Efficacy of tranexamic acid on operative bleeding in endoscopic sinus surgery

Abstract

Tranexamic acid, an antifibrinolytic agent, has been increasingly evaluated for its role in reducing perioperative bleeding in various surgical contexts. This study assesses the efficacy of systemic tranexamic acid in comparison to placebo for intraoperative blood loss, operative time, and surgical field quality in endoscopic sinus surgery (ESS), as well as the incidence of postoperative emesis and thromboembolic events. A randomized, double-blind, placebo-controlled methodology was employed, with quantitative assessment of intraoperative bleeding, validated scoring for surgical field visualization, and systematic monitoring for adverse events. Our findings indicate a statistically significant reduction in operative blood loss and improved visual field scores in the tranexamic acid group, with no observed increase in postoperative emesis or thromboembolic complications. These results support the use of tranexamic acid as an adjunct in ESS to improve surgical conditions safely.

Introduction

Endoscopic sinus surgery (ESS) is the cornerstone for managing chronic rhinosinusitis refractory to medical therapy. One of the primary intraoperative challenges in ESS is managing mucosal bleeding, which can compromise visualization of the surgical field and increase operative time and complication rates. Systemic tranexamic acid (TXA), a synthetic lysine analog, inhibits fibrinolysis by blocking the lysine-binding site of plasminogen, thereby stabilizing fibrin clots. While TXA's efficacy in reducing perioperative bleeding is well documented in orthopedic, cardiac, and gynecological surgeries (Ker et al., 2012; Henry et al., 2011), evidence in rhinologic surgery remains limited (Yaniv et al., 2016). This study seeks to rigorously evaluate the effect of systemic TXA on intraoperative bleeding, operative time, surgical field visualization, and the incidence of postoperative emesis and thromboembolism in patients undergoing ESS, aiming to offer stronger evidence for its clinical utility within rhinology.

Methods

A prospective, randomized, double-blind, placebo-controlled trial was conducted at a tertiary care academic hospital between January 2022 and June 2023. Adult patients (18-65 years) scheduled for primary ESS for chronic rhinosinusitis were enrolled. Exclusion criteria included a history of thromboembolic disease, coagulopathy, renal insufficiency, or pregnancy. Patients were randomized to receive either intravenous tranexamic acid (1g bolus administered 10 minutes prior to incision, followed by a 1g infusion over 8 hours) or a matched saline placebo. Anesthesia and surgical protocols were standardized. Primary outcomes were blood loss (measured by suction canister minus irrigation and weighing sponges) and surgical field quality, assessed by the Boezaart scoring system every 15 minutes. Secondary outcomes

assessed by the Boezaart scoring system every 15 minutes. Secondary outcomes were operative time, postoperative emesis (evaluated up to 24 hours postoperatively), and thromboembolic events (monitored up to 30 days). All adverse events were recorded. Statistical analysis was performed using SPSS v26, with significance set at $p<0.05$.

Results

A total of 120 patients were randomized (TXA group n=60, placebo n=60). The TXA group demonstrated significantly reduced mean intraoperative blood loss (110±30 mL) compared to placebo (170±40 mL; $p<0.001$). Surgical field quality, as rated by the Boezaart score, was superior in the TXA group at all measured intervals (mean score 2.1±0.4 vs. 2.9±0.5; $p<0.01$). Operative time was also slightly reduced in the TXA group (mean 96±18 minutes vs. 105±22 minutes; $p=0.04$). No significant differences were observed in the incidence of postoperative nausea or vomiting (TXA: 10% vs. placebo: 12%; $p=0.76$). No cases of symptomatic thromboembolic events were recorded in either group during the 30-day follow-up.

Discussion

The results of this randomized controlled trial demonstrate that systemic tranexamic acid significantly reduces intraoperative bleeding and improves surgical field quality during ESS without increasing the incidence of postoperative emesis or thromboembolic events. These findings are consistent with prior literature supporting TXA's efficacy across various surgical disciplines (Ker et al., 2012). The improvement in surgical field visualization can potentially lead to fewer intraoperative complications and more efficient surgical maneuvers, as reflected by the decreased operative time. Importantly, the safety profile of TXA in this patient cohort was favorable, with no detected thromboembolic complications; however, the study's sample size may limit the detection of rare adverse events. Limitations of our research include single-center design, the relatively low sample size for safety outcomes, and absence of long-term follow-up. Further multicenter, large-scale studies are warranted to confirm these findings and elucidate any long-term risks.

Conclusion

Systemic tranexamic acid use in endoscopic sinus surgery is associated with significant reductions in operative blood loss and improvements in surgical field conditions, without increased risk of postoperative emesis or thromboembolic events. Our results support the routine consideration of TXA as an adjunct in ESS for bleeding control. Further research should focus on long-term safety and outcomes in larger, diverse patient populations.

References

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