Nebulized Tranexamic Acid Reduces the Need for Operative Cautery for Acute Secondary Post-Tonsillectomy Hemorrhage

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Introduction

- Post-tonsillectomy hemorrhage is a well-known complication following tonsillectomy, occurring in up to 5% of pediatric patients and 13.6% of adult patients.[4]
- Primary post-tonsillectomy hemorrhage occurs within 24 hours after surgery and is generally thought to be a result of technical error, while secondary hemorrhage occurs after the first 24 hours post-operatively.[5]
- While conservative measures to control hemorrhage may help to stop bleeding, they are limited by patient cooperation and site access, and none have been proven to reduce the need for operative intervention.[7,8].
- Tranexamic acid (TXA) treatment has become a more frequent intervention for post-tonsillectomy hemorrhage in recent years. [1,4,7-10]
- While these prior studies have shown success with nebulized TXA for treatment of post-tonsillectomy hemorrhage, they have been limited in sample size and varied with regards to inclusion criteria and TXA dosing.
- The purpose of this study was to determine the efficacy of nebulized TXA in patients presenting with active secondary post-tonsillectomy hemorrhage at our institution.

Methods

- All adult and pediatric patients who presented with active post-tonsillectomy hemorrhage > 24 hours post-tonsillectomy treated at our tertiary care institution between December 2014-July 2025 were included.
- Patients who were not actively bleeding on presentation were excluded.
- Nebulized TXA was administered as a total of 500mg (5mL of 100mg/mL intravenous TXA solution) via nebulizer. Patients typically received a single dose of nebulized TXA. If additional doses were necessary, an additional 500mg of TXA was administered via nebulizer per dose.
- Outcomes were compared between patients who received nebulized TXA and those who did not.
- Outcomes included need for operative intervention, length of hospital stay, and recurrent hemorrhage rate.
- Univariate statistical analysis was performed using SPSS.

Results

- 101 patients were included, 57 of which received nebulized TXA.
- Hemostasis was achieved in 84.2% of the 57 patients following administration of nebulized TXA.

References

Table 1. Baseline patient characteristics and outcomes after secondary post-tonsillectomy hemorrhage.

	Nebulized TXA	No TXA	Difference	Sig. (p-value)
Total Number (n)	57	44	-	-
Age (Mean ± SD)	22.8 ± 12.4	19.9 ± 10.8	2.868 [-1.711-7.447]	0.225
Male Gender (n [%])	32 [56.1%]	23 [52.3%]	0.039 [-0.154-0.230]	0.699
Recurrent or Chronic Tonsillitis (n [%])	34 [59.7%]	21 [47.7%]	0.119 [-0.076-0.306]	0.233
Tonsillar Hypertrophy (n [%])	19 [33.3%]	22 [50.0%]	-0.167 [-0.349-0.027]	0.091
Obstructive Sleep Apnea (n [%])	18 [31.6%]	17 [38.6%]	-0.071 [-0.254-0.115]	0.460
Number of Days Between Tonsillectomy and Hemorrhage (Mean ± SD)	7.0 ± 3.5	7.6 ± 3.0	-0.576 [-1.899-0.747]	0.390
Hemoglobin Level in g/dL (Mean ± SD)	12.6 ± 1.7	12.3 ± 2.1	0.299 [-0.470-1.067]	0.442
Platelets per mcL (Mean ± SD)	313.6 ± 67.7	331.3 ± 91.2	-17.682 [-49.721-14.358]	0.276
Need for Red Blood Cell Transfusion (Mean ± SD)	5 [8.8%]	2 [4.6%]	0.042 [-0.069-0.142]	0.465
Need for Operative Control of Hemorrhage (n [%])	30 [52.6%]	33 [75.0%]	-0.224 [-0.394- -0.034]	0.024
Time from Presentation to Operating Room in Minutes (Mean ± SD)	408 ± 324	249 ± 293	159.23 [3.851-314.609	0.045
Operative Time in Minutes (Mean ± SD)	22 ± 11	18 ± 14	4.579 [-2.055-11.212]	0.172
Anesthesia Time in Minutes (Mean ± SD)	45 ± 15	39 ± 17	5.945 [-2.296-14.187]	0.154
Hospital Length of Stay in Days (Mean ± SD)	1.2 ± 1.1	1.5 ± 1.4	-0.362 [-0.854-0.130]	0.148
Recurrent Post-Tonsillectomy Hemorrhage (n [%])	4 [7.0%]	6 [13.6%]	-0.065 [-0.192-0.060]	0.283

