Tranexamic acid use during thyroid surgery: A single centre retrospective analysis

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Abstract

Key Points: * Tranexamic acid is an antifibrinolytic agent that has been used in variety of operations to reduce blood loss. * Post thyroidectomy haematoma can be life threatening, therefore multiple methods are used to reduce the risk of bleeding. * Tranexamic acid was given intra-operatively to 106 patients undergoing thyroid surgery. * Patients who received tranexamic acid had no return to theatre for post-operative haematoma (p=0.041). * There were no adverse events reported related to the administration of tranexamic acid.

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Keywords: thyroidectomy, thyroid, tranexamic acid, surgery, head and neck

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- Tranexamic acid was given intra-operatively to 106 patients undergoing thyroid surgery.
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- There were no adverse events reported related to the administration of tranexamic acid.

Introduction

Post-operative haemorrhage in thyroid surgery is a serious complication that can lead to significant airway compromise and even rarely death. Several intraoperative techniques are used to minimise the risk of bleeding. There is evidence for the use of tranexamic acid (TXA) to reduce blood loss in surgery.[1] TXA is used intravenously or topically in many different surgical specialties including orthopaedics, and cardiothoracic.[2-3] In Ear, Nose and Throat (ENT), tranexamic acid is commonly used in the management of epistaxis and has been investigated for use in tonsillectomy.[4-5]

TXA is a synthetic antifibrinolytic agent. In the clotting cascade, it acts as a binder at the lysine site on plasminogen. This prevents fibrinolysis and can inhibit plasminogen from dissolving clots, potentially reducing bleeding.[6] Adverse effects of TXA are uncommon; the most frequent is nausea, which is usually caused by rapid intravenous administration.[6] Concerns have been raised previously about the risk of thromboembolic events, however Myles et al. looked at the use of TXA in at-risk patients undergoing coronary-artery surgery and found no increased risk of thrombotic complications. [3]

In this study, we review our outcomes of postoperative haematoma following the administration of perioperative tranexamic acid during thyroid surgery.

Materials and Methods

This study was performed retrospectively in a single district general hospital using a local database of all patients undergoing thyroid surgery. The STROBE reporting guidelines was used. There are 260 patients included in the study who underwent hemi, total or completion thyroidectomy between May 2014 to August 2019 at Great Western Hospital NHS Foundation trust. Patients who had undergone an isthmusectomy or open thyroid biopsy were excluded. All operations were either performed or supervised by the same surgeon. Between May 2014 to November 2017 patients were not given TXA. From December 2017 to November 2019 all patients were given a single dose of 1g intravenous TXA at induction unless there were contraindications. Contraindications to TXA include allergy to TXA, coronary stents within the last 12 months, thromboembolic disease, stroke within the last 6 months, fibrinolytic conditions following disseminated intravascular coagulation and history of convulsions.

Statistical analysis was performed using IBM SPSS Statistics 26 (IBM SPSS, Turkey) software. The t-test was used for analysis of continuous variables and the chi-square test and Fisher exact test for nominal variables. Results were evaluated within a 95% confidence interval, and a p-value of less than 0.05 was regarded as statistically significant.

No ethics approval was sought as TXA is routinely used peri-operatively at the hospital.

Results

A total number of 260 patients were included in the study; 106 were given TXA and 154 patients were not given any. There were four patients, post November 2017, who were deemed to have possible contraindications to TXA and therefore were not given any. One patient previously had a pulmonary embolus, one was on hormone replacement therapy, one had a history of atrial fibrillation and for one patient it is unclear why they were deemed unsuitable for TXA. There were 208 female patients and 52 male. Table 1 shows the characteristics of patients in the two groups.

