



The Efficacy and Safety of Tranexamic Acid in Complex Skull Base Neurosurgical Procedures



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Background

- Tranexamic acid (TXA) is an effective antifibrinolytic agent used to reduce blood loss in a variety of types of surgery¹⁻³
- Little is known about the efficacy of TXA in complex skull base tumors
- Previous reports supporting the role for TXA in the pediatric neurosurgical population⁴
- TXA may be particularly advantageous in skull base procedures given the increased risk of intraoperative blood loss⁵

Study Objectives:

- 1) Determine the relationship between the use of tranexamic acid and blood product transfusion;
- 2) Determine the incidence of adverse events associated with the use of tranexamic acid in complex skull-base neurosurgical procedures.

Methods

- Retrospective cohort study
- Patients who underwent complex skull base neurosurgical procedures by a single surgeon (RA) from 2001 to 2013
 - Acoustic neuroma (55%), meningioma (25%), pituitary tumor (4%), other (16%)
- Tranexamic acid introduced into practice 2006
- Reviewed charts of 245 patients who received tranexamic acid and 274 patients who did not receive tranexamic acid during their surgery
- Abstracted demographic information, data about the diagnosis and procedure, perioperative blood transfusion, laboratory indices and perioperative complications
- Multivariate regression model to predict perioperative transfusion
- Data analysis with STATA 12.1 (StataCorp, Texas, USA)

Results

Table 1. Study population characteristics and outcomes.

	TXA (N=245)	No TXA (N=274)	P-value*
Age (years)	49 (13)	48 (13)	0.41
Weight (kg)	76 (18)	77 (19)	0.83
Male Gender (N, %)	101 (41)	108 (39)	0.67
Tumor diameter (cm)	3.5 (1.1)	2.9 (1.3)	<0.001
Operative time (hours)	7.2 (2.1)	6.2 (2.5)	<0.001
Dose of TXA (mg/kg)	37 (47)	-	-
Change in hemoglobin	26 (12)	27 (12)	0.41
RBC transfusion (N, %)	17 (7)	34 (12)	0.04
Non-RBC transfusion (N, %)	6 (2)	12 (4)	0.34
Any transfusion (N, %)	18 (7)	35(13)	0.04

Abbreviations: TXA, tranexamic acid; ;N, number; RBC, red blood cell; mm, millimeters; mg, milligrams. All results reported as mean (standard deviation) unless otherwise indicated. *P-value for student t-test, chi-squared test or Fisher's exact test, as appropriate.

Table 2. Perioperative complication rates.

Complication	TXA N=245	No TXA N=274
Deep vein thrombosis*	1	4
Pulmonary embolism*	1	4
Intracranial thrombosis	3	4
Other thrombosis**	1	0
Any thrombosis	5	8
Seizure	8	6

Abbreviations: TXA, tranexamic acid. All results reported as absolute number. * 3 patients had both a deep vein thrombosis and pulmonary embolism. ** One patient had a myocardial infarction.

Table 3. Multivariate model to predict perioperative blood transfusion.

	Unadjusted OR	Adjusted OR	95% Confidence Interval	P-value
Tranexamic acid used	0.54	0.23	0.11 to 0.48	<0.001
Operative time*	1.42	1.31	1.14 to 1.53	<0.001
Preoperative hemoglobin**	0.95	0.93	0.91 to 0.96	<0.001
Tumor diameter [#]	2.00	1.88	1.49 to 2.7	<0.001

Abbreviations: OR, odds ratio. *OR for operative time reported per hour; **OR for preoperative hemoglobin reported per g/L; [#]OR for tumor diameter reported per centimeter. Area under the receiver operating characteristic curve 0.88; goodness-of-fit (Hosmer-Lemeshow) P=0.61.

Discussion

- This study is the first to describe tranexamic acid use in a large cohort of patients undergoing complex skull base procedures.
- Administration of tranexamic acid was independently associated with a reduced frequency of transfusion of allogeneic blood products, including packed red blood cells.
- We did not identify an increase in thrombotic complications associated with the use of tranexamic acid.
- Study limitations: non-randomized, retrospective study design; single center; small number of outcomes; potential historical confounding

Conclusions

Patients who received tranexamic acid during complex skull base neurosurgical procedures experienced a lower rate of transfusion without an increase in adverse events.

Our results support the need for further randomized controlled trials to clarify the efficacy of tranexamic acid in neurosurgical procedures.

References

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