# Oral Tranexamic Acid Reduces Transfusions and Operating Room Time in Total Knee Arthroplasty

NEW ENGLAND BAPTIST HOSPITAL

Christine A Fournier Bell, MSN, RN, CAPA, Roger E Perreault, BA; Carl T Talmo, MD; David A Mattingly, MD;

## INTRODUCTION

Intraoperative blood loss is a known potential complication of total knee arthroplasty (TKA) often resulting in the need for postoperative transfusions. The American Red Cross Reports more than 30 million transfusions of blood components are performed each year [1]. Though transfusions are safer than ever before, they continue to hold associated risks. Complications range from mild reactions and discomfort to life-threatening conditions including transfusion-related acute lung injury (TRALI), transfusion-associated circulatory overload (TACO); and hemolytic transfusion reactions (HTR) [1]. Tranexamic acid (TXA) has been shown to reduce intraoperative blood loss and postoperative transfusion in patients undergoing total knee arthroplasty. [2-4] The use of TXA has become present day standard of care in most patients undergoing orthopedic surgery [5].

## IDENTIFICATION OF THE PROBLEM

A gap in the literature exists regarding oral TXA use and optimal dosing for surgical patients . There are numerous studies demonstrating the efficacy of intravenous and topical tranexamic acid in patients undergoing total knee arthroplasty, but comparatively few demonstrating the 1. effectiveness and 2. appropriate dosing recommendations of oral formulations. Evidence based data is warranted to support safe and effective use of Oral TXA in the total joint population.

## PURPOSE

The purpose of this study is to evaluate the transfusion rate on a targeted orthopedic total Knee arthroplasty(TKA) patient population of those who received oral tranexamic acid (OTXA) and those who did not, comparing it to the IV form of the drug and translating this into hospital savings ,patient outcomes, exposure and nursing workload.

## METHODS

After IRB approval, a quantitative retrospective cohort study of 2230 TKA patient procedures performed from August 2014 – September 2015 was completed. Three treatment cohorts were identified: patients undergoing TKA without the use of OTXA (n=968), patients undergoing TKA with administration of a single-dose of OTXA (n=164), and patients undergoing TKA with administration of preoperative and postoperative OTXA (two-dose OTXA, n=1098). Exclusion criteria were relative contraindications to OTXA administration, and were applied uniformly to all groups, including the no-OTA group. Differences in baseline characteristics between the groups were compared using chi-squared tests for categorical data, and independent t-tests for continuous data. Univariate analyses were carried out to compare the outcomes of interest in the two groups. All reported P-values are two sided. The level of significance was set at $p < 0.05$.

## RESULTS

Transfusion rates decreased from 24.1% in the no-OTA group to 13.6% in the single-dose OTA group ($p<0.01$) and 11.1% in the two-dose OTA group ($p<0.01$), with no significant difference in transfusion rates between single- and two-dose OTA groups ($p=0.357$). Operating room time was reduced from 154 minutes in the no-OTA group to 144 minutes in the one-dose OTA group ($p<0.01$) and 144 minutes in the two-dose OTA group ($p<0.01$). Additionally, maximum postoperative decline in hemoglobin was reduced from 4.3 g/dL in the no-OTA group to 3.5 g/dL in the single-dose OTA group ($p<0.01$) and 3.4 g/dL in the two-dose OTA group ($p<0.01$), without a significant difference between the single- and two-dose regimens ($p=0.233$).

| | CONTROL | SINGLE DOSE | TWO DOSE |
|---|---|---|---|
| Pre-Op | 14.06 | 14.02 | 14.09 |
| PACU | 12.72 | 12.78 | 12.99 |
| POD1 | 10.73 | 11.34 | 11.46 |
| POD2 | 10 | 10.73 | 10.89 |
| POD3 | 9.52 | 10.1 | 10.48 |

