

# Use of preoperative tranexamic acid in tonsillectomy with or without adenoidectomy to reduce primary haemorrhage

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## ABSTRACT

**Background:** Haemorrhage during adenotonsillectomy is a common and potentially grave complication especially in children due to less physiological compensation of total blood volume. Tranexamic acid being synthetic antifibrinolytic drug has been widely used in surgical procedures to reduce bleeding. Few researches have done to see its effectiveness during adenotonsillectomy. The objective of current study is to evaluate the use of preoperative tranexamic acid to reduce primary haemorrhage in children who undergo elective tonsillectomy with or without adenoidectomy.

**Subjects and methods:** It was a quantitative, randomized control study and conducted at Pakistan Railway hospital from June 2015 to September 2016. The current study included 80 children randomized into two groups. Children between the ages of 5 to 15 years had been operated for tonsillectomy with or without adenoidectomy. Group 1 (experimental group) was given tranexamic acid at a dose of 10mg/kg of body weight intravenously, 30 minutes before induction of anaesthesia while the other arm (control arm) did not receive injection tranexamic acid. All children underwent dissection and snare method under general anaesthesia. P-value were obtained by applying independent sample t-test and considered statistically significant at 0.05 in reduction of primary haemorrhage during the procedure.

**Results:** In study group mean amount of primary haemorrhage was 64.56 ( $\pm$ 40.85) ml and in control group was 98.34 ( $\pm$ 62.57) ml. The comparison of Boezart blood grading scale was also significantly different between both groups.

**Conclusion:** Preoperative tranexamic acid when used intravenously is effective in reducing primary haemorrhage during tonsillectomy with or without adenoidectomy.

## Keywords:

Tranexamic acid; Tonsillectomy; Adenoidectomy; Primary haemorrhage.

## INTRODUCTION

Perioperative haemorrhage following tonsillectomy in children contributes to serious life-threatening complication.<sup>1</sup> The incidence of haemorrhage is 2 to 5%. Post-tonsillectomy mortality is around 1 in 10000 patients and approximately 16% due to haemorrhages<sup>2</sup>. It has been classified in tonsillectomy as primary haemorrhage, which occurs intra-operatively. Reactionary haemorrhage occurs within 24 hours of surgery and secondary after 4-5 days<sup>3</sup>. ENT surgeons use several methods to control and reduce primary and secondary haemorrhages.

Tranexamic acid is a synthetic derivative of amino acid lysine, producing antifibrinolytic effect by blocking lysine binding sites on plasminogen molecules.<sup>3</sup> This

inhibits plasminogen activation to plasmin on the surface of fibrin. Plasminogen is the main factor of the fibrinolytic enzymatic system and lead to hyper fibrinolysis resulting in massive bleeding during surgical procedures.<sup>4</sup> Fibrinolysis is suppressed by tranexamic acid and it is revealed by reduction in blood levels of D-dimer.

Tranexamic acid is an effective drug for prevention, reduction of bleeding in cardiac, orthopaedics, urological and gynaecological surgical procedures.<sup>5,6</sup> It is also used as a topical mouthwash following dental and oral surgery.<sup>6</sup> Potential benefits of tranexamic acid are high but very few studies have been done to evaluate the role of tranexamic acid in tonsillectomy.

The objective of this study was to evaluate the use of preoperative tranexamic acid in tonsillectomy to reduce primary haemorrhage.

## SUBJECTS AND METHODS

A total of 80 children were recruited in this study who underwent tonsillectomy with or without

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**Table 1.** Demographic and clinical characteristics of the participants (data presented as mean± SD, number)

