

Efficacy of Tranexamic Acid on Intraoperative Blood Loss in third molar Surgery: A Split Mouth Randomized Study

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ABSTRACT

Aim: To evaluate the efficacy of tranexamic acid on the intraoperative blood loss in third molar surgery.

Materials and Methods: A split-mouth comparative study was conducted comprising of 30 healthy patients between September 2018 and February 2020 who were diagnosed clinically and radiographically with identical bilateral impacted lower third molars necessitating surgical removal. The right side of the patient was designated as the test side where tranexamic acid was administered to the patient prior to the surgical removal of the impacted third molar, and the left side of the patient was designated as control side where the surgical removal of impacted third molar was performed conventionally. All surgical interventions for the removal of impacted third molars were performed using a modified Ward's incision. Patients were evaluated for intraoperative blood loss, duration of the procedure, VAS score for pain, hemodynamic changes and adverse effects if any.

Results: The results of this study reveal that there is a significant reduction in the amount of intraoperative blood loss with much better and clear surgical field visibility in the test side when compared to the control side. This also resulted in reduced duration of the procedure on the test side when compared to the control side. The hemodynamic status of the patients was stable in the perioperative phase with no major complications were noted with the use of tranexamic acid

Conclusion: The results of this study show that Tranexamic acid is definitely a safe and effective drug that can be employed to reduce the intraoperative blood loss in addition to enhancing the visibility of the surgical field, thereby permitting the surgical intervention to be performed with ease.

Keywords: Tranexamic Acid, blood loss, third molar surgery.

INTRODUCTION

The spectrum of work that an Oral & Maxillofacial surgeon undertakes encompasses procedures which not only save lives but also those which improves the quality of life by delivering enhanced function

and aesthetics.¹ In spite of the wide spectrum of clinical work, the surgical removal of a wisdom tooth even today continues to be the most frequently performed minor oral surgical

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intervention by an oral & maxillofacial surgeon.² An attempt to remove a deep-seated impacted wisdom tooth is associated with the substantial surgical challenge even to an experienced operator. Literature shows that any surgical intervention carried out to remove a deeply seated impacted wisdom tooth is associated with many complications. These may present as alveolar osteitis, secondary infection, dysesthesia, pain, haemorrhage and even iatrogenic fracture of the mandible. The incidence of such complication's ranges from 0.2% to 6%.^{3,4,5}

Uncontrolled postsurgical bleeding following surgical removal of wisdom tooth is a life-threatening situation. A recent study reported that the incidence of post-extraction bleeding ranges from 0 to 26%, and the incidence of excessive postoperative bleeding following third molar surgery varies from 0.43% to 5.8%.^{6,7} It is essential to prevent such unwanted, and unanticipated post-extraction bleeding to avoid morbidity and postoperative complications in the form of infection and delayed healing.⁸ Tranexamic acid is an antifibrinolytic agent previously used in the prophylaxis and treatment of patients at high risk of intra-and postoperative haemorrhage such as haemophiliacs and patients on thrombolytic therapy and has been found to be highly effective, without significant side effects.^{8,9} This study is intended to evaluate the efficacy of tranexamic acid on the intraoperative blood loss in third molar surgery.

MATERIALS & METHODS

A split-mouth comparative study was carried out consisting of 30 healthy patients (age 18-30; 16 males, 14 females) who were diagnosed clinically and radiographically with identical bilateral impacted lower third molars necessitating surgical removal to evaluate the efficacy of tranexamic acid on the intraoperative blood loss in third molar surgery. The Institutional Ethical Committee approved was obtained. Inclusion criteria for this study included those patients with bilateral symmetrical impacted lower third molars with similar difficulty index which are not associated with any acute infection or any other systemic problems. Patients were excluded if they gave a history of an allergy or hypersensitivity to tranexamic acid; patients with cardiovascular,

respiratory, renal and hepatic diseases which would alter the blood loss and hemodynamic status of the patients; patients who are on oral contraceptive pills, if they were pregnant or lactating; or if they were on medications like fibrinogen, tretinoin, oestradiol valerate etc. which could lead to drug interaction with tranexamic acid

The right side of the patient was designated as the test side where tranexamic acid was administered intravenously as an initial bolus dosage of 10 mg/kg body weight 30 minutes before starting the mucosal incision to the patient prior to the surgical removal of the impacted third molar, and the left side of the patient was designated as control side where the surgical removal of impacted third molar was performed conventionally. A detailed clinical and systematic evaluation was done for all the patients, and then written consents were taken. A final diagnosis was arrived at with the aid of Winter's classification for impacted mandibular third molars. A treatment plan was formulated, and surgical intervention for the removal of impacted third molar in all patients was performed using a modified Ward's incision.

The same surgeon operated on all the patients. A classic inferior alveolar and long buccal nerve block were given using a sterile Luer lock disposable syringe (3 ml), and a standard surgical technique was used to remove the teeth. Postoperatively patients were given a treatment regimen of antibiotics (amoxicillin + clavulanic acid) and analgesics (diclofenac).

