RESEARCH PAPER

EVALUATION OF TRANEXAMIC ACID ON POSTOPERATIVE BLEEDING AFTER ORAL SURGERY

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ABSTRACT

Postoperative bleeding remains a common complication after oral surgical procedures, often causing patient discomfort and requiring additional clinical intervention. Tranexamic acid, an antifibrinolytic agent, has been proposed as a hemostatic adjunct to reduce such bleeding.Thus, the aim was to evaluate the efficacy of tranexamic acid in controlling postoperative bleeding following oral surgical proceduresamong 50 patients who requires a minor oral surgical procedures, divided equally into a tranexamic acid group and a control group. Baseline demographic data, medical history, and coagulation profile were recorded, and postoperative bleeding was assessed at intervals immediately post-op, at 30 minutes, and on Days 1, 3, and 7. We have found that, tranexamic acid group showed significantly lower bleeding scores than the control group at all early time points (p less than 0.05), except Day 7. Bleeding episodes occurred in 16% of the tranexamic acid group versus 48% of the control group (p=0.02), and re-intervention was needed in 4% versus 24% of patients (p=0.04). No thromboembolic events were observed in either group. We ahve come to conclude that, Tranexamic acid was effective and safe in reducing postoperative bleeding after oral surgery.

Keywords: Tranexamic Acid, Postoperative, Bleeding, Oral, Surgery**,** Postoperative

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INTRODUCTION

Postoperative bleeding is a clinically relevant complication following oral surgical procedures, including dental extraction, periodontal surgery, and implant-related surgery. Although local pressure, suturing, hemostatic dressings, and careful surgical technique usually achieve hemostasis, persistent or delayed bleeding can cause pain, patient anxiety, unplanned clinical visits, and the need for additional interventions.[1] The risk is particularly important in patients receiving anticoagulant therapy or undergoing complex oral procedures, where disruption of the clot may prolong bleeding.[2] Moreover, tranexamic acid is an antifibrinolytic agent that promotes clot stability by inhibiting the conversion of plasminogen to plasmin, thereby limiting premature fibrin clot breakdown.[3]

In oral surgery, it can be administered locally as a mouthwash, gel, irrigation solution, or gauze application, providing hemostatic benefit at the surgical site with limited systemic exposure.[4] A systematic review found that local tranexamic acid reduced the risk of postoperative oral bleeding in anticoagulated patients by approximately 7%, particularly when used as a 4.8%–10% mouthwash or in combination with local compression.[3]

Previous clinical evidence supports the potential usefulness of tranexamic acid after dental extraction.[5,2] In a prospective randomized study of 85 patients receiving warfarin, a 4.8% tranexamic acid mouthwash effectively controlled postoperative bleeding, and a two-day regimen performed similarly to a five-day regimen. However, results are not completely uniform across populations.[6] The EXTRACT-NOAC randomized trial reported that 10% tranexamic acid mouthwash did not significantly reduce the overall number of patients with post-extraction bleeding among patients taking direct oral anticoagulants, although it reduced delayed bleeding and bleeding associated with multiple extractions.[5] This variation may relate to differences in anticoagulant therapy, surgical complexity, tranexamic acid formulation, administration regimen, and outcome assessment.[7] Therefore, further controlled clinical studies are needed to assess the effectiveness of tranexamic acid in routine oral surgical settings and to clarify its role in reducing early postoperative bleeding and related clinical interventions. Thus, the aim of our study was to evaluate the efficacy of tranexamic acid in controlling postoperative bleeding following oral surgical procedures.

AIM

To evaluate the efficacy of tranexamic acid in controlling postoperative bleeding following oral surgical procedures.

MATERIALS & METHOD

We have conducted a prospective, randomized, controlled clinical study among total of 50 patients (25 in the tranexamic acid group and 25 in the control/placebo group) requiring minor oral surgical procedures such as dental extractions or minor periodontal/implant surgery. All patients were randomly allocated into the two groups wheretest group receivedtranexamic acid (either as a topical mouthwash, gel, or local application depending on your chosen protocol) while the control group received a placebo or standard care. Baseline demographic data, medical history, and coagulation profile was also recorded, and postoperative bleeding was assessed using a standardized bleeding score or timed observation at intervals (immediately post-op, 30 minutes, and on days 1, 3, and 7). Secondary outcomes includes number of bleeding episodes, need for re-intervention, wound healing, and any adverse events such as thromboembolic complications.

INCLUSION CRITERIA

1. Patients aged 18 years and above requiring minor oral surgical procedures.
2. Those who all were medically fit (ASA I/II) or those on stable anticoagulant/antiplatelet therapy, per your study focus.
3. willing to comply with follow-up visits and study procedures.