Characteristics	Experimental arm (n=40)	Control arm (n=40)	p-value
Age (years)	7.30± 2.66	7.50± 2.37	0.374
Weight (kg)	17.34 ± 3.92	29.54 ±3.84	0.567
Male	26	21	
Female	14	19	0.625
Adeno-tonsillectomy	16	14	0.38
Tonsillectomy	24	26	0.43
Haemorrhage (ml)	64.56±40.85	98.34±62.57	0.01

adenoidectomy at Pakistan Railway Hospital between June 2015 to September 2016. Ethical approval for the study was taken from ethical review committee of the Islamic international Medical College Rawalpindi (Riphah/IRC/19/0368). It was randomized control study. Inclusion criteria comprised all children with history of recurrent tonsillitis who fulfilled the Paradise Criteria i.e. minimum episodes of sore throat in a year, sore throat with at least fever, cervical lymphadenopathy, tonsillar exudate or culture positive for Group A  $\beta$  haemolytic streptococci and antibiotics given for GABA.<sup>7</sup> Children with adenoid hypertrophy causing mouth breathing, snoring and sleep disordered breathing requiring adenoidectomy were also included. Children less than 3 years, having acute tonsillitis, haemoglobin less than 10g%, known allergy to tranexamic acid drug and any haematological disorder were not included in our study.

Total of 80 children aged between 5 to 15 years old fulfilled the criteria included in this study. Patients were divided in two Groups. Group 1 (experimental arm) were given preoperative tranexamic acid at a dose of 10mg/kg intravenously, 30 minutes before surgery. Group 2 (control arm) did not get injection tranexamic acid. Tonsillectomy was done with dissection and snare methods under general anaesthesia. To maintain uniformity surgery was performed by same surgeon. The amount of primary haemorrhage was measured by the blood in the suction jar, gauze pieces and assessment by Boezart blood grading scale. Before each procedure suction jar was emptied and blood loss in jar was measured by pouring fluid in a measuring cylinder. When foam was settled then lower edge of the fluid meniscus was considered for the readings after the foam was settled. Gauze pieces (4x4 cm) were weighed before surgery and weighed again after completion of procedure. The difference among them was taken as the blood soaked in gauze pieces intraoperatively. The Boezart blood grading scale containing numerical vales from 0 to 5 to quantify intraoperative haemorrhage.<sup>8</sup> In this scale, mild bleeding requires infrequent suctioning without any interference in surgical field has got less numerical scores, while in score 5 extensive bleeding

causes frequent suctioning and surgical field becomes visually impaired.<sup>9</sup> All observations of primary haemorrhage were collected, documented and tabulated. Quantitative data was analysed by using mean  $\pm$  standard deviation, and frequencies (number of cases). A p-value  $\leq 0.05$  were considered statistically significant. All statistical calculations were done using computer programs SPSS (Statistical Package for the Social Science; SPSS Inc.

## RESULTS

The current study included 80 children between the age group of 5 to 15 years randomized in 2 groups of 40 children each. Mean age of group 1 was of 7.30  $\pm$  2.66 while group 2 was 7.5 $\pm$ 2.37, which was statistically insignificant. Group 1 included 26 males and 14 females while Group 2 had 21 and 19 respectively. No significance regarding gender distribution was found (p >0.05). The mean weight in Group 1 was 17.34 $\pm$ 3.92 kg and 29.54 $\pm$ 3.84 kg in Group 2. Though Group 2 showed slightly increased weight, the difference was statistically insignificant. In Group 1, 16 patients and in Group 2, 14 patients had been operated for adenoidectomy with tonsillectomy.

The comparison of primary haemorrhage between Groups was significant with mean blood loss in Group 1 was 64.56 $\pm$ 40.85 ml and in Group 2 was 98.34 $\pm$ 62.57ml. The assessment of Boezart bleeding scale (Grade 1, 2, 3, 4 and 5) between 2 Groups was significant (p<0.05). A significant effect on reduction of primary haemorrhage during tonsillectomy was observed. I used unpaired two tailed t test and found 95% confidence interval. P-values were less than 0.05 and it was statistically significant. No side effects of drug had been observed in any patient during this procedure.