In the first cohort who did not receive TXA, five patients were returned to theatre. In the comparison, the second cohort who did receive TXA, no patients returned to theatre. This was statistically significant (p =0.041). The results are summarised in table 2. There was no statistical difference between the equipment used and return to theatre$p$ =0.884. All five patients that returned to theatre did not have bleeding from a named blood vessel, they had generalised slow bleeding. One of the patients had uncontrolled hypertension peri-operatively, one went into urinary retention immediately post-operatively, one patient had uncontrolled Graves' disease and was a smoker who had continual coughing post-operatively and one patient had thyrotoxicosis that was controlled only shortly before surgery. For one patient there was no plausible explanation for post-operative bleeding. The other 3 patients underwent thyroid surgery for thyroid cancer. None of the patients were on anticoagulation or anti-platelet therapy.

There were no adverse outcomes recorded from TXA administration, specifically no patients had thromboembolic events. Only one patient who did not receive TXA was readmitted with temporary hypocalcaemia.

Discussion and Conclusion

The thyroid is a highly vascular structure and given its proximity to the airway any bleeding can be life-threatening. A haematoma post thyroid surgery is a rare, the risk is stated between 0.1-1.4%.[7] Haematomas can occur immediately post-operatively or up to a week after, the majority occur within the first 6 hours post-operatively.[8]

TXA has a half-life of 2 hours, with a maximum concentration of approximately 1 hour after administration.[6] The fibrinolytic effects last from 8 to 17 hours.[6] The use of TXA peri-operatively is becoming more common for multiple specialties. Das et al used TXA for head and neck cancer surgery and showed that those receiving

TXA were less to require a blood transfusion $p < 0.0001$.[9] The study cannot be directly applied to thyroid surgery, however if offers further reassurance on the safety of TXA in head and neck surgery.

Our study suggests that that administering one dose of 1g TXA intravenously during thyroid surgery reduces the risk of post-operative haematoma. There were no adverse reactions in any of our patients from receiving TXA. All the bleeds in this study were not from a named vessel but rather a general slow bleed and we do not expect a TXA to change the outcome from bleeding from a named vessel.

There are a number of limitations to this study, it is a small study. A randomised study with larger sample sizes needs to be conducted to increase the validity of the result. Other confounding factors that should be evaluated include indication of surgery, anticoagulation, hypertension, age of the patients and the use of haemostatic agents such as Surgicel.

Although all the patients were operated on by an experienced surgeon, who had performed over 100 thyroid operations prior to this study, there were no bleeds in the final two years of the study, this could raise the possibility of a surgical learning curve having an impact on the bleed rate. Fan et al found that there was a relationship between the high versus low volume case load and post-operative haematoma, multiple factors are thought to cause this which include surgeon experience or hospital experience such as equipment used. [10] Our centre would be regarded as low volume and again that explain the higher bleed rate in the first cohort of patients who all didn't have TXA.

Conclusions

TXA has been used in multiple specialties to reduce bleeding, with no increased risk of thromboembolic events. This small study has shown that TXA has reduced the rate of return to theatre in thyroid surgery for bleeding.

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Word count: 1113

Characteristic	**No TXA**	**No TXA**	**TXA**	**TXA**	*P* **Value**
	Number	Percentage	Number	Percentage	
Gender					0.415
Male	32	20.7	20	18.9	
Female	122	79.3	86	81.1	
Type of Surgery					0.187
Hemithyroidectomy	110	71.4	75	70.8	
Total thyroidectomy	33	21.4	17	16.0	
Completion	11	7.2	14	13.2	
Equipment used					0.138
Bipolar alone	10	6.6	0	0	
Harmomic/ Bipolar	2	1.3	0	0	
LigaSure/ Bipolar	140	92.1	108	100	
	Mean	SD	Mean	SD	0.681
Age (year)	51.3	15.1	51.3	15.0	

Table 1

	Return to Theatre	**Return to Theatre**	**Return to Theatre**	**Return to Theatre**	*P* **Va**
	Yes	**Yes**	**No**	**No**	
Characteristic	Number	Percentage	Number	Percentage	
Equipment used					0.884
Bipolar	0	0	10	3.9	
Harmomic/ Bipolar	0	0	2	0.8	
LigaSure/ Bipolar	5	100	243	95.4	
TXA					0.041
Yes	0	0	106	41.7	
No	5	100	149	58.3	

Table 2