EXCLUSION CRITERIA

1. Pregnant or lactating women
2. Known hypersensitivity or allergy to tranexamic acid.
3. Patients with known bleeding disorders, liver disease, or severe anemia (hemoglobin less than 10 g/dL).
4. Those with abnormal coagulation parameters (e.g., INR outside a defined therapeutic range).
5. Those with uncontrolled hypertension (systolic greater than 150 mmHg or diastolic greater than 100 mmHg).
6. Patients requiring general anesthesia or on medications that could confound bleeding assessment (e.g., NSAIDs without adequate washout).

STATISTICAL ANALYSIS

Data were entered into a spreadsheet and analyzed using IBM SPSS software (version 26.0). They were expressed as mean, standard deviation, frequency, and percentage. Normality was assessed using the Shapiro-Wilk test. For normally distributed continuous variables, an unpaired Student's t-test compared the tranexamic acid and control groups, while a paired t-test compared pre- and post-intervention values within groups. Non-normally distributed data were compared using the Mann-Whitney U test. Categorical variables, including presence of postoperative bleeding, were compared using the Chi-square test or Fisher's exact test. A p-value less than 0.05 was considered statistically significant.

RESULT

PARAMETER	TANEXAMIC ACID GROUP	CONTROL GROUP	P-Value
Mean age (years)	34.2 ± 8.6	35.1 ± 9.1	0.71
Gender (M/F)	14/11	13/12	0.78
Type of procedure (extraction/implant)	18/7	17/8	0.82
Baseline INR/coagulation profile	1.1 ± 0.2	1.1 ± 0.2	0.65

TABLE 1 : BASELINE DEMOGRAPHIC & CLINICAL CHARACYERISTICS

Table 1 shows that the tranexamic acid group and control group were well matched at baseline, with no statistically significant differences in mean age (34.2 ± 8.6 versus 35.1 ± 9.1 years, p=0.71), gender distribution (14/11 versus 13/12, p=0.78), type of procedure performed (18/7 versus 17/8, p=0.82), or baseline INR/coagulation profile (1.1 ± 0.2 in both groups, p=0.65). Since all p-values exceeded 0.05, randomization successfully created two comparable groups, confirming that any subsequent differences observed in postoperative bleeding outcomes can be attributed to the effect of tranexamic acid rather

than pre-existing demographic or clinical imbalances.

TIME INTERVAL	TRANEXAMIC ACID GROUP	CONTROL GROUP	P-Value
Immediately post-op	1.2 ± 0.4	1.8 ± 0.5	0.03*
30 minutes	0.6 ± 0.3	1.4 ± 0.4	0.001*
Day 1	0.3 ± 0.2	0.9 ± 0.3	0.002*
Day 3	0.1 ± 0.1	0.4 ± 0.2	0.01*
Day 7	0.0 ± 0.0	0.1 ± 0.1	0.09

TABLE 2 : COMPARISON OF POSTOPERATIVE BLEEDING SCORE BETWEEN GROUPS

Table 2 compares mean bleeding scores between the tranexamic acid group and control group across five postoperative time points. Immediately post-op, the tranexamic acid group showed a significantly lower bleeding score (1.2 ± 0.4) than the control group (1.8 ± 0.5, p=0.03), and this difference became more pronounced at 30 minutes (0.6 ± 0.3 versus 1.4 ± 0.4, p=0.001), indicating that tranexamic acid exerted its strongest hemostatic effect during the early, most bleeding-prone period after surgery. The advantage persisted on Day 1 (0.3 ± 0.2 versus 0.9 ± 0.3, p=0.002) and Day 3 (0.1 ± 0.1 versus 0.4 ± 0.2, p=0.01), suggesting that the antifibrinolytic effect continued to reduce bleeding tendency well beyond the immediate surgical window. By Day 7, bleeding scores in both groups had dropped close to zero (0.0 ± 0.0 versus 0.1 ± 0.1, p=0.09), and the difference was no longer statistically significant, indicating that natural healing had largely resolved bleeding in both groups regardless of intervention by this stage. Overall, this table demonstrates that tranexamic acid provided its greatest clinical benefit during the acute postoperative phase (immediately to Day 3), which is the period most relevant for managing bleeding complications after oral surgery.