## DISCUSSION

Haemorrhage is the main complication in ENT surgeries, particularly great incidence in oral and nasal operations.<sup>10</sup> Despite the advancement in recent surgical techniques, haemorrhage during tonsillectomy is still the most cause of prolonged hospitalization, re-admission, surgical re-intervention and blood

**Table 2.** Quality of surgical field Boezart et al.

Boezart scale	Description	Experimental arm	Control arm	p-value
0	No bleeding (cadaveric conditions)	0	0	0
1	Slight bleeding-no suctioning required	5	1	0.04
2	Slight bleeding-frequent suctioning required	22	9	0.01
3	Slight bleeding- frequent suctioning required; bleeding threatens surgical field a few seconds after suction is removed	9	18	0.02
4	Moderate bleeding –frequent suctioning required; bleeding threatens surgical field directly after suction is removed	3	7	0.03
5	Severe bleeding-constant suctioning required; bleeding appears faster than can be removed by suction; surgical field severely	1	5	0.04

transfusion.<sup>11</sup> Tranexamic acid has been used for its potential benefits to decrease haemorrhage in several surgical specialities.<sup>12</sup> It inhibits the breakdown of clot formation due to its antifibrinolytic properties.<sup>13</sup> Studies done in orthopaedics, urological and cardiac surgeries revealed a reduction of haemorrhage 45.32%, 52.94% and 39.81% respectively with the use of preoperative tranexamic acid.<sup>13,14</sup> Tranexamic acid has been used peri-operatively in dental surgeries to prevent post-operative bleeding and facilitate the discharge on same day.<sup>15</sup> In ENT procedures like epistaxis, randomized control trial reported a single dose of 500 mg tranexamic acid stopped bleeding in 71% of patients with in 10 minutes than patients with nasal packing, haemorrhage stopped only in 31.2% within 10 minutes.<sup>16</sup> One previous study on children undergoing endoscopic sinus surgery showed that Intraoperative bleeding was reduced with the use of preoperative intravenous tranexamic acid.<sup>17</sup> All these studies stated no significant side effect of use of this drug.

Present study showed significant benefit of tranexamic acid when used preoperatively in reduction of bleeding during tonsillectomy. One previous study of randomized control study of 80 patients reported statistically reduction of haemorrhage ( $p < 0.005$ ) during the tonsillectomies.<sup>17,18</sup> Present study is also supported by George A who conducted a randomized control trial to verify the efficacy of pre-operative intravenous tranexamic acid in the control of tonsillectomy bleeding and showed the beneficial effect of tranexamic acid during tonsillectomy.<sup>19</sup> Present results support the primary aim of the current study and showed reduced haemorrhage by using tranexamic acid during tonsillectomy.

Few studies showed results contrary to this study. Brum and associates found no reduction of intraoperative haemorrhage during adenotonsillectomy in a randomized control study.<sup>20,21</sup> Another systemic

review and meta-analysis showed no beneficial effect of tranexamic acid during tonsillectomy.<sup>22</sup>

Current study and review of other studies show variable results. Few studies support present findings while some found no advantage of tranexamic acid in reducing primary haemorrhage during tonsillectomy. The observation of all these studies vary due to multiple factors like age of patient, surgical technique, dose, administration and duration of tranexamic acid.

Few limitations to the present study should be noted. Firstly, only impact of single dose of intravenous tranexamic acid intraoperatively to reduce haemorrhage is studied. Future researches should evaluate its effect postoperatively with continued doses in postoperative period. Secondly, future studies should see its effect on dose, duration of tranexamic acid and its impact with different surgical techniques. The sample size was small in this study and should be evaluated its impact on large number of patients.

## CONCLUSION

We conclude that preoperative tranexamic acid when used intravenously is effective in reducing primary haemorrhage during tonsillectomy with or without adenoidectomy. However further studies are required to confirm our study by using large sample size.

## REFERENCES

- Miyamoto Y, Shinzawa M, Tanaka S, Tanaka-Mizuno S, Kawakami K (2018) Perioperative steroid use for tonsillectomy and its association with reoperation for posttonsillectomy hemorrhage: a retrospective cohort study. *Anesth Analg* 126:806–814
- Hoshino T, Tanigawa T, Yanohara G et al (2017) Effect of body mass index on posttonsillectomy hemorrhage. *Biomed Res Int* 2017:9610267
- Chan CC, Chan YY, Tanweer F (2013) Systematic review and meta-analysis of tranexamic acid in tonsillectomy. *Eur Arch Otorhinolaryngol* 270:735–748
- Robb PJ (2014) Tranexamic acid—a useful drug in ENT surgery? *J Laryngol Otol* 128:574–579

