between Post-Partum Hemorrhage, Tranexamic Acid Use, and Postoperative Pain After Cesarean Delivery

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## INTRODUCTION

- Post-cesarean pain remains common despite modern analgesia strategies.
- Post-partum hemorrhage occurs in up to 10% of cesarean deliveries and is commonly managed with tranexamic acid (TXA).
- Emerging preclinical data suggests TXA may impact postoperative pain through modulation of spinal neuronal signaling, including inhibition of GABA and glycine receptors and increased excitatory glutamatergic activity.
- Our study evaluates intraoperative TXA use on post-cesarean pain.

## METHODS

- Retrospective cohort of cesarean deliveries at the University of Illinois Hospital from Sept 2020 – Nov 2025 (n = 1,791).
- Demographic, obstetric, and clinical variables extracted from electronic medical records.
- Propensity score matching (1:1 nearest neighbor, caliper 0.2) used to create comparable TXA and non-TXA cohorts, resulting in **305 patients in each group (n = 610 total)**.
- Analysis: Mann-Whitney U test and Fisher exact test before matching; Wilcoxon signed-rank and Fischer exact test after matching.
- Multiple linear regression evaluated predictors of highest postoperative pain score in matched cohorts.

## RESULTS

- Total blood loss was independently associated with higher pain scores (0.056 increase in post-cesarean highest pain score, per 100 mL of blood loss, 95% CI: 0.00022 to 0.00091, $p = 0.0016$).
- Intraoperative TXA administration was not associated with increased highest postoperative pain scores after adjustment for hemorrhagic burden and clinical covariates (β = 0.46, 95% CI: −0.20 to 1.10, $p = 0.17$).

## CONCLUSION

- Our findings suggest that greater blood loss is associated with higher postoperative pain scores, potentially reflecting increased tissue injury and inflammatory response.
- Although TXA was not associated with increased pain, its ability to reduce hemorrhage may indirectly lessen postoperative pain.

Fawcus S, Moodley J. Postpartum haemorrhage associated with caesarean section and caesarean hysterectomy. Best Pract Res Clin Obstet Gynaecol. 2013 Apr;27(2):233-49. doi: 10.1016/j.bpobgyn.2012.08.018. Epub 2012 Oct 17. PMID: 23084097.
Amaral S, Provinciatto H, Gewehr DM, Lombardi RA, D'Souza RS, Terres MT, Pereira EMM, da Silveira CAB, Assis MLM, Pereira LC, Barbalho ME, Rasador ACD, Donadon IB, Habib AS. Prophylactic strategies for prevention of postpartum haemorrhage in caesarean delivery: a systematic review and Bayesian network-meta-analysis of randomised controlled trials. Lancet Glob Health. 2025 Aug;13(8):e1415-e1424. doi: 10.1016/S2214-109X(25)00185-8. PMID: 40712613.
Wurtz JW, Wurtz LD, Ziemba-Davis M, Deckard ER, Meneghini RM. Topical Tranexamic Acid Increases Early Postoperative Pain After Total Hip Arthroplasty. J Arthroplasty. 2020 Jun;35(6S):S219-S225. doi: 10.1016/j.arth.2020.01.069. Epub 2020 Jan 31. PMID: 32098737.
Ohashi N, Sasaki M, Ohashi M, Kamiya Y, Baba H, Kohno T. Tranexamic acid evokes pain by modulating neuronal excitability in the spinal dorsal horn. Sci Rep. 2015 Aug 21;5:13458. doi: 10.1038/srep13458. PMID: 26293582; PMCID: PMC4544020

# TXA Use During Cesarean Delivery **Was Not Associated With** Increased Postoperative Pain

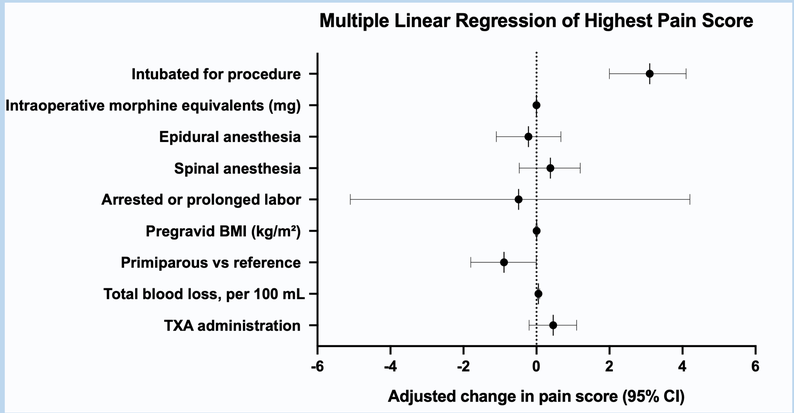


Figure 1. Predictors of Highest Post-Cesarean Pain Score

**Blood loss WAS associated with pain**

+0.056 pain score increase per 100 mL blood loss ($p = 0.0016$)

