



## Research article

# Impact of single dose intravenous tranexamic acid on peri-operative blood transfusion requirements in burn patients: A prospective, randomized trial



Nidhi Bhatia<sup>a,\*</sup>, Indu Sen<sup>a</sup>, Kamlesh Kumari<sup>b</sup>, Parmod Kumar<sup>c</sup>, Neerja Bharti<sup>a</sup>

<sup>a</sup> Department of Anaesthesia & Intensive Care, PGIMER, Chandigarh, India

<sup>b</sup> Department of Anaesthesia & Intensive Care, Dr. SN Medical College, Jodhpur, India

<sup>c</sup> Department of Plastic Surgery, PGIMER, Chandigarh, India

## ARTICLE INFO

## Article history:

Received 1 April 2017

Revised 1 May 2017

Accepted 10 May 2017

Available online 20 May 2017

## Keywords:

Tranexamic acid  
Burn debridement  
Blood loss  
Blood transfusion

## ABSTRACT

**Objective:** Debridement of burn wounds and skin graft harvesting is associated with increased peri-operative bleeding. In this study we evaluated the effectiveness of tranexamic acid in reducing blood transfusion requirements during burn wound debridement/eschar removal and skin graft harvesting in adults with major burn injuries, with the primary outcome being the total amount of intraoperative blood loss.

**Methods:** Fifty adult patients having >20% total body surface area of burn wounds, scheduled for wound debridement/eschar removal ± skin grafting after 10 days of burn injury under general anaesthesia were included. Patients were randomly allocated to receive either injection tranexamic acid 15 mg/kg diluted to 25 ml with isotonic saline over 10 min or an equal volume of only isotonic saline before induction of general anaesthesia. Venous blood gas analysis was done in the beginning and end of surgery, and then at 24 postoperative hours to assess hemoglobin levels of the patients. Blood transfusion was given when hemoglobin levels fell down to or below 7 gm/dl. Intraoperative blood loss was calculated using the Gross formula.

**Results:** Intraoperative blood loss was found to be significantly higher in placebo group compared to tranexamic group,  $990 \pm 358.9$  ml vs  $581 \pm 333.2$  ml ( $p < 0.00$ ), with more blood and colloid solutions being used to replace the blood loss in placebo group ( $p < 0.05$ ).

**Conclusions:** Preoperative administration of a single dose of tranexamic acid significantly reduces blood loss during debridement of burn wounds and skin graft harvesting surgeries without increasing the risk of untoward side-effects or complications.

© 2017 Publishing services by Elsevier B.V. on behalf of Egyptian Society of Anesthesiologists. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

Debridement of burn wounds and skin graft harvesting is associated with increased peri-operative bleeding, particularly in cases where the percentage of total body surface area burnt is high. These surgeries may be associated with blood loss significant enough to warrant transfusion of blood products [1]. It is important that we use blood and blood components judiciously, since they are an expensive and a limited resource. Further, serious side-effects can occur following transfusion of these products, thus increasing perioperative morbidity and mortality. Hence, various

blood conservation strategies including subcutaneous or topical adrenaline, topical thrombin, limb tourniquets have been used to reduce blood loss during burn wound debridement [2–4]. But, these techniques are not used consistently [5] and search for cost-effective alternatives is still going on.

In recent years, role of antifibrinolytic agents (aprotinin, tranexamic acid and epsilon-aminocaproic acid) to reduce perioperative bleeding and thus the requirement of blood transfusion has been evaluated [6]. Of the various antifibrinolytic agents available, the effectiveness and safety of tranexamic acid in reducing surgical blood loss has been widely studied in joint arthroplasties, cardiac surgical procedures, paediatric surgeries and in musculoskeletal trauma patients [7–12]. A number of previous reports [13,14] suggest various other techniques that are available to help reduce blood loss in burn surgeries. These include topical application of

Peer review under responsibility of Egyptian Society of Anesthesiologists.

\* Corresponding author.

E-mail address: [nidhi.bhatia75@gmail.com](mailto:nidhi.bhatia75@gmail.com) (N. Bhatia).

<http://dx.doi.org/10.1016/j.egja.2017.05.004>

1110-1849/© 2017 Publishing services by Elsevier B.V. on behalf of Egyptian Society of Anesthesiologists.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

adrenaline soaks, thrombin solutions and subcutaneous adrenaline infiltration. However, there are no reports in literature evaluating the role of tranexamic acid in reducing surgical blood loss and blood transfusion requirements during burn wound debridement. Thus, the present study was planned with the aim of evaluating the effectiveness of tranexamic acid in reducing blood transfusion requirements during burn wound debridement/eschar removal and skin graft harvesting in adults with major burn injuries. Primary outcome measure of our study was the total amount of intraoperative blood loss and secondary outcome measures included blood transfusion requirements (transfusion trigger point of 7 gm/dl), the change in hemoglobin and hematocrit levels following burn wound debridement/eschar removal and skin graft harvesting as well as any untoward effects attributed to the use of study drug.

## 2. Methods

After institutional ethics committee approval, this prospective, randomized, double blind, placebo controlled study was carried out by the department of Anaesthesia & Intensive Care and Plastic Surgery over a period of 2 years (July 2013 to July 2015). After obtaining written informed patient consent, 50 adult patients of either sex in the age group of 18–50 years, ASA physical status I/II, having >20% total body surface area (TBSA) of burn wounds, scheduled for wound debridement/eschar removal ± skin grafting after 10 days of burn injury under general anaesthesia were included in the study. Only third degree burns patients with obvious eschar were taken for debridement. Patients with a documented history of infarction, unstable angina, renal or hepatic insufficiency, pregnancy, ocular pathology, coagulopathy and those with allergy to tranexamic acid were excluded from the study.