5. Myles PS, Smith JA, Forbes A et al (2017) Tranexamic acid in patients undergoing coronary-artery surgery. *N Eng J Med* 376:136–148
6. Chan CC, Chan YY, Tanweer F. Systematic review and meta-analysis of the use of tranexamic acid in tonsillectomy. *Eur Arch Otorhinolaryngol.* 2013; 270: 735-48.
7. Grassin-Delyle S, Couturier R, Abe E, Alvarez JC, Devillier P, Urien S. A practical tranexamic acid dosing scheme based on population pharmacokinetics in children undergoing cardiac surgery. *Anesthesiology.* 2013; 118: 853-62.
8. Esfandiari BR, Bistagani MM, Kabiri M. Low dose tranexamic acid effect on post-coronary artery bypass grafting bleeding. *Asian Cardiovasc Thorac Ann.* 2013; 21: 669-74.
9. Krings JG, Kallogjeri D, Wineland A, Nepple KG, Piccirillo JF, Getz AE. Complications of primary and revision functional endoscopic sinus surgery for chronic rhinosinusitis. *Laryngoscope.* 2014; 124: 838-45.
10. Robb PJ, Thorning G. Perioperative tranexamic acid in day-case paediatric tonsillectomy. *Ann R Coll Surg Engl* 2014;96:127–9.
11. Maeda T, Sasabuchi Y, Matsui H, Ohnishi Y, Miyata S, Yasunaga H (2017) Safety of tranexamic acid in pediatric cardiac surgery: a nationwide database study. *J Cardiothoracic Vasc Anesth* 31:549–553
12. Hallstrom B, Singal B, Cowen ME, Roberts KC, Hughes RE (2016) The Michigan experience with safety and effectiveness of tranexamic acid use in hip and knee arthroplasty. *J Bone Joint Surg Am* 98:1646–1655
13. Couturier R, Rubatti M, Credico C, et al. Continuous or discontinuous tranexamic acid effectively inhibits fibrinolysis in children undergoing cardiac surgery with cardiopulmonary bypass. *Blood Coagul Fibrinolysis.* 2014; 25: 259-65.
14. Albu S, Gocea A, Mitre I. Preoperative treatment with topical corticosteroid and bleeding during primary endoscopic sinus. *Otolaryngol Head Neck Surg.* 2010; 143: 573-78.
15. Boezarrt A, van der Merwe J, Coetzee A. Comparison of sodium nitroprusside- and esmolol-induced controlled hypotension for functional endoscopic sinus surgery. *Can J Anaesth.* 1995; 42: 373-6.
16. Robb PJ, Thorning G. Perioperative tranexamic acid in day-case paediatric tonsillectomy. *Ann R Coll Surg Engl.* 2014; 96: 127-9.
17. Robb PJ, Ewah B. Can tranexamic acid reduce bleeding after tonsillectomy? A pilot study. *Otorinolaringologia.* 2013; 63: 163-7.
18. Zielgler S, Ortu A, Reale C, et al. Fibrinolysis or hypercoagulation during radical prostatic surgery? An evaluation of thrombelastographic parameters laboratory tests. *Eur J Anaesthesiol.* 2008; 25: 538-43.
19. George A, Kumar R, Kumar S, Shetty S. A randomized control trial to verify the efficacy of pre-operative intra venous tranexamic acid in the control of tonsillectomy bleeding. *Indian J Otolaryngol Head Neck Surg* 2011; 63: 20tonsillectomy bleeding.
20. Brum MR, Miura MS, Castro SF, Machado GM, Lima LH, Lubianca Neto JF. Tranexamic acid in adenotonsillectomy in children: a double-blind randomized clinical trial. *Int J Pediatr Otorhinolaryngol.* 2012; 76: 1401-5.
21. Grassin-Delyle S, Couturier R, Abe E, Alvarez JC, Devillier P, Urien S. A practical tranexamic acid dosing scheme based on population pharmacokinetics in children undergoing cardiac surgery. *Anesthesiology.* 2013; 118: 853-62.
22. Bhattacharya N, Kepnes LJ. Revisits and postoperative haemorrhage after adult tonsillectomy. *Laryngoscope.* 2014; 124: 1554-6.