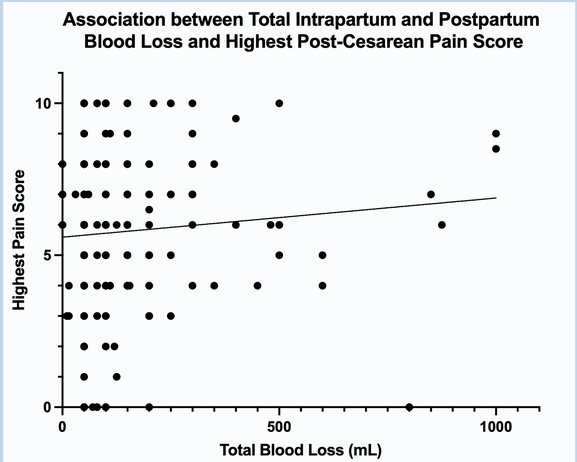


Figure 2. Relationship Between Blood Loss and Pain Score

| Preoperative Characteristics | Before Matching | | | | After Matching | | | |
|---|---|---|---|---|---|---|---|---|
| | Total (n=1,791) | No TXA (n=1,463) | TXA (n= 328) | *p*-value | Total (n= 610) | No TXA (n=305) | TXA (n=305) | *p*-value |
| Age (years) | 30 (26-34) | 30 (26-34) | 30 (26-35) | 0.2185 | 30 (26-35) | 30 (25-35) | 30 (26-35) | 0.6426 |
| Pre-gravid BMI, kg/m² | 31 (25-38) | 30 (25-37) | 32 (27-39) | 0.0003 | 33 (27-40) | 34 (26-41) | 32 (27-39) | 0.2037 |
| Nullipara | 39.5 (708) | 40.3 (589) | 36.3 (119) | 0.0320 | 39.7 (242) | 42.0 (128) | 37.4 (114) | |
| Primipara | 27.6 (495) | 28.4 (416) | 24.1 (79) | | 23.4 (143) | 23.3 (71) | 23.6 (72) | |
| Multipara | 30.7 (550) | 29.2 (427) | 37.5 (123) | | 34.6 (211) | 32.5 (99) | 36.7 (112) | 0.6523 |
| Intubated for procedure | 8.0 (143) | 7.2 (105) | 11.6 (38) | 0.0126 | 10.8 (66) | 10.8 (33) | 10.8 (33) | >0.9999 |
| Quantitative Blood Loss | 700 (475-1089) | 630 (450-922) | 1254 (830-1679) | <0.0001 | 1214 (786-1600) | 1213 (774-1583) | 1215 (800-1615) | 0.1055 |
| History of PPH | 4.0 (71) | 3.4 (49) | 6.7 (22) | 0.0075 | 6.2 (38) | 6.2 (19) | 6.2 (19) | >0.9999 |

Table 1. Demographic and Clinical Characteristics Before and After Propensity Scoring

| Variable | Total (n=610) | No TXA (n=305) | TXA (n=305) | *p*-value |
|---|---|---|---|---|
| Procedure Length, min | 79 (63-106) | 75 (61-101) | 85 (64-114) | 0.005 |
| Intraoperative MME | 101 (63-158) | 98 (50-158) | 101 (68-158) | 0.4045 |
| PACU MME | 0 (0-7.5) | 0 (0-7.5) | 0 (0-7.5) | 0.2992 |
| Postoperative MME 6h | 7.5 (0-7.5) | 5.8 (0-7.5) | 7.5 (0-8) | 0.2465 |
| Postoperative MME 24h | 7.5 (0-18) | 7.5 (0-19) | 7.5 (0-16) | 0.4533 |
| Postoperative MME 48h | 15 (7.5-30) | 15 (0-31) | 15 (7.5-30) | 0.3082 |
| Highest Pain Score in Recovery | 5 (0-8) | 5 (0-8) | 6 (0-8) | 0.0962 |
| Length of Stay, days | 5 (4-6) | 5 (4-5) | 5 (4-6) | 0.3602 |

PACU = Post-Anesthesia Care Unit; MME = Morphine Milligram Equivalents

Table 2. Intraoperative Characteristics and Outcomes After Matching

| Variable | Adjusted change in pain score* (95% CI) | p-value |
|---|---|---|
| TXA administration | 0.46 (−0.20 to 1.10) | 0.17 |
| Total intrapartum and postpartum blood loss, mL | 0.00056 per mL (0.00022 to 0.00091) | 0.0016 |
| Primiparous vs reference | −0.89 (−1.80 to −0.004) | 0.049 |
| Pregravid BMI (kg/m²) | 0.005 (−0.03 to 0.04) | 0.7718 |
| Arrested or prolonged labor | −0.49 (−5.10 to 4.20) | 0.8376 |
| Spinal anesthesia | 0.38 (−0.47 to 1.20) | 0.3804 |
| Epidural anesthesia | −0.22 (−1.10 to 0.67) | 0.6332 |
| Intraoperative morphine equivalents (mg) | −0.00078 (−0.0039 to 0.0023) | 0.619 |
| Intubated for procedure | 3.10 (2.00 to 4.10) | <0.0001 |

*Numeric rating scale from 0-to-10

Table 3. Multivariate Linear Regression for Highest Pain Score in Recovery