We recorded the duration of the procedure; the intensity of pain was assessed subjectively using a VAS that ranged from 0 = no pain to 10 = the worst pain imaginable. Haemodynamic changes (blood pressure and heart rate) were monitored throughout the procedure, and a calculated amount of saline was used during all procedures. The residual amount of blood collected after excluding the saliva content (roughly usually 30 ml, considering the fact that 1.5 L/day is secreted in healthy individuals) and saline, in the manual suction was counted as blood loss. We did not use gauze or any absorbent swabs during the procedure. The parameters evaluated are shown in Table - 1:

Table 1: Mean observations made before the procedure, during the first 15 min and after the procedure.

	With Tranexamic acid	Without Tranexamic acid	P-value
Duration of procedure (min)	27	36	<0.001
VAS	3	4	<0.001
Blood loss (ml)	7	10	<0.001
Preoperative BP:			
Systolic	124	124	0.75
Diastolic	82	82	0.60
Intraoperative BP (first 15 min):			
Systolic	138	130	<0.001
Diastolic	87	82	0.50
Postoperative BP:			
Systolic	120	122	0.66
Diastolic	80	80	0.60
Heart rate:			
Preoperative	78	78	0.54
Intraoperative (first 15 min)	82	87	<0.001
Postoperative	80	82	0.71

RESULTS

A total of 30 healthy patients between the age group 18 -30 years were included in the study. All 30 patients were given equal amounts of local anaesthetic drug on either side (2 ml for the inferior alveolar and lingual nerve block, and 0.5 ml for the long buccal nerve block). The duration of the procedure ranged from 20 to 45 min. The onset of action was found to be shortened significantly on the test side with a prolonged duration of action ($P < 0.05$). Intraoperative bleeding was noticeably less following the injection of tranexamic acid on the test side when compared to the control side without tranexamic acid. There were no significant changes in the systolic blood pressure, diastolic blood pressure and heart rate from the baseline following the injection of tranexamic acid. The rest of the results are shown in Table - 1

Statistical Methods: The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Data were expressed as Mean $\pm$ SD. Student's independent t-test was employed to compare the onset of action and duration of action between two

groups. A P-value of less than 0.05 was considered statistically significant

DISCUSSION

Amongst the numerous complications, a third molar surgery is associated with; uncontrolled postsurgical bleeding is a life-threatening situation. Previous studies have shown that in addition to achieving surgical precision, a clinician should also be mindful of intraoperative parameters like duration of the procedure and intra-operative blood loss.¹⁰

The pharmacological approaches to reduce intraoperative bleeding and autotransfusion had newly developed as an adjunctive method to conserve blood due to its objectives of limiting the primary loss of blood during surgical interventions.^{11,12} Numerous drugs like aprotinin, tranexamic acid, epsilon aminocaproic acid, desmopressin, prostacyclin, dipyridamole, recombinant factor VIIa and erythropoietin have been employed previously for reducing intraoperative blood loss.^{11,12} Amongst all these tranexamic acid has shown better efficacy in reducing perioperative blood loss.¹²

Previous studies have shown that tranexamic acid in the dose regimen of 10mg/kg/hr, as initial bolus is sufficient to prevent fibrinolysis with relatively stable drug levels throughout the procedure and that larger doses do not provide additional haemostatic benefits.^{13,14} The use of tranexamic acid has reduced the intraoperative blood loss other medical fields like orthopaedic, cardiac, and neurosurgery.^{13,15} This when extrapolated to the maxillofacial region, the perioperative use of tranexamic acid has reduced the intraoperative blood loss following orthognathic surgeries.¹⁶ The results of this study are in accordance with previous studies.

The results of this study revealed that the overall surgical field rating was better in the test side as compared to the control side. The clear surgical field aided the surgeon to perform the procedure swiftly and precisely without paying much attention to suctioning or achieving hemostasis. Hence, the duration of the procedure was lesser on the test side when compared to the control side. The results obtained were in accordance with many studies.^{17,18} In addition to these, literature shows that the use of potent anaesthetic agent along with proper positioning of the patient also plays a key role in decreasing the intraoperative blood loss.^{19,20}

Previous studies have shown that tranexamic acid as a mouthwash has been found to reduce the incidence of postoperative bleeding in patients with prosthetic heart valves, cardiac valvular stenosis or vascular prosthesis on continuous unchanged oral anticoagulants undergoing oral surgery.²¹ The systemic use of a single preoperative dose of tranexamic acid in healthy adult volunteers undergoing day-case surgery, to facilitate early discharge and avoid readmission has not been carried out before.

Previous studies have reviewed the uses of tranexamic acid for surgical interventions, along with their indications and complications. They noted that the most common complications with the use of tranexamic acid were blurred vision, hypotension associated with rapid intravenous administration, diarrhoea and nausea and vomiting. Thromboembolism was rarely noted in these studies. In our study with the use of tranexamic acid, we did not encounter any major complications

which were in accordance with previous studies.^{16,18,22}

CONCLUSION

The results of this study reveal that a single intravenous dose of 10 mg/kg tranexamic acid given preoperatively was effective in reducing intraoperative as well as postoperative bleeding following minor oral surgical interventions thereby avoiding morbidity and postoperative complications in the form of infection and delayed healing. It was noticed that tranexamic acid given prior to the surgical intervention in healthy patients was not associated with complications or side effects. The use of this simple approach can be applied to all dentoalveolar and periodontal surgical procedures under local anaesthesia, which are widely carried out in general practice.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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