## NURSING IMPLICATIONS

- Perianesthesia nurses provide much of the care involving blood transfusions, especially in the orthopedic population. Decreasing exposure to blood products is a safety benefit to nurses and patients by avoiding transfusion related syndromes, risk of blood exposure, decreasing blood demand, decreasing nursing workload, earlier patient ambulation, increased comfort, earlier discharge and increased patient satisfaction scores (HCAP).
- This study supports the administration of Oral TXA in reducing OR time, transfusion requirements, nursing exposure/risk and workload, improved patient outcomes and decreased operating costs
- Nursing feed back suggests there may be significant post operative nausea associated with OTA . Further study is needed to investigate this.
- OTA is a large pill and can be difficult for some patients to swallow. This study suggests there may be benefit in one vs two doses there by decreasing the administration of a second dose
- Future research should focus on the efficacy of a single pre op dose of OTA

| | No-OTXA (n=968) | Single-Dose OTXA (n=162) | Two-Dose OTXA (n=1098) | p-value | | |
|---|---|---|---|---|---|---|
| | | | | Control vs Single-Dose | Control vs Two-Dose | Single-Dose vs Two-Dose |
| Proportion of patients transfused | 24.10% | 13.40% | 11.10% | <0.01 | <0.01 | 0.39 |
| Units transfused (units) (range) | 0.28 ± 0.53 (0 to 4) | 0.14 ± 0.37 (0 to 2) | 0.12 ± 0.34 (0 to 2) | <0.01 | <0.01 | 0.399 |
| Drain output (mL) | 65.3 ± 124.9 | 15.4 ± 37.2 | 18.2 ± 52.7 | <0.01 | <0.01 | 0.518 |
| Hemoglobin drop (g/dL) | 4.3 ± 1.1 | 3.5 ± 1.0 | 3.4 ± 1.0 | <0.01 | <0.01 | 0.233 |
| EBL (mL) | 117 ± 110 | 114 ± 94 | 116 ± 94 | 0.745 | 0.841 | 0.794 |
| LOS (d) | 3.2 ± 1.0 | 3.1 ± 0.1 | 3.2 ± 0.8 | 0.262 | 0.116 | 0.665 |
| Cell salvage volume (mL) | 0.9 ± 12.3 | 0 ± 0 | 1.5 ± 34.3 | 0.329 | 0.624 | 0.574 |

## LIMITATIONS & CONCLUSIONS

Study limitations were in a single center however it represents one of the largest single-center unselected series examining the effectiveness of Oral TXA to date.

Conclusion: Administration of Oral TXA reduces transfusion rates and shows a significant difference in maximum postoperative decline in hemoglobin. These findings speak to the efficacy of Oral TXA and also provide clinical evidence to support oral dosing in this select patient cohort.

Future Research: There was a slight increase in nausea for the patients in the 2 dose group and because results were similar it would be recommended that a study using just one dose would be a future research recommendation

## References

1. Dubeck D. Blood transfusion events – Lessons learned from a complex process. Pennsylvania Patient safety advisory. 2016 Sept; 13: 100-106.
2. Wang C, Xu GJ, Han Z, Ma JX, Ma XL, et al. Topical application of tranexamic acid in primary total hip arthroplasty: a systemic review and meta-analysis. International journal of surgery. 2015 Mar; 15: 134-9.
3. Alshryda S, Sukeik M, Sarda P, Blenkinsopp J, Hadda FS, Mason JM. A systematic review and meta-analysis of the topical administration of tranexamic acid in total hip and knee replacement. The bone and joint journal. 2014 Aug; 96-B(8): 1005-15.
4. Panteli M, Papkostidis C. Dahabreh Z, Giannoudis PV. Topical tranexamic acid in total knee replacement: a systematic review and meta-analysis. The knee. 2013 Oct; 20(5): 300-9.
5. Poeran J, Rasul R, Suzuki S, Danninger T, Mazumdar M, Opperer M, et al. Tranexamic acid use and postoperative outcomes in patients undergoing total hip or knee arthroplasty in the United States: retrospective analysis of effectiveness and safety. Bmj. 2014; 349:g4829