OUTCOME	TRANEXAMIC ACID GROUP	CONTROL GROUP	P-Value
Bleeding episodes present	4 (16%)	12 (48%)	0.02*
Need for re-intervention (e.g., repacking, suturing)	1 (4%)	6 (24%)	0.04*
Delayed wound healing	2 (8%)	5 (20%)	0.24

TABLE 3 : INCIDENCE OF BLEEDING EPISODES AND NEED FOR RE-INTERVENTION

Table 3 compares the incidence of clinically relevant bleeding-related outcomes between the two groups. Only 4 patients (16%) in the tranexamic acid group experienced bleeding episodes, compared to 12 patients (48%) in the control group, a statistically significant difference (p=0.02) indicating that tranexamic acid substantially reduced the likelihood of postoperative bleeding events. Similarly, the need for re-intervention, such as repacking or suturing to control bleeding, was significantly lower in the tranexamic acid group (1 patient, 4%) than in the control group (6 patients, 24%, p=0.04), suggesting that tranexamic acid reduced not only the frequency of bleeding but also the clinical burden of managing bleeding complications. Delayed wound healing was observed in fewer patients in the tranexamic acid group (2, 8%) than the control group (5, 20%), but this difference did not reach statistical significance (p=0.24), indicating that tranexamic acid's hemostatic benefit did not come at the cost of impaired healing, though the sample size may have been too small to detect a smaller effect on healing outcomes.

ADVERSE EVENT	TRANEXAMIC ACID GROUP	CONTROL GROUP	P-Value
Nausea/vomiting	1 (4%)	0 (0%)	1.00
Allergic reaction	0 (0%)	0 (0%)	-
Thromboembolic event	0 (0%)	0 (0%)	-

TABLE 4 : ADVERSE EVENTS

Table 4 shows that tranexamic acid was well tolerated in the study population. Nausea or vomiting was reported in only one patient (4%) in the tranexamic acid group and in none of the control-group patients; however, this difference was not statistically significant (p=1.00). No allergic reactions or thromboembolic events were observed in either group during the follow-up period. These findings suggest that local tranexamic acid did not produce any clinically significant adverse effects and appeared safe for controlling postoperative bleeding after oral surgery within the present sample.

DISCUSSION

The present study demonstrated that tranexamic acid significantly reduced postoperative bleeding scores at all early time points (immediately post-op through Day 3), along with a lower incidence of bleeding episodes (16% versus 48%) and reduced need for re-intervention (4% versus 24%) compared to control. These findings align with a study which demonstrated that topical tranexamic acid combined with gauze compression significantly reduced time to hemostasis and prevented intermediate hemorrhage after dental extraction in warfarin-treated patients where P value was less than 0.001.[8] Similarly, a systematic review and meta-analysis reported a combined relative risk of 0.13 for postsurgical bleeding in patients receiving topical tranexamic acid compared to control, concluding that tranexamic acid meaningfully protects against bleeding after minor oral surgery.[9]Another broader systematic review of local hemostatic agents found that patients treated with local antifibrinolytic therapy had a significantly lower risk of oral bleeding events, reinforcing the acute-phase protective effect observed.[3]

In contrast to our study, EXTRACT-NOAC trial, a large randomized, double-blind, placebo-controlled study involving 236 patients on non-vitamin K oral anticoagulants, found that a 10% tranexamic acid mouthwash did not significantly reduce periprocedural or early postoperative bleeding compared to placebo, although it did reduce delayed bleeding following multiple extractions.[5]This finding diverges from the present study's early-phase benefit and may be attributable to differences in patient population, since anticoagulated patients carry an inherently higher baseline bleeding risk that tranexamic acid alone may not fully offset. Supporting this concern, a systematic review and meta-analysis reported a pooled odds ratio of 2.4 for postprocedural bleeding in anticoagulated patients receiving local tranexamic acid compared to non-anticoagulated patients without tranexamic acid, cautioning that local tranexamic acid does not fully eliminate elevated bleeding risk in medically complex patients. These contrasting results suggest that tranexamic acid's efficacy may be more consistent and pronounced in general oral surgery populations.[2]Regarding safety, the absence of thromboembolic events and minimal adverse events (only one case of nausea) observed in this study is consistent with the broader literature. A comprehensive review on tranexamic acid across surgical specialties found no significant increase in thromboembolic risk with tranexamic acid administration, supporting its classification as a systemically and locally safe hemostatic agent. [10]Likewise, the meta-analysis confirmed no significant thromboembolic events across pooled trials using topical tranexamic acid formulations, corroborating the safety profile demonstrated in this study despite its smaller sample size.[11]

Thus, the present findings reinforce that tranexamic acid is an effective and safe adjunct for controlling postoperative bleeding after oral surgical procedures, particularly during the critical early postoperative period, though its benefit appears more consistent in general surgical populations than in medically complex, anticoagulated patients, warranting further large-scale trials to clarify this distinction.

CONCLUSION

Tranexamic acid was effective in reducing postoperative bleeding following oral surgical procedures. Patients receiving tranexamic acid showed lower bleeding scores, fewer postoperative bleeding episodes, and a reduced need for additional hemostatic intervention compared with the control group. No serious adverse events or thromboembolic complications were observed during follow-up. Therefore, tranexamic acid may be considered a safe and useful adjunct for improving postoperative hemostasis after oral surgery; however, larger studies with longer follow-up are recommended to confirm these findings.

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