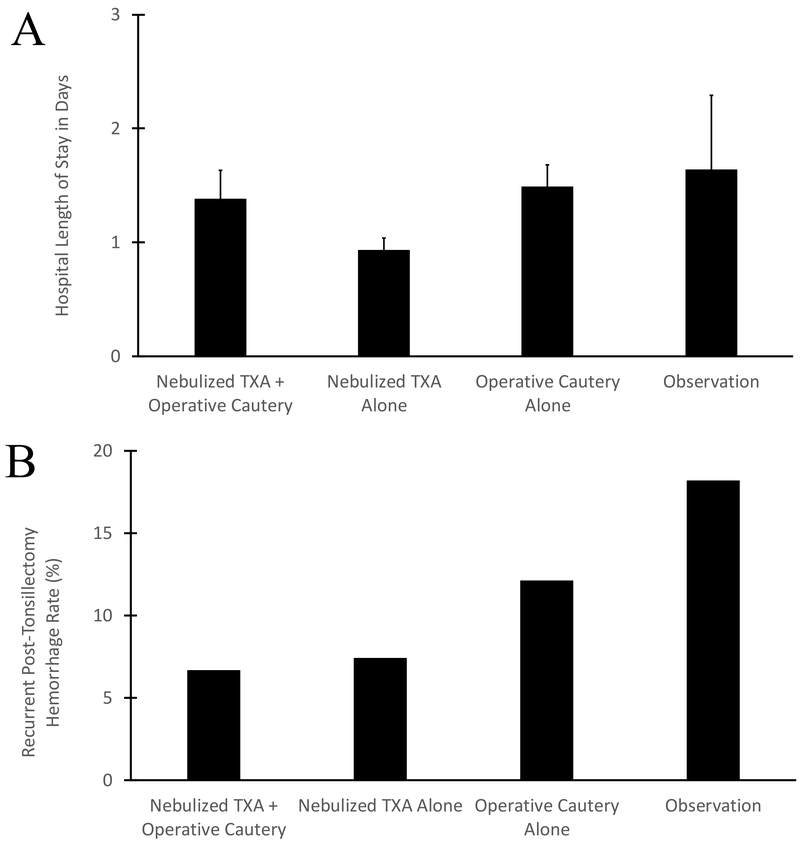

Figure 1. Subgroup analysis stratified by treatment modalities delivered. A) Hospital length of stay (in days) between groups. Error bars represent standard error of the mean. B) Recurrent post-tonsillectomy hemorrhage (rebleed) rate between groups.

Results (Continued)

- Patients who received nebulized TXA were significantly less likely to require operative intervention (52.6% versus 75.0%, OR = 0.370 [0.157-0.873], p = 0.024).
- Administration of nebulized TXA was significantly associated with a longer duration from time of presentation with hemorrhage to need for operative intervention (408 ± 324 versus 249 ± 293 minutes, p = 0.045).
- Neither operative time (22.2 ± 11.2 versus 17.6 ± 13. 8 minutes, p = 0.172) nor anesthesia time (45.2 ± 14.7 versus 39.2 ± 16.5, p = 0.154) differed significantly between those who received nebulized TXA and those who did not.
- Neither hospital length of stay (1.2±1.1 versus 1.5±1.4 days, p = 0.148) or readmission rate for recurrent post-tonsillectomy hemorrhage (7.0% versus 13.6%, p = 0.283) differed significantly between those who received nebulized TXA and those who did not.
- Subgroup analysis showed no difference in hospital length of stay (F = 1.384, p = 0.252, see Figure 1A) or rate of recurrent post-tonsillectomy hemorrhage (p = 0.630, see Figure 1B) between groups.
- No adverse effects of nebulized TXA were observed in this study.

Discussion

- The goal of this study was to determine the safety and efficacy of nebulized TXA administration for secondary post-tonsillectomy hemorrhage.
- Nebulized TXA significantly reduced the need for operative cautery in secondary post-tonsillectomy hemorrhage.
- While TXA nebulization was not shown to reduce overall length of hospital stay, reducing rates of operative intervention corresponds to lower healthcare costs overall.
- In patients that required operative intervention, administration of TXA safely delayed time to operation without impacting operative time or overall length of hospital stay.
- These findings support the use of nebulized TXA as a management strategy for post-tonsillectomy hemorrhage or as a temporizing measure to achieve hemostasis as a bridge to definitive operative intervention.
- While study was limited by its retrospective nature and sample size, to our knowledge this is one of the largest retrospective cohort studies to date to investigate the efficacy of nebulized TXA for control of secondary post-tonsillectomy hemorrhage in actively bleeding patients.
- In many cases operative intervention was performed in patients who had achieved hemostasis with nebulized TXA to remove clot and localize the source of bleeding. At our institution, patients who are hemostatic with clot present in the fossa may be taken to the operating room for clot disruption and cautery or challenged with a liquid diet to disrupt the clot while in a monitored setting. The number of patients who ultimately underwent operative intervention after receiving nebulized TXA may therefore have been inflated by inclusion of patients who underwent operative intervention despite having already achieved hemostasis with nebulized TXA.

Conclusions

- Administration of nebulized TXA is a safe and effective strategy for acute stabilization of secondary post-tonsillectomy hemorrhage. Nebulized TXA reduced the rate of operative intervention for secondary post-tonsillectomy hemorrhage and increased the time until intervention was required.