The study design was prospective, randomized, double blind and placebo controlled. Using a computer generated random number table, patients were randomly allocated to either tranexamic acid group (n = 25) or placebo group (n = 25). Allocation concealment was done using sequentially numbered coded sealed envelopes. The study drugs were prepared in identical looking syringes by independent investigator not involved in recording the observations. The contents of syringe were unknown to both the surgeon who was operating and the anaesthesiologist involved in administering the drug and recording of observations. Decoding was done on completion of the study.

All patients were kept fasting after midnight and pre-medicated with tablet alprazolam 0.25 mg and tablet ranitidine 150 mg orally night before and two hours prior to surgery. In the operating room, patients were monitored for heart rate (HR), non-invasive blood pressure (NIBP), continuous electrocardiogram (ECG), arterial oxygen saturation (SpO<sub>2</sub>), end tidal carbon dioxide (EtCO<sub>2</sub>) and temperature using multichannel monitors. Baseline readings were recorded and an intravenous access was established in all patients. Tranexamic acid group patients (n = 25) received injection tranexamic acid 15 mg/kg diluted to 25 ml with isotonic saline over 10 min and placebo group patients (n = 25) received an equal volume of only isotonic saline before induction of general anaesthesia.

A standard technique was used for general anaesthesia induction in all the groups. Anaesthesia was induced with intravenous Morphine 0.1 mg kg<sup>-1</sup> and Propofol 2–3 mg kg<sup>-1</sup>. Vecuronium bromide 0.1 mg kg<sup>-1</sup> was used to facilitate tracheal intubation. Maintenance of anaesthesia was provided with 66% nitrous oxide in oxygen supplemented with isoflurane (1–2%). Venous blood gas analysis was done in the beginning of surgery, at the end of procedure and then at 24 postoperative hours to assess the hemoglobin levels of the patients. Blood transfusion was given to the patients in cases where the hemoglobin levels fell down to or below

7 gm/dl. In all patients in our study we also used adrenaline soaked (1:2,00,000 dilution) gauze pieces alongwith cautery and limb elevation to decrease amount of blood loss. At the end of surgery, all patients received ondansetron 4 mg i.v. and residual neuromuscular blockade was reversed with intravenous neostigmine 50 µg kg<sup>-1</sup> and glycopyrrolate 10 µg kg<sup>-1</sup>.

Intraoperative blood loss was calculated using the formula described by Gross [15]:  $CBL = EBV \times [(Hb (i) - Hb (f))/Hb (m)] + Tx$  where CBL is the calculated blood loss, EBV is the estimated blood volume, Hb (i), Hb (f) and Hb (m) are the initial, final and mean (of initial and final) hemoglobin levels respectively and Tx is the total transfusion volume received (in milliliters). Any complications or side-effects due to the study drugs were also recorded.

The data was analyzed with Statistical Package for Social Studies (SPSS for windows 14, Chicago, IL, USA). Patient characteristics were analyzed by the Chi-square test for nominal data. Parametric data (age, height, weight) was analyzed using the independent samples *t*-test. Non parametric data was analyzed using Mann Whitney-*U* test. To evaluate anaesthetic data the independent samples *t*-test or the Mann Whitney-*U* test was used. Quantitative data was expressed as mean ± S.D. Categorical data was expressed as median (IQR) or number (%). P-value of <0.05 was considered statistically significant.

As this was the first study evaluating the effect of tranexamic acid in burn patients, we did pilot cases (10 patients in each group) to determine the sample size. Mean blood loss was 900 ± 200 ml in placebo group and 700 ± 200 ml in tranexamic acid group. To detect this difference with 90% power and a level of significance of 5%, we needed to recruit 22 patients in each group. To account for possible dropouts we decided to include 25 patients in each group.

## 3. Results

Sixty patients were assessed for eligibility, of which 6 patients did not meet the inclusion criteria and 4 patients refused to give consent for participation in the study. A total of fifty patients were included in the study and eventually analyzed. The CONSORT flow diagram is presented in Fig. 1.

Both the groups were comparable in terms of patient demographics (i.e., age, weight, gender distribution, patient temperature). Total body surface area burnt (%), duration of surgery and number of patients undergoing limb debridement and trunk debridement was also comparable between the two groups (Table 1). In both the group of patients, on an average only 15–20% of the total burnt area was debrided, with skin grafting being done in 8 patients in tranexamic group and 6 patients in placebo group.

Intraoperative blood loss per percentage total burn surface area was significantly higher in placebo group as compared to tranexamic group (Table 2), with the mean blood loss being 990 ± 358.9 ml vs. 581 ± 333.2 ml (p < 0.00) in the placebo and tranexamic groups respectively.

Preoperative hematological status (hemoglobin and hematocrit) was comparable between the two groups (Table 3). However, as compared to the tranexamic group, in the placebo group, postoperative hemoglobin, immediately and at 24 postoperative hours, was significantly lower (p < 0.05). The immediate postoperative hematocrit was also significantly lower in placebo group as compared to tranexamic group (Table 4).

In the placebo group more blood and colloid solutions were used to replace the blood loss (p < 0.05) (Table 5). In tranexamic group, only 6 patients required blood transfusion compared to 13 patients in placebo group (p < 0.05) and only 7 units of blood

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات